INTERNATIONAL JOURNAL FOR INNOVATION EDUCATION AND RESEARCH

ONLINE ISSN: 2411-2933 PRINT - ISSN: 2411-3123

INTERNATIONAL EDUCATIVE RESEARCH FOUNDATION AND PUBLISHER (IERFP)

Volume- 5 Number- 12

December Edition

About the Journal

Name: International Journal for Innovation Education and Research

Publisher: Shubash Biswas

International Journal for Innovation Education and Research
44/1 Kallyanpur Main road
Mirpur, Dhaka 1207
Bangladesh.
Tel: +8801827488077

Copyright: The journal or any part thereof may be reproduced for academic and research purposes with an appropriate acknowledgment and a copy of the publication sent to the editor. Written permission of the editor is required when the intended reproduction is for commercial purposes. All opinions, information's and data published in the articles are an overall responsibility to the author(s). The editorial board does not accept any responsibility for the views expressed in the paper.

Edition: December 2017

Publication fee: $100 and overseas.

Editorial

Dear authors, reviewers, and readers

It has been a month since I was given the privilege to serve as the Chief Editor of the International Journal for Innovation Education and Research (IJIER). It is a great pleasure for me to shoulder this duty and to welcome you to ***THE VOL-5, ISSUE-12 of IJIER*** which is scheduled to be published on **31st December 2017.**

International Journal for Innovation Education and Research (IJIER) is an open access, peer-reviewed and refereed multidisciplinary journal which is published by the International Educative Research Foundation and Publisher (IERFP). IJIER aims to promote academic interchange and attempts to sustain a closer cooperation among academics, researchers, policy makers and practitioners from a wide range of disciplines, which contribute to state of the art in science, education, and humanities. It provides a forum for the exchange of information in the fields mentioned above by welcoming original research papers, survey papers, and work-in-progress reports on promising developments, case studies, and best practice papers. The journal will continue to publish high-quality papers and will also ensure that the published papers achieve broad international credibility.
The Chief Editor, appointed by the Associate Editors and the Editorial Board, is in charge for every task for publication and other editorial issues related to the Journal. All submitted manuscripts are first screensed by the editorial board. Those papers judged by the editors to be of insufficient general interest or otherwise inappropriate are rejected promptly without external review. Those papers that seem most likely to meet our editorial criteria are sent to experts for formal review, typically to one reviewer, but sometimes more if special advice is needed. The chief editor and the editors then make a decision based on the reviewers' advice.
We wish to encourage more contributions from the scientific community to ensure a continued success of the journal. We also welcome comments and suggestions that could improve the quality of the journal.

I would like to express my gratitude to all members of the editorial board for their courageous attempt, to authors and readers who have supported the journal and to those who are going to be with us on our journey to the journal to the higher level.

Thanks,

Dr Eleni Griva
Ass. Professor of Applied Linguistics
Department of Primary Education
University of Western Macedonia- Greece
Email: chiefeditor@ijier.net

Table of content

Paper ID	Title	Page
55	**A DEVELOPMENT OF PaDLeSS APPROACH FOR PART DISPOSAL REDUCTION IN AIRCRAFT COMPOSITE MANUFACTURING** ***Authors:*** *Mohd Shihabudin Ismail, M.I. Hussain, N. Muhammad, Z. Mohd Zain, R. Ahmad, M.S. F. Soberi*	1-17
844	**Financial Education for Adults - Women beneficiaries of the Bolsa Família Program (BFP) and Retirees with income of up to two minimum salaries** ***Authors:*** *Claudia Márcia de Jesus Forte, Fernanda Sanches Rocha*	18-38
855	**Female Saudi International Students Daily Practices on Social Media in Australia** ***Authors:*** *Hanan MOHAMMED ALSHEHAB*	39-77
867	**Technology Transfer A Bibliometric Analysis** ***Authors:*** *Dimitrius Pablo Sabino Lima de Miranda, Armoni Da Cruz Santos, Suzana Leitão Russo*	78-87
868	**Female College Students Perceptions of Virginity and Oral Sex** ***Authors:*** *Peggy Bergeron, Margaret Bergeron*	88-94
872	**Multivariate Analysis of Brazilian Agricultural Production** ***Authors:*** *Fernando Ferrari Putti, BRUNO CÉSAR GÓES, VINÍCIUS PALÁCIO, BEATRIZ RODGRIGUES DE GODOY, DIOGO DE LUCCA SARTORI*	95-100
873	**Implementation Process of Corporate University in Network (CUN)** ***Authors:*** *Gertrudes Aparecida Dandolini, Patricia de Sá Freire, João Artur de Souza*	101-126
875	**A Scenario-Based Methodology for Cloud Computing Security Risk Assessment** ***Authors:*** *Ishraga Mohamed Ahmed Khogali, Hany Ammar*	127-155
880	**STRATEGIC MANAGEMENT PRACTICES AND PERFORMANCE OF PUBLIC HEALTH INSTITUTIONS IN MANDERA COUNTY, KENYA** ***Authors:*** *Ibrahim Ahmed Issack, Stephen M. A. Muathe*	156-168
881	**The follow-up of alumni as a strategic action in Brazilian universities** ***Authors:*** *Claudia Prim Correa, Cibele Barsalini Martins, Areli Andreia dos Santos*	169-179
882	**Innovation, creativity and entrepreneurship as a teaching strategy** ***Authors:*** *Gentil Luiz da Silva II, Juliano Bueno Barbosa da Silva, Rafael Rocha da Silva, Enio Costa, Rafael Thyago Antonello*	180-184
886	**A Decade of Implantation of the Bachelor's Degree in Electrical Engineering in the Western Amazon** ***Authors:*** *Carlos Alberto T. Carvalho Jr., Ciro J. Egoavil, Lucas F. Ramos, Mauren P. C. Silva, Priscila L. Vianna, Viviane B. Silva, Walterlina B. Brasil*	185-197
888	**The Use of Cryodehydratated Animal Anatomical Segments for Veterinary Anatomy Teaching** ***Authors:*** *ANA LUISA SCHIFINO VALENTE, Lygia Almeida*	198-210
892	**Strategic Human Resource Management Practices and Performance of Employees in the Ministry of Health, Nairobi City County, Kenya** ***Authors:*** *NYAMBANE ARIRI NYAMBANE, Stephen M. A. Muathe*	211-227

International Educative Research Foundation and Publisher ©2017

894	**Active and Latent Failures in Customer Services and Opportunities for Quality Innovation for Convenience Stores** ***Authors:*** *An-Che Chen*	**228-236**
895	**Report on Experience on Health Education as A Tool in The Prevention of Hypertension and Diabetes Mellitus with Male Female Civic Policies in The Integrated Regions of Public Safety Risp and 1st Regional Delegacy of Juiz De Fora Mg – Brazil** ***Authors:*** *Martha Bezerra Vieira, Karla Julião Villani Felippe, Juliane da Silva Barros*	**237-246**
897	**Using simulation as cervical and anal cytology teaching-learning strategy** ***Authors:*** *Janaina Coser, Janice de Fátima Pavan Zanella, Vanessa Laís Diefenthäler, Sara Gallert Sperling, Dario Ronchi, Tatiana Mugnol, Juliana Lemes dos Santos*	**247-259**
899	**Redesigning an economics course to achieve more reflexivity Is blended learning a curse or a blessing for mid-career MPA students and teacher?** ***Authors:*** *Peter Koenraad Marks*	**260-273**

International Educative Research Foundation and Publisher ©2017

Development of PaDLeSS Approach for Part Disposal Reduction in Aircraft Composite Manufacturing

M.S. Ismail[1, a], M.I. Hussain[2, b], N. Muhammad[3, c], Z. Mohd Zain[4, d], R. Ahmad[5, e], M.S. F. Soberi[6,f]
[1,2,3,4,5,6]School of Manufacturing Engineering, University Malaysia Perlis, Pauh Putra Campus, 02600 Arau, Perlis, Malaysia

Abstract
This paper focus on a development and implementation of a systematic guided lean and six-sigma approach to solve high rejection rate on part disposal at composite manufacturing for aircraft component industry. The approach is called PaDLeSS which is stand for Part Disposal reduction through Lean and Six Sigma. PaDLeSS is developed from the integration between lean and six sigma tools with a guided by R-DMAIC-S approach and it is focused on the reduction of parts disposal mainly at a composite manufacturing panel for aircraft components. Since a unit price for one composite panel of aircraftcomponent is very high, a systematic approach to improve, control and sustain the process is necessary in order to reduce parts rejection rate in the process, outgoing process and at the customer process. PaDLeSS is devided into two main phases; development phase and implementation phase. In a development phase, a thorough study was carried out from previous works and match with a requirement needed in part disposal reduction at composite manufacturing for an aircraft panel. The related data related to the parts disposal at the manufacturing line was also analyzed to get actual situation for improvement monitoring. Then, in the implementation phase, a few case studies selected at company A (composite panel for aircraft manufacturing company in Malaysia) for verification and validation purposes. In this paper, the development of PaDLeSS will be presented.

Keywords: PaDLeSS approach, aircraft composite panel, lean, six sigma, Kaizen, Cause & Effect diagram

Introduction

The aerospace industries have proven that composite materials (such as fiberglass & carbon-fiber/epoxy) have superior strength-to-weight ratios & excellent fatigue resistance and its ability to be tailored to different properties by various reinforcement configurations, matrix materials & manufacturing processes. Majority of aerospace components manufacturing in Malaysia using hand lay-up technique to process composite panels. The selection of the hand lay-up process is due to its advantage in the ability to fabricate large & complex parts with a quick initial start-up. However, there is a main disadvantage of hand layup process which is a manual process and depends very much on operator skills. Therefore, it is a necessary to introduce lean and six sigma approaches to reduce process variation and production waste due to the manual processes involved in this type of industry.

Manual hand lay-up process in aerospace industry is exposed to high process variation. The skills between operators are very hard to get constant results in the inconsistency of the product quality. Furthermore, the nature of low volume high mix product produced increases the process variation. This process limitation leads to high rejection rate of the finished and semi finished product. A systematic lean and six sigma techniques need to be developed to solve a high disposal cost for semi finished product in aerospace composite manufacturing company. For example, in company A (aircraft composite panel manufacturer), the company need to absorb millions ringgit (MYR) as a part disposal cost in year 2013. Top defect items causing this high disposal cost need to be identified from the Pareto chart and the causes and actions for each defect item to be determined clearly. Besides that, in order to enable the lean and six sigma techniques applied in the company successfully, the awareness among employees is required. The lean and six sigma culture need to be enhanced among the employees in order to solve the top defect items effectively.

Literature reviews

Lean six sigma is an organizational philosophy of applying relentless efforts to drive waste out of the organization and improve product quality. It is a continuous analysis of the organization to determine where improvement is needed followed by kaizen events and projects. The projects are managed by means of the six sigma define, measure, analyze, improve and control (DMAIC) process using many great tools included in the six sigma knowledge. Lean six sigma is about applying a strategy to improve the business. It can be applied to improve certain areas of business or operations on a tactical level or to achieve strategic objectives. All lean six sigma projects should be driven by metrics. Each area the company desires to improve must be measured to develop meaningful metrics which are most effectively applied via dashboards [1]. A dashboard is a cluster of charts, graphs and other data revealing performance to key metrics. Dashboards are simple, yet powerful tools to communicate progress to everyone in the organization. In Japanese word, dashboard is known as *kanban*.

Six sigma is about reducing the variation of a process. Normally process variation is indicated by a standard deviations (σ). The more standard deviations (σ) that fit between the mean of the distribution and the specification limits (as imposed by the customer), the more capable is the process. A six sigma process means that six(6) standard deviations fit on each side of the mean, between the mean and the specification limits. Six Sigma equates in percentage terms to 99.9997% accuracy or to 3.4 defects per million opportunities to make a defect. Figure 1 illustrates how Six Sigma quality is achieved by reducing variations in a process [2].

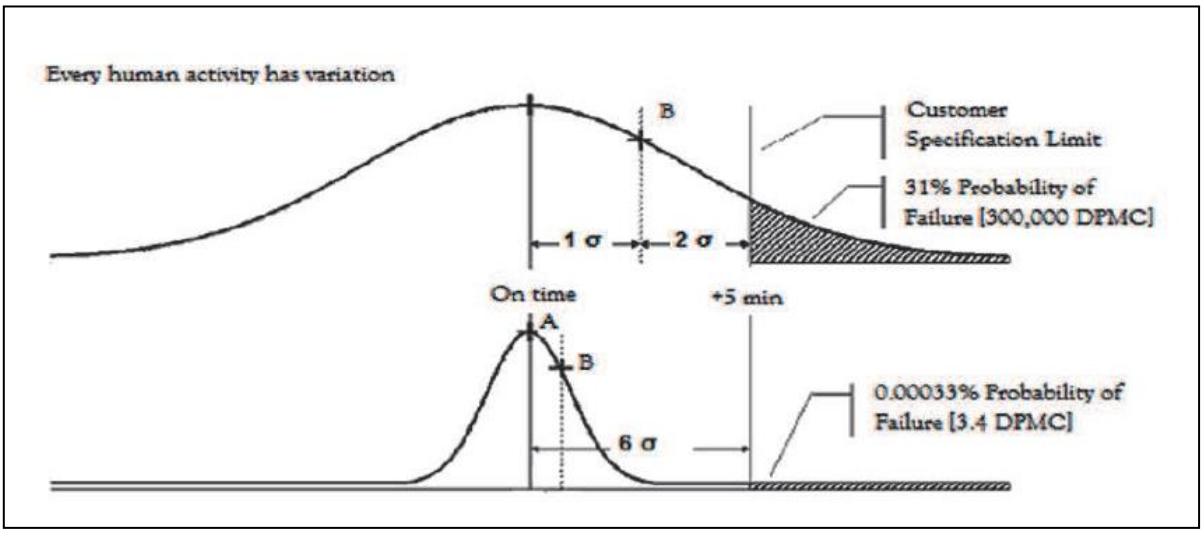


Figure 1 : Reducing process variation using Six Sigma

Six Sigma concepts can be better understood and explained using mathematical term Sigma and Normal Distribution. Sigma is a Greek symbol represented by "□". The bell shape curve shown in Figure 2 is called "normal distribution" in statistical terms. In real life, a lot of frequency distributions follow normal distribution, as in the case of the MP4 Player production pass yield at the SONY production line. Natural variations cause such a distribution or deviation. One of the characteristics of this distribution is that 68% of area (the data points) falls within the area of -1□ and +1□□ on either side of the mean. Similarly, 2□ on either side will cover approximately 95.5% area. 3□ on either side from mean covers almost 99.7% area. A more peaked curve (for instance more and more good MP4 player were made on target) indicates lower variation or more mature and capable process. Whereas a flatter bell curve indicates higher variation or less mature or capable process. To summarize, the Sigma performance levels – one to six sigma are arrived at in the following way.

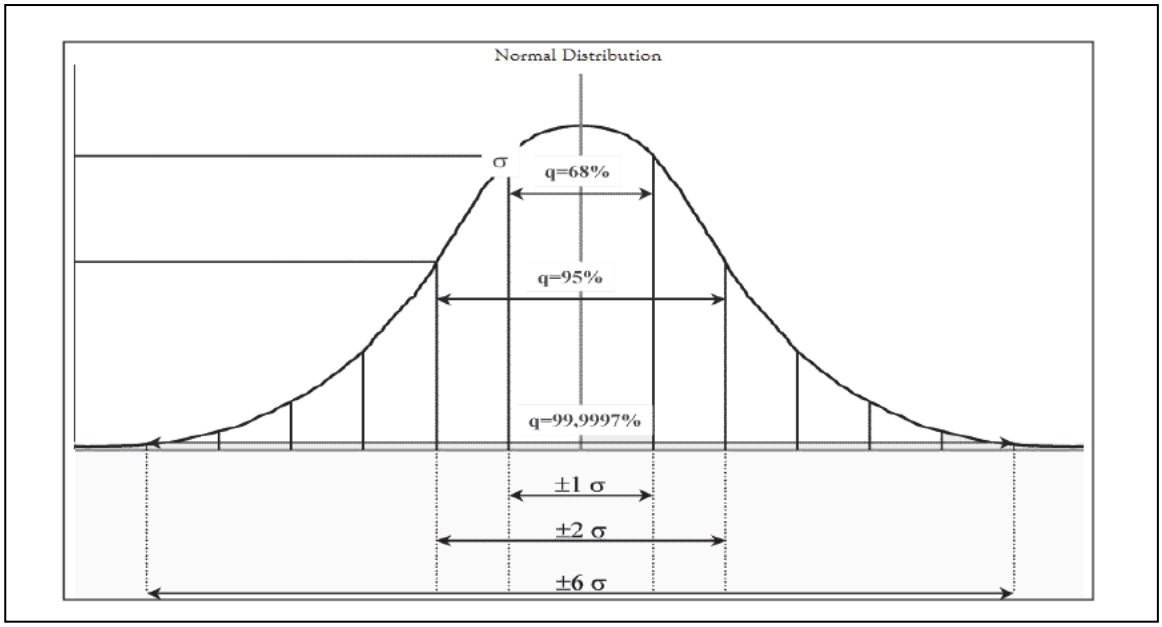


Figure 2 : Normal Distribution

If good MP4 player target is reached 68% of the target output, SONY are operating at +/- 1 Sigma and if 95.5% of the target output achieved, they are operating at +/-2 Sigma. Then, if 99.73 % of the target output achieved, SONY is operating at +/-3 Sigma. 6 Sigma is said to be achieved by SONY if only 3.4 ppm defects is made by the production line, which is equal to 99.9997% of the target output. Sigma Quality Level (SQL) is a measure used to indicate how often the defects are likely to occur. Sigma is a mathematical term and it is the key measure of variability. It emphasizes need to control both the average and variability of a process. Table 1 shows different sigma levels and associated defects per million opportunities. For example, sigma level 1 indicates that it tolerates 690,000 defects per million opportunities with 31% production pass yield. Sigma level 6 allows only 3.4 defects per million opportunities with 99.9997 production pass yield.

Sigma Performance Levels - One to Six Sigma		
Sigma Level	**Defects Per Million Opportunities**	**Percentage Yield**
1	690,000	31
2	308,537	69
3	66,807	93.3
4	6,210	99.38
5	233	99.977
6	3.4	99.99966

Table 1 : Sigma performance Levels

The Six Sigma implementation effects are quantified in tangible savings (as opposed to Total Quality Management (TQM) where the benefits cannot be measured). Quantification of tangible savings is a major selling point for Six Sigma.

Lean manufacturing is another quality and productivity improvement methodology introduced in Toyota Production Systems (TPS) which is based on the concept of elimination of waste in processes which can results in productivity gain and improvement of speed and flow in the value stream [2]. The principle of Lean can be stated as a relentless pursuit of the perfect process through wastage elimination in the value stream. Lean identifies three different kinds of wastes, using Japanese terminology from the Toyota Production System where lean originated:

i) *Muda* (waste of time and materials),
ii) *Mura* (unevenness/ variation), and
iii) *Muri* (the overburdening of workers or systems)

Every employee in a lean manufacturing environment is expected to think critically about his or her job and make suggestions to eliminate waste and to participate in kaizen, a process of continuous improvement involving brainstorming sessions to fix problems. Kaizen is another Japanese terminology which comes from two words “kai” and “zen” which means “change” and “good”, respectively. In a phrase

it can be translated as "change for a better" or "improvement". Kaizen is globally practiced in manufacturing companies for production continuous quality improvement (CQI) activities. There are 5 main steps in Kaizen cycles which can be simplified as DAKRS, as shown in Figure 3.

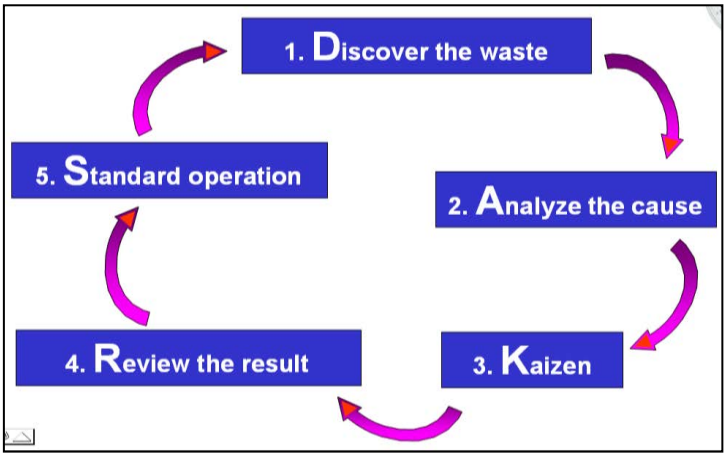


Figure 3 : Kaizen Cycle

The first step in the Kaizen cycle is discovering the waste in the manufacturing processes. There are various types of wastes which are 'hiding' behind the production line processes. Bill Carreira [1] said that if an activity generates revenue, it is not waste but if an activity adds cost and generates no revenue, it is considered waste. This simple description of process waste clearly mentioned that waste is any process which is not adds value to the semi finished product. There are seven typical categories of process waste which are :

a) Overproduction
   Overproduction waste can happen either producing something before the next step in the process requires it or producing something before a customer is prepared to purchase it. This waste might be happened due to unbalance cycle time for each operator in the production line and a long setup and changeover times.
b) Excess inventory
   Excess inventory is referred to the actual material that is not yet needed that causing cost of people, machines and space besides cost of actual materials and the associated carrying cost.
c) Transportation
   Transportation or transport waste is a symptom of layout and linkage between processes. Moving activity of an item from one location to another adds no value. Devices and systems for material transport are also incure huge cost. It is important to design a factory layout with minimum transport of material and semi finished product.
d) Process
   Process flow design by production engineer is very critical to avoid any process waste. The process should be focused on value added activities and need to optimize the inspection items with priority given on the customer requirement items.

e) Reject and rework

Variation in the process and the effects of characteristics of material will cause specification differences at each point in the system. A reject can occur at any, or all, steps in this process such as materials and components rejected during incoming inspection, product rejected at any point of internal process, product rejected at final inspection, product rejected after received by customer or product rejected by the end user, returned to customer with a cost incurred back to the manufacturer. Therefore, lean manufacturing need to answer the questions, "How do we design our process so that the variation falls under a Six Sigma distribution curve?" or "How do we create an environment that uses Six Sigma tools and teams to minimize variation and reduce rejects?". For this research, the reject and rework wastes are the main focus and the KPI (key performance index) is set as a final research objective.

f) Waiting time

There are many causes of waiting time waste such as waiting for materials, inspectors, instructions and equipments. Normally it is due to lack of process definition and unbalance process design. This type of waste might be happen by people, machines, materials and information. Lean manufacturing need to look into improving the linkage between processes so that the balance between people, machines, materials and information could be achieved.

g) Unnecessary motion

This waste is related to people and layout. It is a measure of travel and handling of materials, tools and machines by operator in the layout and process sequence designed. MODAPTS is one of the methods of work study which could be applied during process design in order to avoid motion waste. The ergonomic factor also need to be considered during design the layout to reduce operator's or user's fatigues and ease the process.

All items above are nonvalue added activities to the product and not contribute to a more complete product or service and the customer is unwilling to pay for these activities.

Lean Six Sigma approach is how to integrate between lean manufacturing and six sigma approach to improve the company's profit In terms of either production line pass yield, productivity, on line defect rate or parts disposal reduction (internal and customer return). For this study, parts disposal reduction will be the main focus. The fusion of Lean and Six Sigma is required because lean alone cannot bring process under statistical control and Six Sigma alone cannot dramatically improve process speed or reduce invested capital. Lean Six Sigma is a disciplined methodology which is rigorous, data driven, result-oriented approach to process improvement. It combines two industry recognized methodologies evolved at multinational companies such as Motorola, GE, Toyata, and Xerox. By integrating tools and processes of Lean and Six Sigma, a powerful engine for improving quality, efficiency, and speed in every aspect of business are created[2].

Embedding a rigorous methodology likes lean six sigma into organizational culture is not a short journey, but it is a deep commitment not only to near-term results but also a long term, continuous, even break-through results. Everton and Sergio [3] carried out a good comparison between previous researchers

methodology for Lean and Six Sigma tools. There are basically common tools between Six Sigma and Lean, as shown in Figure 4 .

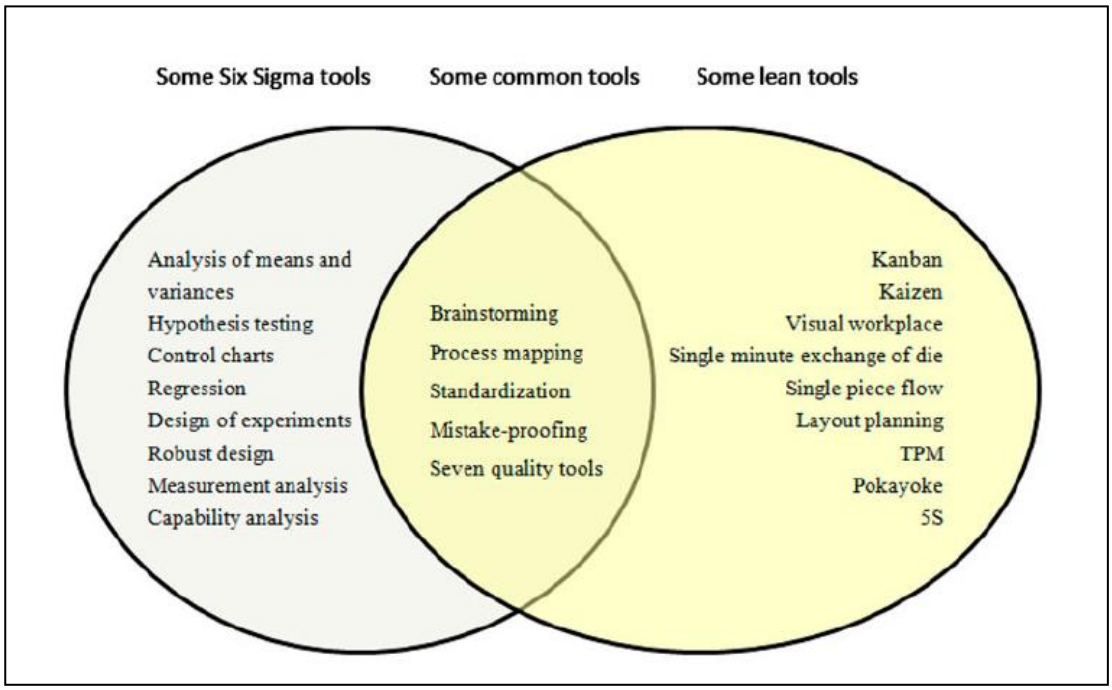


Figure 4 : Six Sigma and Lean tools

The common tools include brainstorming, process mapping, standardization and mistake-proofing. He modified Forza's proposed methodological with six phases and came out with the conceptual model of Lean Six Sigma theory as in Figure 5. He broke down the steps into three simple steps; Initial, Intermediate and Final steps. Initial step involved literature review involving four specific areas of knowledge; operation strategy, lean manufacturing, Six Sigma and Lean Six Sigma. Questionnaires and exploratory survey was carried up in Intermediate step and at the final step, the survey results is analyzed statistically.

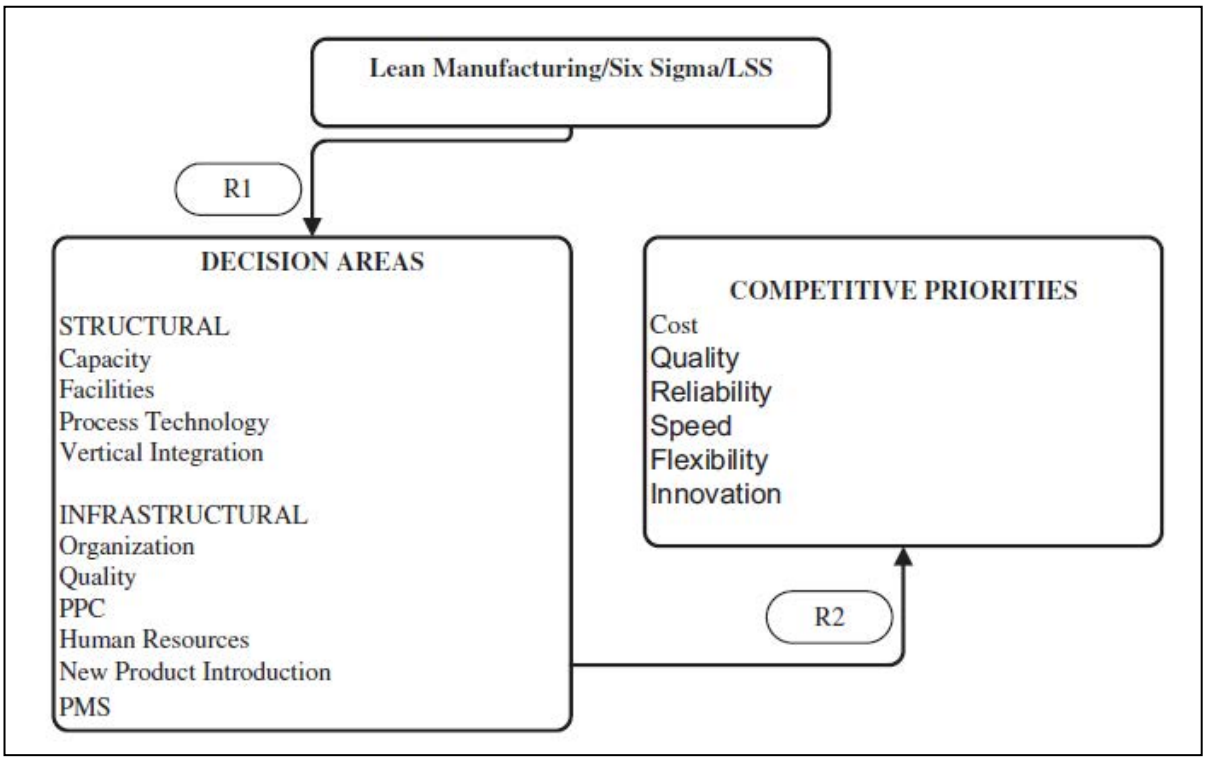


Figure 5 : Conceptual model of Lean Six Sigma theory

Double LEAN Six Sigma approach was developed by Mark and Jagadeesh [4]. Double LEAN means "LL-EE-AA-NN" which consists of four phases; LL (Look and Locate), EE (Explore and Establish), AA (Analyze and Apply) and NN (New and Navigate). First phase LL "Look" at the organization, its customers and processes and "Locate" the process need to be improved. At second phase EE, the company need to "Explore" the process to understand it and "Establish" a baseline after collecting the relevant data. Next in third phase AA, to "Analyze" the problems (or processes), it is necessary to identify the process parameters, steps and link the causes to its effects. Then "Apply" that knowledge to identify the improvement steps by using ANOVA and hypothesis testing. The final phase is NN which means a "New" process is developed based on the evaluation and implementation of the improvements. Plans are introduced to "Navigate" the use of the new process in order to ensure the improvements achieved are monitored and maintained.

There was one study found related to lean manufacturing implementation at Spanish aeronautics industry. The study carried out by B. Prida and M.Grijalvo [5]. Only lean techniques applied in the company in order to reduce process waste (MUDA) but Six Sigma was not integrated together. In this study, the entire assembly line is gathered in a VSM model (Value Stream Mapping) with a combination of a new developed standard which is called VSM-II model. VSM-II model was able to create a snap shot of the system to provide a more precise definition of how the system works. Then, the deviation from standard was measured by using the TMD (Total Mean Deviation) and AMD (Absolute Mean Deviation) equations as performance indicators. The study concluded that the policy of flexibility which allowed for a greater use of manpower, constitute a major barrier to the implementation of lean manufacturing in the company.

The comparison between traditional versus lean manufacturing approach in term of this flexibility is shown in Figure 6.

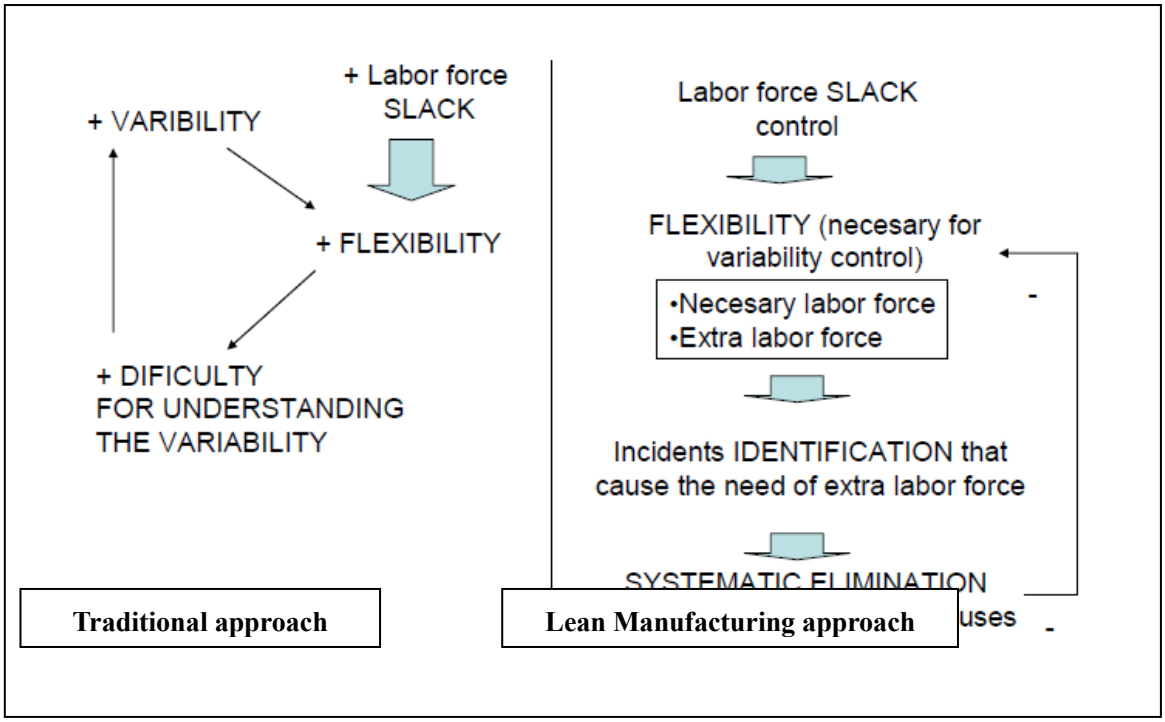


Figure 6 : Traditional approach vs lean manufacturing approach

The study also concluded that when it comes to lean manufacturing, participation from the bottom of the shop floor is vital to the successful implementation of this process. Nevertheless, shop floor participation usually does not occur in companies spontaneously. Training is useful but is clearly not enough. It is necessary to change procedures, practices and policies in order to change the culture of organizations and these changes are not easy to be implemented quickly [6].

The use of composite materials such as carbon fiber reinforced plastics (CFRPs) is increasing especially in structural parts in aircraft industry. Manufacturability needs to be considered in aircraft design to ensure a cost-effective manufacturing process. Frida and Astrid [7] describe the development of a new strategy for how SAAB Aerostructures addressing manufacturability issues during the development of airframe composite structures. Nowadays, the design and manufacturing of parts and subsystems are often outsourced to several different sub-suppliers. The suppliers put strong requirements on cost and time of delivery. According to Airbus and Boeing, the amount of air travel is expected to increase by around 5% in the coming twenty years. This means a higher demand for aircrafts among the world's aircraft manufacturers. DFM (design for manufacturing) is one of the method in Six Sigma could be applied by the companies to meet this demand. One way that aircraft manufacturers are dealing with a demand to lower fuel consumption and environment impact is to reduce the weight of the aircraft by using new types of materials, especially CFRP.

Besides, recently there are many accidents involving aircraft occurs. This makes the giant manufacturer of aircraft (Boeing and Airbus) started to tighten the incoming specifications for the sub-assembly components from the suppliers. Thus besides the technical point of view, a better process control is required to be implemented at the suppliers' production line in order to guarantee the quality of the aircraft components produced. Furthermore, in order to improve profit at the supplier company, inline defects need to be avoided or reduced and continuous quality improvement (CQI) activities need to be absorbed as a company culture. This is where the integration between lean manufacturing and six sigma required.

Alastair [1] proposed a problem solving concept known as R-DMAIC-S cycle. The cycle starts with Recognize (R) where the systematic problems or significant gaps in the business need to be identified. Then, in Define (D) step the business problem need to be formulated and the scope need to be defined. Next, the correct data is gathered in Measure (M) step and the critical to quality (CTQ) to be selected. The data gathered then need to be changed into a stastical problem in Analyze (A) step. At this step, process capability need to be established and performance objective need to be defined. Step 'I' is referred to Improve and at this step the team need to develop a practical solutions. The best improvement strategies must be chosen. Next, in Control (C) step will implement the practical solution where the measurement system to be validated and process control and risk management have to be in place. Finally, in Sustain (S) step the evaluation and report for the Six Sigma project need to be executed.

In this research, both lean manufacturing approaches and six-sigma tools will be integrated together which expected to results in the excellence efficiency and productivity of the production line. The R-DMAIC-S cycle will be used as a guideline for the methodology of the research. Evaluation of this integration will be carried out at one of the aerospace component manufacturer, company A located at northern region of Malaysia to justify the actual result. This company manufactures flat and contoured primary structure (aileron skins, spoilers and spars) and secondary structure (flat panels, leading edges, trailing edges and so on) of composite bond assemblies and sub-assemblies for aerospace industries. One of the major issues facing by the company is high parts disposal cost. A collaboration to be made between researcher and the company's lean and six-sigma team to bring down this part disposal cost. During doing the analysis, all the related lean approaches and six-sigma tools to be utilized.

Even though many researchers had come out with Lean and Six Sigma approaches, there is still a loop hole for validation of this concept at an actual production line especially at aircraft component manufacturing area. Therefore this research will focus on an actual aircraft components production at company A which currently newly set up a lean department to look into the lean and six sigma approaches seriously. At early year 2015, this company is running the production at 2 Sigma level only and generally the lean manufacturing awareness among the employees is still low. The lean department team opinion said that it is very difficult to get cooperation from all the employees in the factory due to low awareness of a lean six sigma among them and need to be improved drastically. Therefore the kick off of this project

research is at a perfect time in order to assist the company achieving the key performance index (KPI) set by the company's top management regards the part disposal cost reduction. The tangible KPI which is 50% reduction of the part disposal by end of year 2015 and further 50% reduction by end of year 2016, makes this project very important to the company A's lean department team.

Methodology and approach

By referring to the situation above, a guided Lean-6s (lean six sigma) technique is required to be applied in aerospace composite panel manufacturing company. By this application, the manual process variation could be reduced statistically and unwanted production waste could be eliminated from the production line in order to give a higher productivity and quality of the product. PaDLeSS (Part Disposal reduction through Lean & Six Sigma) is developed as a guided Lean-6s approach to focus on the parts disposal reduction. Company A production line will be selected as a pioneer for the implementation of this approach which targeted to give a big impact to the reduction of part disposal cost. There are two key processes for composite panel manufacturing involved; lay up and trimming processes. For an improvement on a Lean-6s culture among the employees in the company, series of trainings to the employees from all positions (includes operators) could be conducted.

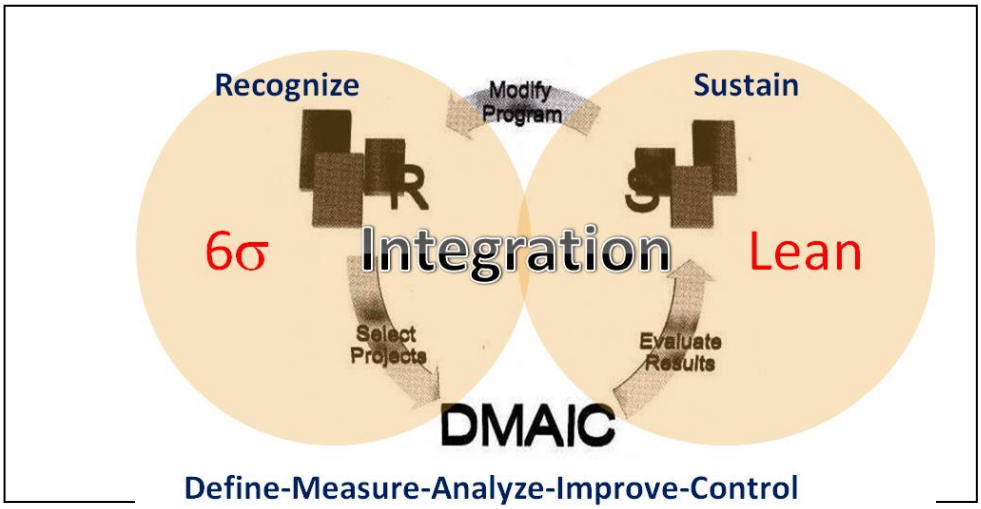


Figure 7: PaDLeSS approach

PaDLeSS approach is shown in Figure 7 where it is a combination of integration between lean six sigma and R-DMAIC-S methods. Its key steps are described in a flow chart, as in Figure 9. The methodology of integration between lean and six sigma approaches is guided by the R-DMAIC-S cycle [8]. The seven steps involved are as follows ; Recognize (R) and Define (D), Measure (M), Analyze (A), Improve (I), Control (C) and Sustain (S)

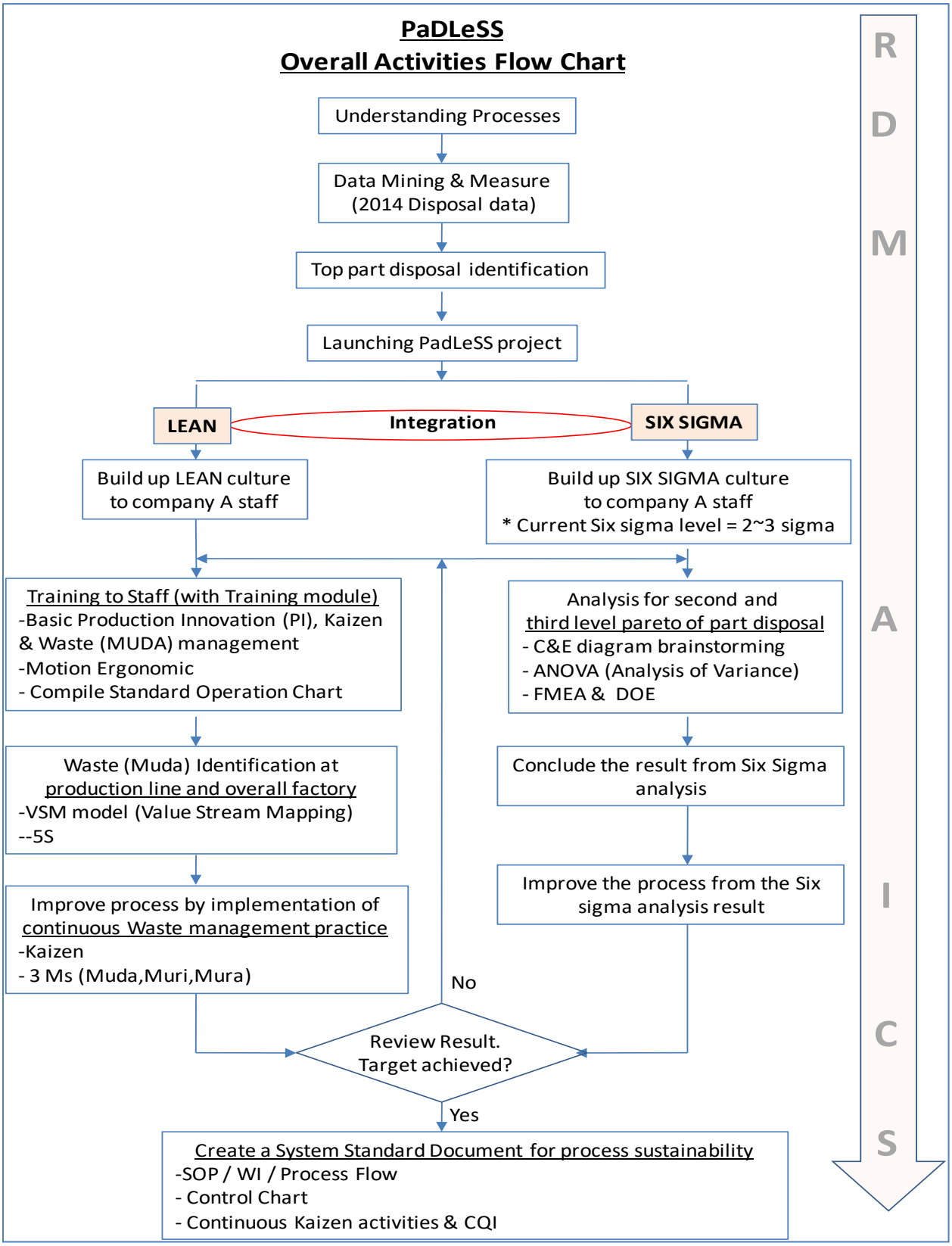


Figure 8: PaDLeSS Methodology

(a) Recognize (R) and Define (D)

The chart begins with recognize (R) step of the problem. One of the major issue rose in year 2014 in company A is very high parts disposal cost. Therefore the parts disposal reduction by half was selected

as a key performance index (KPI) to link with the lean and six sigma approaches research. Then in a define step (D), the problem statement, objective and scope of the project need to be clearly identified and written. This work involves the voice of customer (VOC) and the lean six sigma team must listen to this VOC and translate the customer's language into meaningful requirements.

(b) Measure (M)

The next step is measure (M) step with two main purposes ; gather data to validate and quantify the problem (opportunity) and begin teasing out facts and numbers that offer clues about the causes of the problem [9]. In this step, year 2014 part disposal data was gathered and monitored. From the company's parts failure by items data, overall scenario of the pareto for model X disposal parts is shown in Figure 9.

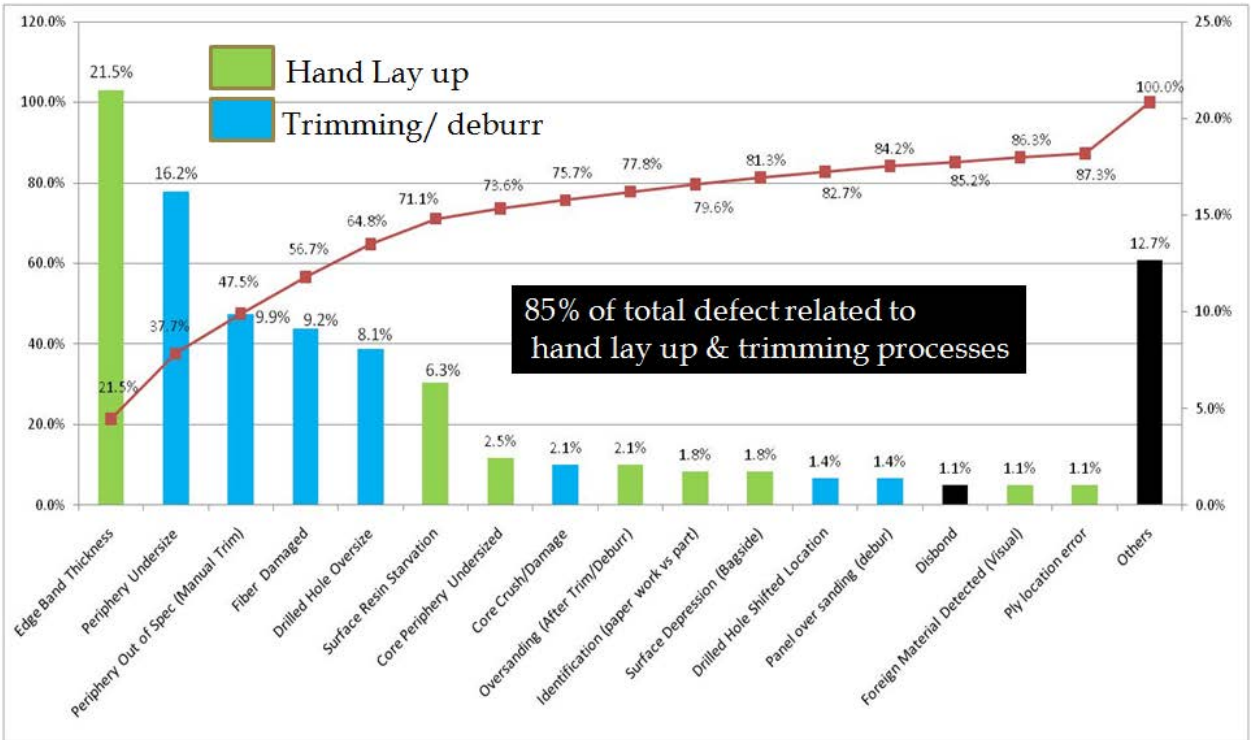


Figure 9: First Level Pareto for model X failure items

From the first level pareto in Figure 9, 85% of the overall defect items quantity are from two main processes ; hand lay up and trimming (deburr). These two processes need to be further studied to get a second level pareto in order to know the root cause of each items. Edge band thickness is a major defect faced by the aircraft company production line which is referred to a thickness dimension of the finished product out of specification when compared to the manual drawings. Periphery out of specification and dimension undersize are other two major defects. Manual trimming process will make the periphery dimension more difficult to be controlled. Fiber damaged also one of the difficult items to be controlled statistically since most of these failures are related to the handling issue.

At the end of M step, the PaDLeSS project was launched and kicked off at company A. From a lean point of view, the lean manufacturing awareness among employees in company A need to be measured. This could be done by giving the survey questions to the employees for them to answer. As for

a six sigma point of view, the measurement should be focused on the sigma level which is currently practiced by company A. From the measurement, it was finalized that the awareness of lean manufacturing among employees is still low and the company's production is only running at 2 to 3 sigma level (approximately at 70% to 90% yield). As a result, the researcher feels that the lean six sigma culture at company A is still need to be built up and this action should be put as a priority.

(c) Analyze (A)

In this step, the team will use it to find the root cause of the problem. One of the principles of good R-DMAIC-S problem solving is to consider many types of causes, so that not to let biases or past experience cloud the team's judgment [9]. The most common six sigma tool could be utilized here is Cause and Effect (Fishbone) diagram. Some of the common cause categories to be explored are (6 M's) as follows :

i) Methods : the procedures or techniques used in doing the work
ii) Machines : the technology used in a work process such as manufacturing equipments, computers and copiers
iii) Materials : the data, instructions, numbers or facts, forms, and files that if flawed, will have a negative impact on the output.
iv) Measures : faulty data resulting from measuring a process or changing people's actions on the basis of what's and how it is measured.
v) Mother Nature : environment elements, from weather to economic conditions that might impact on process or business performance
vi) Man : factors caused by human being due to fatigue and it is a key variable to produce business result.

Figure 10 shows the cause and effect diagram for top failure of the part defect which is Edge Band Thickness (EBT) failure.

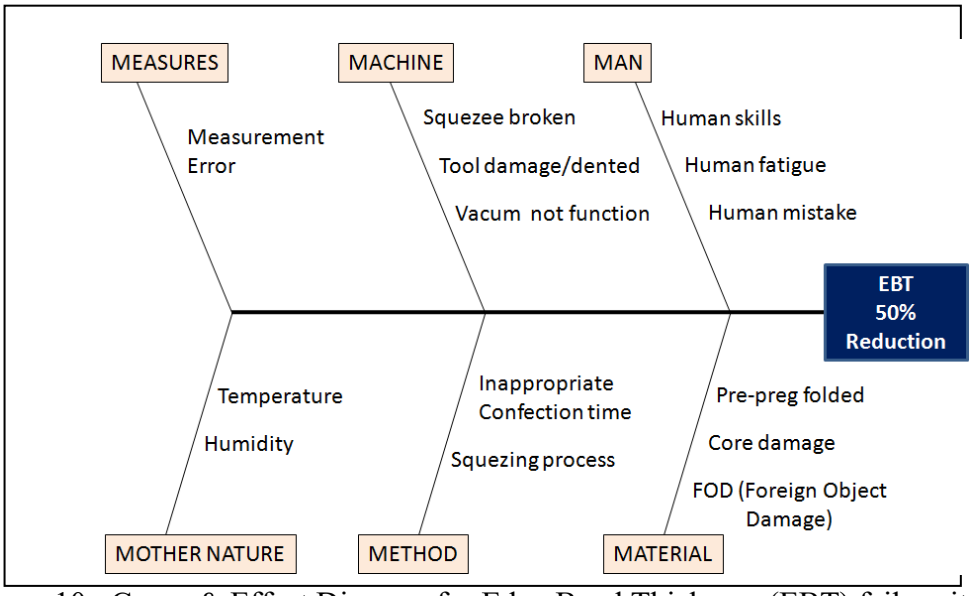


Figure 10 : Cause & Effect Diagram for Edge Band Thickness (EBT) failure item

One of the big challenges in analyze step is to select a right tools. When causes go deeper or when the relationship between the problem and other factors is complex and hidden, more advance statistical techniques may be required to identify and verify the cause. From Figure 8, at the beginning of step A, a training to employees were conducted in order to familiarize them with lean six sigma culture. The training to be conducted includes basic production innovation (PI), kaizen and waste (Muda) management, motion ergonomic and compile standard operation chart. Then for lean, waste at production line and the overall factory need to be identified by using Value Streaming Mapping (VSM) and other related tools. As or six sigma, analysis need to be carried out for a second and third level pareto of finding a root cause for the part disposal issue. This could be achieved by using six sigma tools such as Cause and Effect diagram, Analysis of Variance (ANOVA), Failure Mode Engineering Analysis (FMEA) and Design of Experiment (DOE). The analysis step conclusion is then concluded before move to a next step.

At this analysis step, the knowledge and theory about advance composite materials and its manufacturing processes need to be known and understood well by the researcher and team members. Discussion and brainstorming sessions among team members need to be carried out regularly. All the limitations such as specification by Boeing and Hexcel need to be understood as a scope of the analysis.

(d) Improve (I)

After conclusion has been decided from the analysis step, it is time to start the improvement. A traditional method of improve and solving problem is called 'Fire Fighting' or 'See problem, Kill problem' method. In this method, the repairer or engineer tends to straight away try to look into a temporary solution or countermeasure without finding as actual root cause of the problem. This method also sometimes happens in company A. The disadvantage of this method is although the problem is solved, it may be repeated since the actual root cause is not solved. With systematic tools in a lean six sigma approach, the cause of a problem could be solved until the root of it. From a lean point of view, an improvement could be done on the continuous waste management practice. This includes Kaizen implementation, 5S and 3 M's (Muda, Muri, Mura) improvement. As for a six sigma view, production line processes need to be improved according to the statistical and non statistical result obtained from analysis step.

(e) Control (C) and Sustain (S)

Control and sustain step is very important in order to make the improvement carried out in previous step could be remained. Otherwise the problem and the similar cycle of solving might be repeated again and again. Firstly, the improvement items need to be reviewed regularly. In this project the review to be carried out at every two months. If the result found diverting from its lower and upper control limit, action need to be taken immediately. A system standard document for process sustainability needs to be created by the team for easy monitoring. The most common lean six sigma tools to serve this purpose are Standard Operating Procedure (SOP) or Work Instruction (WI), Process Flow, Statistical Process Control Chart (SPC), continuous Kaizen activities and Continuous Quality Improvement (CQI).

Specific control tasks that must be completed by the teams include [9] :

i) Developing a monitoring process to keep track of changes they have set out

ii) Creating a response plan for dealing with problems that may arise

iv) Helping focus management's attention on a few critical measures that give them current information on the outcomes of the project

Conclusion

PaDLeSS as an integration between lean manufacturing and Six Sigma (lean six sigma) with a guideline from seven steps in D-DMAIC-S expected to give a big impact to company A in term of part disposal by end of the research period, hence meeting the KPI set by the top management. Its holistic approaches cover all the important area especially from lean point of view which is waste elimination and six sigma point of view which is process variation improvement. This study concluded the PaDLeSS approach and methodology could be applied by aircraft composite manufacturing in order to reduce the part defects in the production line hence improve the psrtd disposal cost.

References

[1] Bill Carreira, 2006, **Lean Six Sigma That Works**, Amacom, New York

[2] Vivekananthamoorthy N & Sankar S, 2010, **Lean Six Sigma, Six Sigma Projects and Personal Experiences**, ISBN:978-953-307-370-5

[3] Everton D. & Sergio E.G., 2013, **Lean, Six Sigma and Lean Six Sigma: an analysis based on operations strategy**, *International Journal of Production Research*

[4] Mark G. & Jagadeesh R., 2011, **Double LEAN Six Sigma – A Structurefor Applying Lean Six Sigma**, Journal of Applied Business and Economics: vol.12(6)

[5] B.Prida & M.Grijalvo, 2011, **Implementing Lean Manufacturing by Means of Action Research Methodology Case Study in the Aeronautics Industry**, *International Journal of Industrial Engineering, 18(12),611-619*

[6] Goddinho M.,Faria F.C., 2009, **Strategic Paradigms for Manufacturing Management (SPMM): Key Elements and Conceptual Model** , International Journal of Industrial Engineering: Theory, Applications and Practice, 16(2):147-159

[7] Frida A., Astrid H., 2014, **Design for Manufacturing of Composite Structures for Commercial Aircraft – the Development of DFM strategy at SAAB Aerostructures**, *CIRP Conference on Manufacturing System: 17(2014) 362-367*

[8] Alastair K Muir, 2006, **Lean Six Sigma Statistics – Calculating Process Efficiencies in Transactional Projects**, McGraw-Hill, New York

[9] Pete P & Larry H., 2002, **What is Six Sigma**, McGraw-Hill, New York

[10] Susan K.L., Dauglas B.S., 2008, Practical **Support for Lean Six Sigma Software Process Definition**, Wiley, New Jersey

[11] Keki R.B.,2003, **The Power of Ultimate Six Sigma**, Jaico Publishing House, Mumbai

[12] James W.M., 2007, **Lean Six Sigma for Supply Chain Management – The 10 Step Solution Process**, McGraw-Hill, New York

[13] E.A. Parr, 1998, **Industrial Control Handboo**k, 3rd Ed, Industrial Press, Oxford

[14] Jon D.S., 1999, **Evaluation of Hand Lay-Up and Resin Transfer Molding in Composite Wind Turbine Blade Manufacturing**, Montana State University-Bozeman

[15] Adan V & Jaime S., 2009, **Implementation of Six Sigma in a Manufacturing Process: A Case Study**, *International Journal of Industrial Engineering: 16(3),171-181*

[16] M.White & J.L.Garcia, 2009, **Cycle Time Improvement by a Six Sigma Project for the Increase of New Business Accounts**, *International Journal of Industrial Engineering: 16(3),191-205*

[17] Daryl S., 2009, **Beyond Six Sigma – A Control Chart for Tracking Defects per Billion Opportunities(dpbo),** *International Journal of Industrial Engineering: 16(3),227-233*

[18] Jerusha M.& Tracy B., **Professional Perceptions of Six Sigma's Value**, *International Journal of Industrial Engineering: 16(3),234-247*

Financial Education for Adults - Women beneficiaries of the Bolsa Família Program (BFP) and Retirees with income of up to two minimum salaries

Claudia Márcia de Jesus Forte
Associação de Educação Financeira do Brasil (AEF-Brasil),
São Paulo, Brazil.

Fernanda Sanches Rocha
Associação de Educação Financeira do Brasil (AEF-Brasil),
São Paulo, Brazil.

Abstract

The article presents the Impact Evaluation results carried out in the Financial Education Program for Women Beneficiaries of the Bolsa Família Program (BFP) and Retirees with income of up to two minimum wages. This program aims to promote the increase of financial literacy and changes in habits and behaviors, in order to develop skills and abilities that help to manage the family budget efficiently. The methodology used was the one of experimental experience and made possible the coexistence with beneficiaries and retirees in their homes, seeking to understand the realities and the local needs. The change in behavior through the development of skills and abilities, as well as the acquired knowledge, demonstrated that decision making becomes more conscious, promoting autonomy and meaningful better in the quality of life of the family and the family environment.

Keywords: Women; Bolsa Familia Program; Financial education; Decision making; Retired.

1. Introduction

The present article aims to show the relationship between financial education and the behavior of individuals - women beneficiaries of the Bolsa Família Program (BFP) and Retirees with income of up to two minimum wages. The first part presents the Financial Education Association of Brazil - AEF-Brazil - as well as the National Strategy for Financial Education - ENEF - and the National Committee for Financial Education - CONEF. The general and specific objectives of the Adult Financial Education Program, the presentation of the Program, the justification for the choice of target audiences and the social technologies developed are presented below. Soon after, the methodology used in the field and in the evaluation of the impact of the Program and, finally, the results obtained.

2. Presentation of the Financial Education Association of Brazil (AEF-Brasil)

Financial Education Association of Brazil - AEF-Brazil, is an OSCIP, Civil Society Organization of Public Interest, created in 2012 by the National Committee for Financial Education - CONEF, to support the National Strategy for Financial Education - ENEF, Decree No. 7,397, of December 22, 2010

For centralized coordination, ENEF proposed a governance structure that reconciles the need for integration of private and public entities, which have an interest in promoting financial education, preserving the independence of financial system supervisory bodies to develop their own education actions (ENEF, 2012). The governance of ENEF should contemplate the following spheres, according to the Master Plan of the National Education Strategy (2012):

a) **Strategic:** formed by the National Committee for Financial Education (CONEF), responsible for the direction, promotion and supervision of ENEF.
b) **Consultative:** formed, initially by GAP (Pedagogical Support Group), responsible for pedagogically guiding content development.
c) **Coordination:** the ENEF will be coordinated by an exclusive purpose entity, not integrated into the structure of any of the ministries, in order to ensure the management balance between the markets and interested segments.
d) **Execution:** carried out through the supervisory and oversight bodies of the national financial system and of private and public conducting partners that develop Financial Education programs or actions to integrate ENEF.

The strategic sphere, formed by CONEF, is, according to the Master Plan of the National Strategy for Financial Education (2012), composed of: President of the Central Bank of Brazil (BCB); chairman of the Securities and Exchange Commission (CVM); superintendent of the National Superintendence of Complementary Pensions (PREVIC), Superintendent of the Superintendence of Private Insurance (SUSEP); executive secretary of the Ministry of Education (MEC); executive secretary of the Ministry of Finance and executive secretary of the Ministry of Justice (MJ).

It is established as competence of CONEF, as indicated in the Master Plan of the National Strategy for Financial Education (2012, p.118):

> regulate ENEF, being able to contemplate programs, plans and actions; establish guidelines and objectives for ENEF planning, financing, execution, evaluation and review; set up working groups with specialized activities to provide technical support; and to approve its bylaws.

ENEF's performance is imminent in the adult audience segment, because it is the working public that deals with money, consumes, saves and invests. And, in order to have a strategy for this segment, factors such as Brazilian territorial dimension, difficulties of access to information by a large part of the population, cultural diversity, educational level, age group, niche, differences of interest, among others (ENEF, 2012). According to the Master Plan of the National Financial Education Strategy (2012, p. 111), some target audiences, themes and actions that may be the object of a program for the adult segment were established, namely:

a) **Target publics:** military, civil servants, formal and informal workers, liberal professionals, university students, housewives, unemployed, retired, rural workers, beneficiaries of social programs, Brazilians residing abroad, others.
b) **Themes**: financial inclusion, consumer protection, personal finance concepts, concepts of the national financial system, credit and microcredit, conscious consumption, pension, retirement preparation, investments, insurance, capitalization, others.
c) **Actions:** portal, lectures, publications and booklets, seminars, regional meetings, competitions, call centers, advertising campaigns, courses, television programs, radio programs, fairs, cultural spaces, scheduled visits, etc.

3. Objectives of the Adult Financial Education Program

3.1 General objective

Developing skills and abilities so that women beneficiaries of the BFP and retirees with incomes of up to two minimum wages can efficiently manage the family budget in order to achieve objectives, promoting financial autonomy through change in behavior and attitude, involving the making of individual decision and impacting the family environment.

3.2. Specific objectives

1) Immersing themselves in the context of beneficiaries and retirees in order to understand them and to know their financial habits, defining personas that mark the creations of technologies; 2) To develop social technologies adhering to beneficiaries and retirees, based on the acquired knowledge, testing them in three rounds for refinement of prototypes; 3) Systematize the social technology to the end of the tests, taking into account the criteria of adequacy to the public, financial viability and scalability; 4) Carry out a pilot project and impact assessment with systematized technologies, applying them to a treatment group and comparing data with a control group (who did not have access to the technologies); 5) Disseminate social technologies to existing programs and policies, making them available in a web environment and articulating partnerships.

4. Adult Financial Education Program

4.1 Justification for choosing the target audiences

Brazil is a non-poor country, however, it faces a great deal of social inequality that makes it possible to exclude a significant part of the population from access to the minimum conditions of inequality and citizenship (BARROS, HENRIQUES & MENDONÇA, 2000).

In front of this reality, the Bolsa Família was created, which is a "program that contributes to the fight against poverty and inequality in Brazil (MDS, 2015). Created in October 2003, it has three main axes, according to the website of the Ministry of Social Development (2015):

1. **Income supplement** - Every month, the families served by the Program receive a cash benefit, which is transferred directly by the federal government. This axis ensures the most immediate relief from poverty.
2. **Access to rights** - families must meet certain commitments (conditionalities), which aim to strengthen access to education, health and the cycle of poverty through better opportunities for social inclusion.

   Important - conditionalities do not have a punitive logic; but rather of guaranteeing that basic social rights reach the population in poverty and extreme poverty. For this reason, public power at all levels also has a commitment: to ensure the provision of such services.

   3. **Articulation with other actions** - Bolsa Família has the capacity to integrate and articulate various social policies in order to stimulate the development of families, helping them to overcome the situation of vulnerability and poverty.

In 2000, during the UN meeting, 191 countries signed a commitment to combat poverty and other social problems in the world, resulting in the drafting of the UN Millennium Declaration. The Declaration opened doors to the establishment of the Millennium Development Goals (MDGs), an international effort to achieve development in: social and racial equality, environment and human and women's rights. Divided into 8 goals to be achieved by 2015, with 21 goals and 60 indicators the themes are: End hunger to misery; Quality basic education for all; Gender equality and women's empowerment; Reduce child mortality; Improve the health of pregnant women; Combat AIDS, malaria and other diseases; Quality of life and respect for the environment; Everyone working for sustainable development.

According to the Millennium Development Goals (MDGs) released by the UN in 2015, efforts to achieve the eight goals have been successful, despite the shortcomings and difficulties. The data presented in the Millennium Development Goals Report 2015 show that even the poorest countries have made progress as a result of consistent strategies, with specific interventions, political will and adequate resources.

In September 2015, from the MDGs emerged dialogues and negotiations that resulted in the adoption of a new global agenda of goals and objectives to be achieved by 2030, during the UN Summit on Sustainable Development, are the Sustainable Development Objectives (SDOs). Agreed among the 193 UN member states, the 17 goals and 169 targets provide for global action in the areas of poverty eradication, agriculture, food security, education, health, gender equality, energy, water and sanitation, sustainable patterns of production and consumption, among others.

The ODS themes can be categorized into four dimensions: the **social**, issues related to human needs, such as education, justice and health; **economic**, thinking about situations of depletion of natural resources, energy consumption and waste production; **environmental**, about conservation and preservation of the environment, thinking about forests, oceans and climate change; and **institutional**, dealing with the possibilities of implementing the SDOs.

The UN member countries have taken responsibility for the implementation of the objectives without legal obligation, however, they assume the establishment of national milestones for the achievement of the goals.

In this sense, it is up to them, through data collection, to monitor and review progress in this implementation.

In addition to the questions presented, "*The SDOs are part of a larger context - the Agenda 2030 - and represent a synthesis of the challenges created by the exceptional economic growth, technological advancement and population growth that occurred in the 20th century*", as mentioned in the paper Instituto Ethos e GVces - Center for Sustainability Studies in 2016 about companies and SDOs.

The Bolsa Família Program, provided by law - Federal Law No. 10,836, dated January 9, 2004 - and regulated by Decree No. 5,209 of September 17, 2004, and other standards, since 2011, is part of the Brasil Sem Miséria Plan, which brought together various initiatives to enable families to leave extreme poverty, granting effective access to basic rights and opportunities for work and entrepreneurship (MDS, 2015).

According to the website of the Ministry of Social Development (2015), the Program still has a decentralized management, ie, both the Federal Government, the states, the Federal District and municipalities have attributions in their execution. If analyzed at the federal level, we find that the Ministry of Social Development (MDS) is responsible for the Program, and Caixa Econômica Federal is the agent that executes the payments and is dynamic, that is, every month, there are families that enter and others that leave the program.

In order to acquire the benefits of the Bolsa Família Program - which include Variable Benefit Linked to the Child or Adolescent from 0 to 15 years old (being required to attend school for children and adolescents between 6 and 15 years of age), Variable Benefit Linked to the Pregnant Woman and Variable Benefit Linked to the Nutriz (people who have children between 0 and 6 months old, to reinforce the baby's feeding, even in cases where the baby does not live with the mother) - it is necessary that the person enroll in the Cadastro Único for Social Programs of the Federal Government, and the families interested should go to the Bolsa Família and Cadastro Único sectors in their city and, in many places, registration can also be made at the Social Assistance Referral Centers (CRAS) (MDS , 2015).

According to the website of the Ministry of Social Development (2015), the granting of the benefit depends on how many families have already been served in the municipality, compared to the estimate of poor families made for that locality. In addition, the federal government must respect the budgetary limit of the program.

Forte (2006, p. 46), notes that

> despite the process of development through which Latin America is passing, rigid roles that relegate women to the reproductive sphere still prevail in some parts of Latin America. These traditional roles lead to inequalities and the inefficient use of resources by families in their struggle against misery and toward socioeconomic development. Key gender issues still outstanding on the agenda of many countries include classic issues such as violence against women, effective incorporation of women into the economy and access to credit.

In order to maintain a focus on families living in conditions of poverty and extreme poverty, the Bolsa Família Program has periodic mechanisms of control, causing families to be withdrawn from the program,

with the main reasons for not updating the registration information or improving income, resulting in the non-adequacy of the profile for the receipt of the benefit. Other reasons that lead to loss of benefit are the noncompliance with commitments in the areas of education and health, in the latter case because the objective of conditionalities is to strengthen the access of the poorest families to social rights or voluntary However, for this to happen, it is necessary for it to go to the Bolsa and Cadastro Único sector in the municipality and request voluntary termination (MDS, 2015).

The Ministry of Social Development reported that currently there are 12.7 million families receiving the benefit of the program, with 90% of the women enrolled. Single mothers and heads of households accounted for 42% of the beneficiaries. Of the total number of enrolled beneficiaries, 30% have completed elementary education and have great difficulty in entering the labor market, with very variable income sources.

Currently in Brazil, according to Portal do Brasil (2017), women have gained space in the labor market, occupying 44% of jobs in 2016, mainly in the public administration and services sectors. Still in the evaluation of the portal, this is due to the advances of the labor laws that allowed the growth of this workforce and, consequently, the income generated from the feminine work, that gains more and more importance in the family sustenance. It should be taken into account that, even with the increase in the insertion of women in the labor market, there is much to be done in relation to their participation in managerial and managerial positions in companies and organizations (Porta Brasil, 2017).

In Brazil, according to the *Síntese de Indicadores Sociais: uma análise das condições de vida da população brasileira* (IBGE, 2016), the composition of the elderly population increased from 9.8% to 14.3%. According to this report, a substantial increase of 11.7% is forecast for 23.5% of this population over a period of 24.3 years, in addition to the speed with which this will occur.

In a report that appeared in the Infomoney news portal and was written by Veronesi (2014), it is presented that through a study prepared by SPC Brasil (Credit Protection Service) in partnership with the financial education portal Meu Bolso Feliz, found that 57% of Brazilians reach the third age without any kind of financial reserve or investments. Still in this report, it was informed that almost half of the 632 elderly people interviewed (47%) guarantee that they think about the family future and end up doing things that they would like to maintain a financial reserve. Due to a lack of financial reserves, of the population over 60 years of age resort to loans and end up not honoring the payment (VERONESI, 2014). Therefore, identifying a social technology of financial education focused on the elderly and addressing the issue of over-indebtedness is necessary for this population.

4.2 Program organization

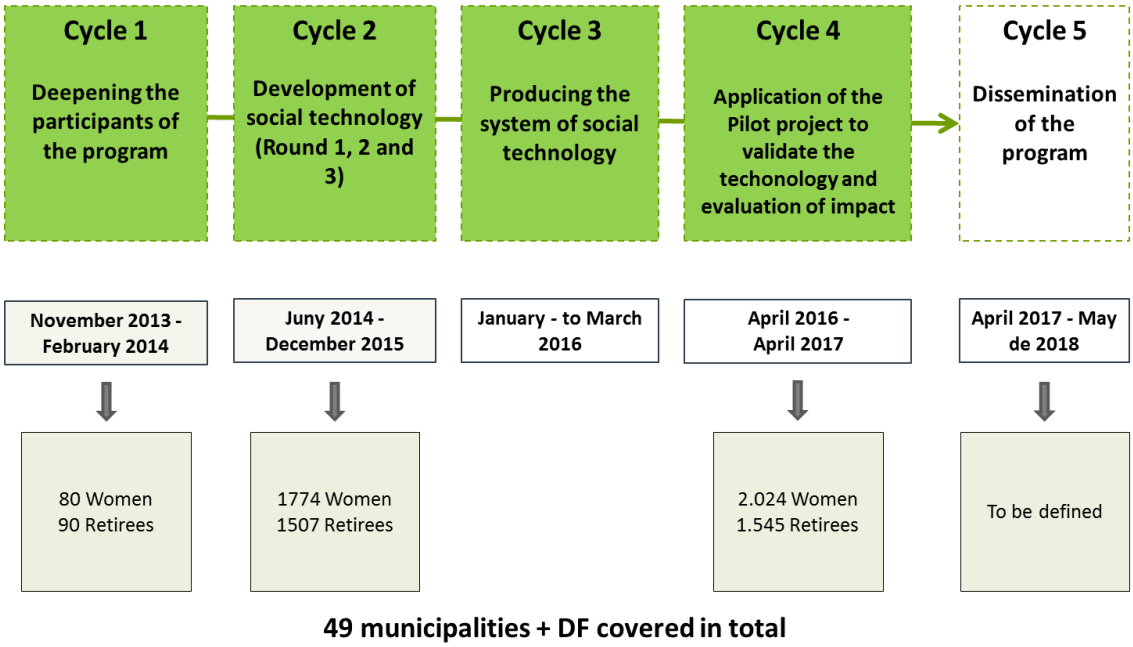


Figure 1. Program Steps
Source: Author's Consolidation

The project was structured around five cycles that allowed the understanding of the context of women beneficiaries of BFP and retirees, the definition and testing of prototypes of social technologies developed with target audiences and target publics, and the systematization of social technologies, generated the final kit, the application of the final social technologies in financial education workshops for CRAS (Center for Social Assistance Center) and CCI (Center for the Coexistence of the Elderly) together with the impact evaluation to verify if the program generated positive impact on the lives of beneficiaries and retirees and, finally, the dissemination of social technologies developed to other beneficiaries and retirees that are distributed throughout Brazil. The details of each cycle are discussed below:

Cycle 1 - Deepening on beneficiaries of BFP and retirees: immersion in the context of beneficiary women and research and documents of the Bolsa Família Program, to understand the program's functioning and financial behavior patterns of the beneficiaries. There were 4 months of field research (November 2013 to February 2014) and counted on the participation of 80 women in 15 municipalities in the N, NE and SE regions, urban and rural areas, as well as riverine communities resulting in 4 different "*personas*" that inspired the production of social technologies, namely: dreamy (has a low responsibility for the use of money due to the impulse to consumption, the challenge being to encourage them to make more mature and conscious financial choices and to provide instruments for that); visionary (generates wealth and income and generates risks and investments, the challenge being to support them in the expansion and protection of their assets and to stimulate their multiplier role); survivor (it has limited resources optimization, the challenge being to potentialize the scarce resource management talent to empower them) and the warrior (has a focus on short-term choices, the challenge being to develop a vision of risks and orientation so that they can be planned in the medium and long term).

Immersion in the context of retirees with income of up to two minimum wages to understand the program's operation and financial behavior patterns of this target audience. There were 4 months of field research (November 2013 to February 2014), and there were 90 participants in 12 municipalities in the N, NE and SE regions, urban and rural areas, resulting in 4 different "*personas*" who inspired production of social technologies, namely: dedicated (has for reasons of super-indebtedness the donation and the realization of the desires of others, the challenge being found to set limits and make the retiree look at itself); (it has as a motive of super-indebtedness the undertaking and investment in adverse situations, the challenge being to show the risks and unforeseen circumstances to this retiree); resigned (it has as its motives for super-indebtedness the financial abuses, inconsistent choices and ignorance, the challenge being found to empower and isolate this retiree) and the hedonist (has as reasons for super-indebtedness impulsive consultation, vanity and the prioritization of the present, being the challenge found to give sustainability and discipline to this retiree).

Cycle 2 - Social Technology Development (Prototypes): based on the findings of Cycle 1, ideas were generated on ways to contribute to the reduction and prevention of over-indebtedness. Based on feasibility criteria of application and dissemination, ideas were chosen that became prototypes - that is, initial samples that can turn out to be a social technology, bringing demonstration of content, language, format. During this Cycle, there are 3 rounds of prototyping and in each one the prototypes were refined, excluded or incorporated, until the final version arrived. 1,774 women participated in 27 municipalities, with the purpose of providing evidence on the elements that best fit and should be included in a social technology, to be disseminated later on a national scale.
1,507 participants participated in 24 municipalities, with the purpose of providing evidence on the elements that best fit and should be included in a social technology, to be disseminated later on a national scale.

Cycle 3 - Systematization of social technology: at the end of the test rounds, the resulting social technology was systematized and available in formats that facilitate dissemination and adoption by governmental organizations or NGOs. All materials will be made available on a website that will, free and public, social technologies as well as the ways of using them.

Cycle 4 - Pilot Project and Impact Evaluation: In order to reapply and incorporate social technology into existing programs and policies, a pilot study was conducted involving 2,024 women in 9 municipalities and 1,545 retirees in 12 municipalities. The technology was applied by local agents, followed by treatment and control groups, who underwent the first evaluation that collected data on the level of knowledge of topics related to financial education and on specific financial behaviors - indebtedness. After 6 months, a new evaluation was conducted seeking differences between the Control and Treatment groups.

Cycle 5 – Dissemination of the program: where we intend to format Social Technology for grassroots organizations that serve the target audience and train trainers for dissemination in vulnerable territories, promoting the sustainability of the project.

4.3 Composition of the Social Technologies kits (ST)

Through the data collected in the field survey, it was possible to construct a set of 20 STs with the participation of beneficiaries and 23 STs that had the participation of retirees in different regions of the country, seeking a better understanding of the reality of the family and the environment to develop solutions that respond to the unique realities of the target population through methodologies that meet their needs and can be easily incorporated into daily life.

The set of 20 STs is composed of: 1) **instructor's guide** (guide with a general explanation of how the program works and how to apply the financial education workshops to the beneficiaries; 2) **guide to the piggy banks** (guide that explains about the workshop that deals with the piggy banks and the money trail and how to apply this workshop. 3) **money trail** (it explains in a playful way the trajectory of money and how to identify simple and real ways of creating reserves from the change, this material is given to the beneficiaries and to the instructors); 4) **special envelope type G - 24x34cm bag type** (used to place the piggy banks inside. This material is delivered to beneficiaries and instructors); 5) **family goals piggy bank** (large size bank that serves for the whole family to save money in order to achieve family goals. This material is delivered to the beneficiaries and to the instructors); 6) **family support piggy bank** (small size piggy bank that is used to store the money that can be used to complete the payment of the bills of the month.This material is delivered to the beneficiaries and to the instructors); 7) **emergency piggy bank** (medium size piggy bank that is used to store money that can be used in emergencies and can be opened in case of unforeseen circumstances. This material is delivered to the beneficiaries and to the instructors); 8) **agenda guide** (guide that explains how to apply the workshop that deals with the family agenda. This guide is only given to the instructors); 9) **calculator** (this material is only given to the instructors); 10) **pencil with rubber** (this material is delivered to beneficiaries and instructors); 11) **a wallet guide** (a guide that explains how to apply the workshop that deals with the family's wallet and about the poster of Mrs. Joana.This guide is only given to the instructors); 12) **poster Mrs. Joana (5 posters)** (posters that tell the story of Mrs. Joana and her money dealing with debts and types of loans, types of payments, credit card and income commitment. 13) **agenda 24x12,5cm** (used to fill in the monthly expenses, calculations of entry, exit and balance to visualize financial photography and setting goals for expenses reduction, income increase, control of money or creation of reserves. is delivered to beneficiaries and trainers); 14) **a wallet** (to keep the passbooks, this material is delivered to the beneficiaries and to the instructors); 15) **booklet "where my money comes from"** (for daily notes for amounts received. This material is delivered to beneficiaries and instructors); 16) **booklet "where my money goes"** (for daily notes for the amounts spent. This material is delivered to beneficiaries and instructors).

The set of 23 TS is composed of: 1) **instructor's guide** (a guide with a general explanation of how the program works and how to apply the financial education workshops to the participants. 2) **financial photography guide** (guide that explains how to apply financial photography and the fiches where my money comes / goes. This guide is only given to the instructors); 3) **tokens from where my money comes / goes** (tokens that help with the financial photography. This guide is only given to the instructors); 4) **calculator** (this material is only given to instructors); 5) **pencil with rubber** (this material is given to retirees and instructors); 6) **financial photography** (a tool developed so that retirees can map their sources

of income and monthly expenses, and calculate their monthly balance. This material is given to retirees and instructors); 7) **debt guide** (guide that explains how to apply the workshop dealing with debts. This guide is only given to the instructors); 8) **posters (8 posters)** (proposes the memorization of an orientation, through the "Stop, Think and Decide" mental shortcut. This material is only given to the instructors); 9) **debt cardholder** (simple tool that can help the elderly to write down and visualize all the financial commitments made. This material is given to the retired and the instructors); 10) **a table comparing debts** (a tool that assists seniors in comparing loan prices in different institutions. This material is given to retirees and trainers); 11) **magnet traffic light** (for retirees to put in the refrigerator, it's a reminder of what they learned "Stop, Think and Decide." This material is given to retirees and instructors) 12) **planning guide** (guide explaining how to apply the workshop which deals with the calendar of fixed accounts and debts of the month and the chart of the next steps. This guide is only given to the instructors); 13) **DVD** (deals with financial challenges through the story of an elderly couple. This material is only given to instructors); 14) **magnet calendar** (refrigerator calendar, this material is given to retirees and instructors); 15) **small magnets** (small magnets that represent the bills of the month, such as: rent, water bills, light etc. to place on the calendar. 16) **card my next steps** (tool to set up the plan to take small steps toward the life you would like to have in the years to come. This material is given to retirees and trainers).

5. Methodology used in the Adult Financial Education Program

5.1 Methodology used in the field

The hypothetical-deductive method was used, which, according to Marconi & Lakatos (2003, p. 99 apud Bunge, 1974: 70-2), is composed of the following steps:

a) **Placing the problem:**

Recognition of facts - examination, preliminary classification and selection of facts that are most likely relevant in some respect;

Discovery of the problem - finding a gap or incoherence in existing knowledge;

Formulation of the problem - placement of a question that has some probability of being correct; in other words, reduction of the problem to a meaningful nucleus, which is likely to be solved and to present itself fruitfully, with the aid of available knowledge.

b) **Construction of a theoretical model:**

Selection of relevant factors - the invention of plausible assumptions that relate to supposedly relevant variables;

Invention of central hypotheses and auxiliary assumptions - proposal of a set of assumptions that are related to supposed links between variables (for example, enunciation of laws that are expected to conform to observed facts or phenomena).

c) **Deduction of particular consequences:**

Search of rational supports - deduction of particular consequences that may have been verified in the same field or contiguous fields;

Empirical support search - for available or conceivable checks, elaboration of predictions or regressions, based on theoretical model and empirical data.

d) **Testing the hypotheses:**

Proof outline - planning the means to test predictions and backslides; determination of both observations, measurements, experiments and other instrumental operations;

Execution of the test - accomplishment of the planned operations and new data collection;

Elaboration of the data - procedures of classification, analysis, reduction and others, referring to the empirical data collected;

Inference of the conclusion - in the light of the theoretical model, interpretation of the data already elaborated.

e) **Addition or introduction of conclusions in theory:**

Comparison of conclusions with predictions and regressions - contrast of test results with deduced consequences of the theoretical model, specifying the degree to which it can now be considered confirmed or not (probable inference);

Readjustment of the model - if necessary, possible correction or readjustment of the model;

Suggestions for further work - if the model has not been confirmed, search for errors in theory or in empirical procedures; otherwise - confirmation - examination of possible extensions or unfolding, including in other areas of knowledge.

For the field research, the quantitative-descriptive type was used, which according to Marconi & Lakatos (2003, p.187 apud Tripodi et al, 1975, pp. 42-71),

> consist of investigations of empirical research whose main purpose is the delineation or analysis of the characteristics of facts or phenomena, the evaluation of programs, or the isolation of key or key variables. Any of these studies may use formal methods, which approximate experimental designs, characterized by statistical precision and control, in order to provide data for the verification of hypotheses. They all deliver quantitative artifacts aimed at systematically collecting data on populations, programs, or samples of populations and programs. They use various techniques such as interviews, questionnaires, forms, etc. and employ sampling procedures.

In the first stage, a population description study was used, which, as presented by Marconi & Lakatos (2003, p.187 apud Tripodi et al, 1975, pp. 42-71),

> are quantitative-descriptive studies that have, as a primordial function, the exact description of certain quantitative characteristics of populations as a whole, organizations or other specific collectivities. They usually contain a large number of variables and use sampling techniques to have a representative character. When researching qualitative aspects such as attitudes and opinions, they employ scales that allow quantification.

Given the complexity, it was decided to adopt a combination of the following areas of knowledge in the project:

Service Design: It is the interdisciplinary process of designing beyond your result, which combines different methods and tools from various disciplines. The result can have several forms, namely: abstract organizational structures, operational processes, service experiences and even concrete physical objects

(STICKDORN & SCHNEIDER, 2011). Still in Stickdorn & Schneider's (2011) explanation, service design is a field focused on the well thought-out creation of experiences using a combination of tangible and intangible means, which generates several benefits to the final consumer when applied in sectors such as retail, banking, transportation and health.

Behavioral sciences: In Skinner's view, people tend to behave in ways that garner rewards and avoid punishment (MOREIRA, 1999). That is, human learning happens through stimuli and responses or by significant methods that help in the construction of skills and knowledge, of the individual and of the community in general (ARAUJO, 2009). According to Skinner (1974), there are seven types of behavior, namely: usual behavior; probable behavior; perceptive behavior; past behavior; covert behavior; future behavior and multiple translations. Financial education works with behavioral science because it believes that changing habits assists in better decision-making.

Public administration: Gianetti (1993) considers that the principles of ethics, as a factor of social cohesion and the input of the economic process, are essential both for the consolidation of rules and for the proper functioning of the market. He still believes that there is a relationship between ethics, individual behavior and economic efficiency.

Theory U: According to Scharmer (2009) the objectives of the U-theory can be presented as five movements, namely: to coincide (connect with people and contexts related to what life calls you to do); co-presencing (going to a quiet place and connecting with oneself), co-planning (building plans to explore the future), and co-development (co-develop a larger ecosystem and maintain space which links people through the borders of seeing and acting from the whole.) Scharmer (2009) still presents three methods for achieving these goals: phenomenology (individual consciousness), dialogue (fields of conversation) and collaborative action research (ratification institutional models and structures) that address the same issue: the blended constitution of knowledge, reality and self.

5.2. Methodology used in Impact Evaluation

The chosen methodology was the experimental evaluation of social impact, recognized as the best way to identify the true effect of a program and, therefore, the most recommended for programs in which the objective is to become public and large-scale policies so that there is a greater confidence that the volume of resources invested will lead to the desired social return.

According to the *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (Report of the Experimental Evaluation of Social Impact of the Program of Financial Education for Low Income Adults of AEF-Brazil) (2017, p.17),

> the methodologies for evaluating the impact of social programs are based on theoretical foundations of clinical experiments comparing two groups: one that receives the intervention (or the treatment group) and one that does not receive it (control or decomparation group). In biological sciences, these groups are traditionally composed of formalized, that is, the participants participate in a lottery in which everyone has the same probability of receiving the intervention, regardless of their individual characteristics. Thus, with a minimum size of

participants, the two groups should have the same initial average characteristics (or very close) and the simple differences between the groups observed at the end of the intervention can be attributed to treatment with grand-safety.

6. Results of the Impact Evaluation

According to the *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017), the following is presented the impact of the Financial Education Program for Adults - Women beneficiaries of BFP and Retirees with income up to two minimum wages - to the beneficiaries who participated in the training workshops in financial education.

The impact of the program on the public of women beneficiaries of the BFP was significant. The proportion of beneficiaries who managed to fund an emergency in the 3 months of reference among those attending the workshops increased by 6.6%.

The impact on the workshop participants' knowledge indicator on planning has increased by 6% and on the perception of money use planning there has been a 10% growth.

The beneficiaries of the BFP were asked how they financed the last emergencies they had in the last 3 months (reference)

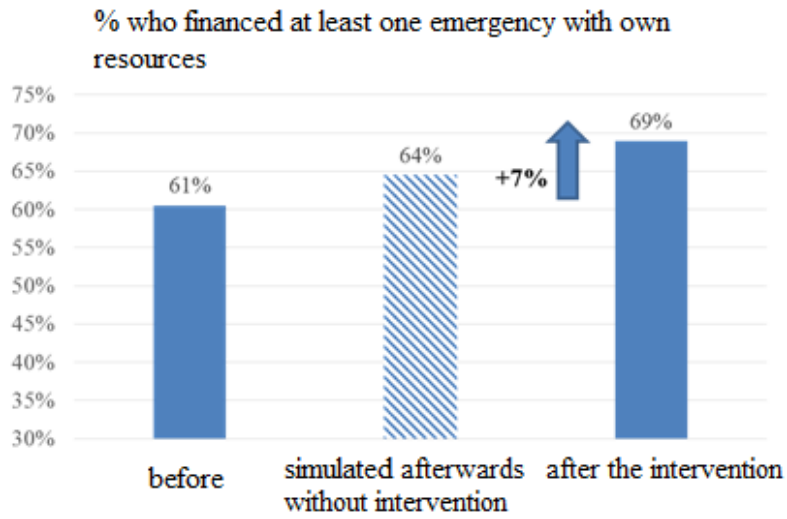


Figure 2. Percentage of women who can afford to finance at least one emergency

Source: *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017)

Through the financial education workshops given to the beneficiaries, it was possible to instruct them to save part of their income to use it only in case of emergency. After the three-month period of this instruction they were asked if they financed at least one emergency with their own resources. The result was, after the intervention, a 7% increase in women who were able to finance at least one emergency with their own resources.

The beneficiaries of the BFP were asked if they had **savings** or reserve money (Yes or No)

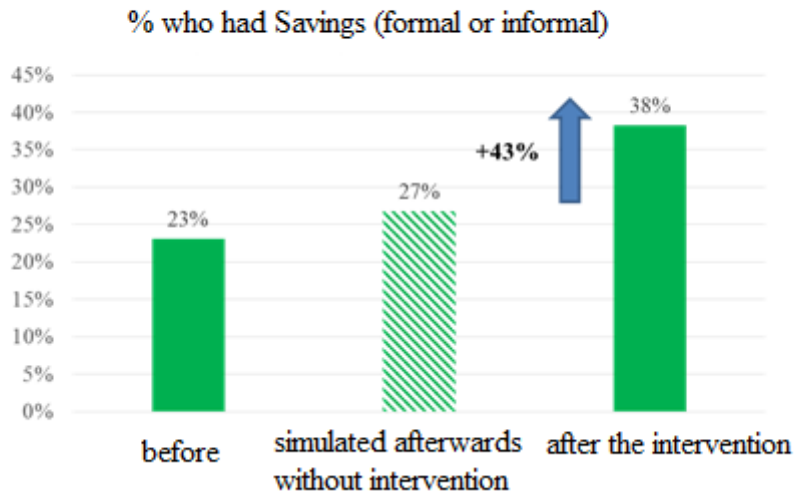


Figure 3. Increase in saving or cash reserve

Source: *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017)

It is possible to verify that, after the intervention, there was an increase of 43% of women beneficiaries of the Bolsa Família Program who started the habit of creating savings, be it formal or informal.

The beneficiaries of the BFP were asked if they **had been able to save** in the last 3 months (in Real)

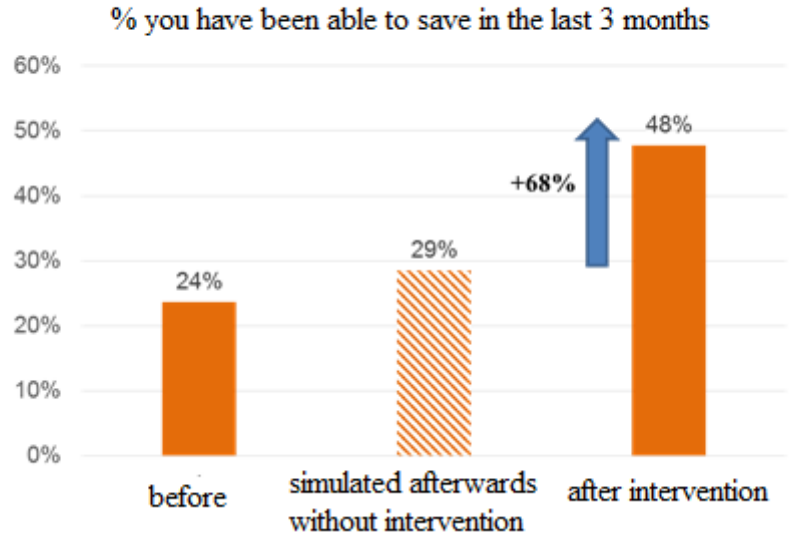


Figure 4. Increase in saving or cash reserve

Source: *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017)

It increased by 68% the number of beneficiaries, who participated in the financial education workshops, which in the last three months have been able to save.

The beneficiaries of the BFP were asked **how much they had been able to save** in the last 3 months (in Real)

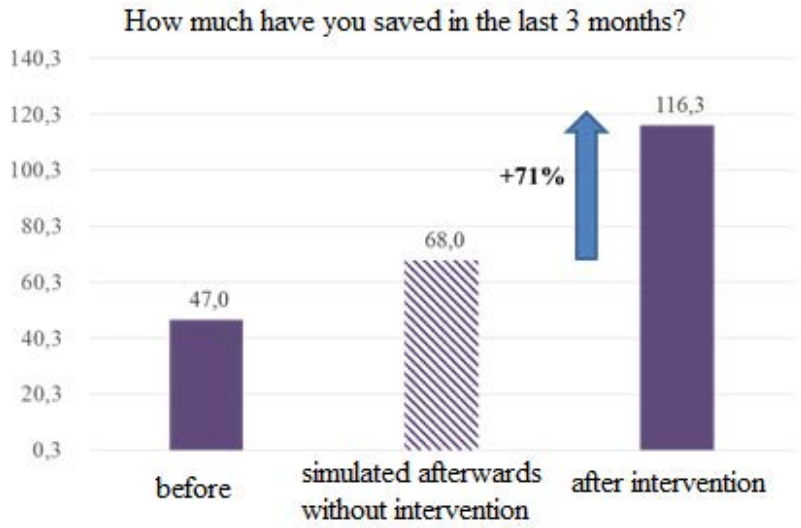


Figure 5. Increase in saving or cash reserve

Source: *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017)

With regard to monetary values, it is noticeable that beneficiaries who previously saved an average of R$ 47.00, every three months, after the intervention managed to save on average R$ 116.30. That is, women can now save 71% more quarterly than before.

The beneficiaries of the BFP were asked how much they had to **reserve money at home** (piggy bank) (Yes or No)

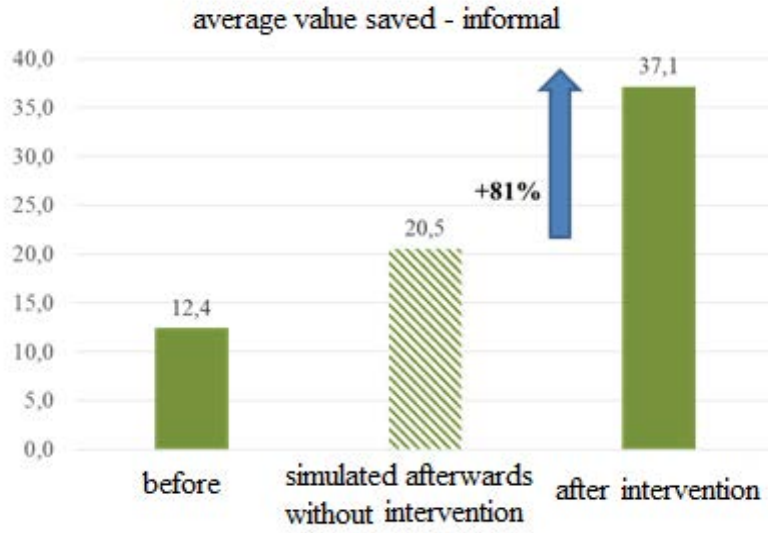


Figure 6. Increase in informal savings

Source: *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017)

After checking for shorter periods, the women before the intervention saved an average of R$ 12.40 per month and after the intervention this figure increased 81%, that is, the economy rose to R$ 37.10 per month.

The beneficiaries of the BFP were asked: 1) how much they know their income and; 2) how much you control your expenses - self-declaration (Index of 0 to 10 points)

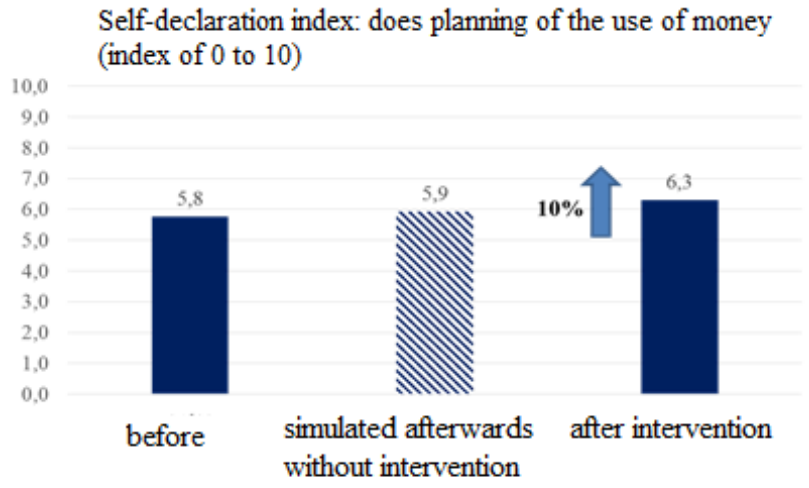


Figure 7. Improvement in budget planning

Source: *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017)

After the intervention, the self-reported knowledge that beneficiaries had about their revenues and control of their expenses increased by 10%.

Questions were asked to measure the knowledge about the content offered (Index of 0 to 4 points)

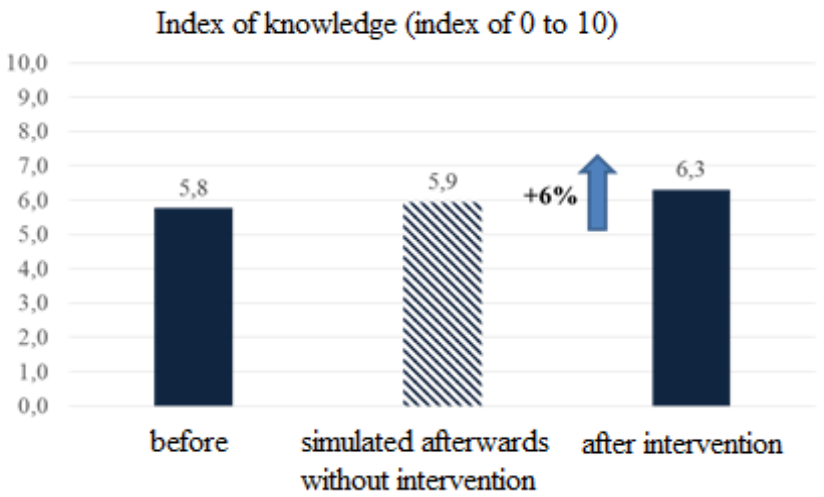


Figure 8. Gaining knowledge about financial planning

Source: *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017)

Based on questions asked to measure the knowledge about the content administered in the workshops (such as debt control and reserve creation), it was possible to verify that there was a 6% increase in relation to women with and without the intervention.

The impact of the program for the retired public with income of up to two minimum wages was significant, ie those who participated in the workshop showed better evolution of impact indicators than those who did not participate. The retirees who attended the workshops increased their spending with basic necessities by 35.6% and there was a 3.5% reduction in the rate of retirees who classified themselves as super indebted.

Was asked how they know if there was left or missing money each month

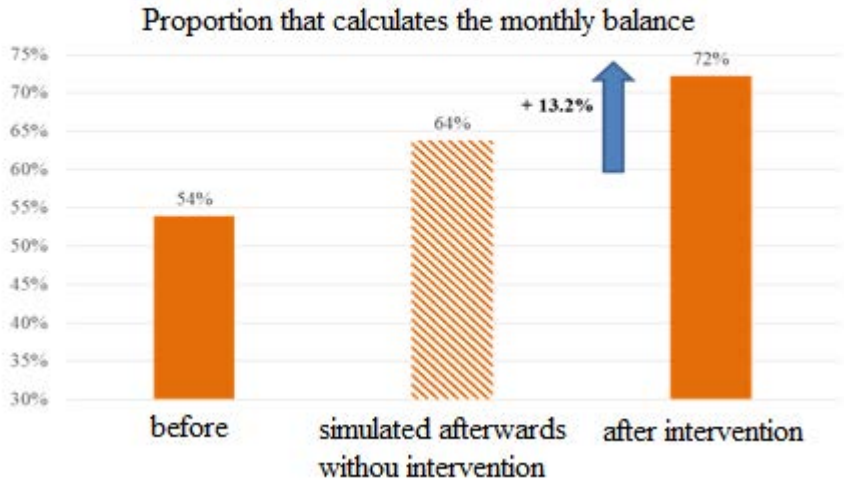


Figure 9. Percentage of retirees calculating their monthly balance
Source: *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017)

It is observed that after the intervention, there was a 13.2% increase in the number of retirees who began to calculate their monthly income to verify if the balance was positive or negative.

It was asked how much the family spent with each area and what family income and income and calculated the ratio spent on basic needs / total income (%)

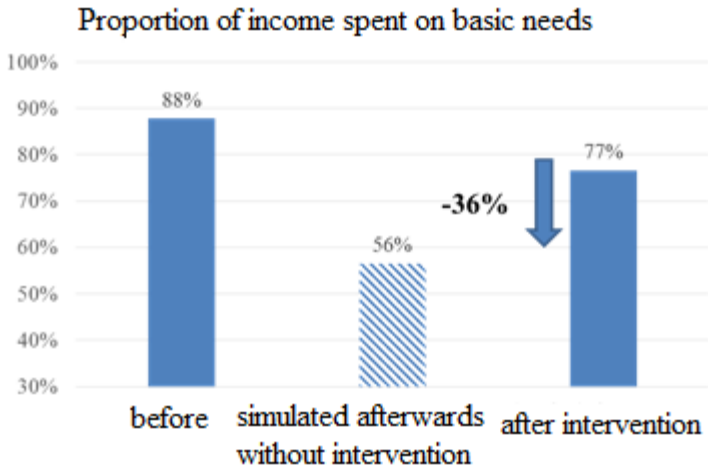


Figure 10. Raising the proportion of income spent on basic necessities (food, housing, health)Source: *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017)

There was a 36% decrease in spending on basic needs for retirees who attended financial education workshops.

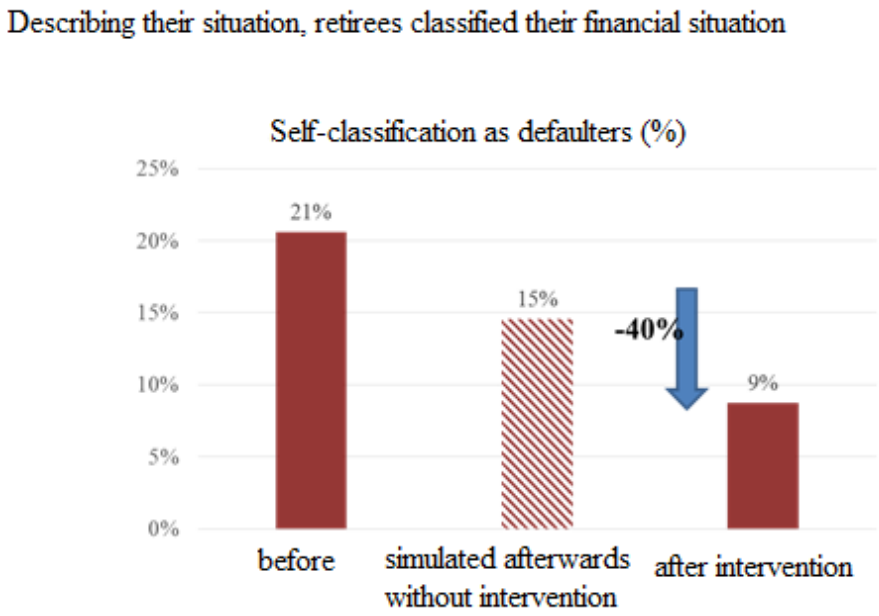


Figure 11. Percentage of retired self-declared defaulters

Source: *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017)

After the knowledge acquired with the financial education workshops, there was a decrease of 40% of retirees who declared themselves to be delinquent.

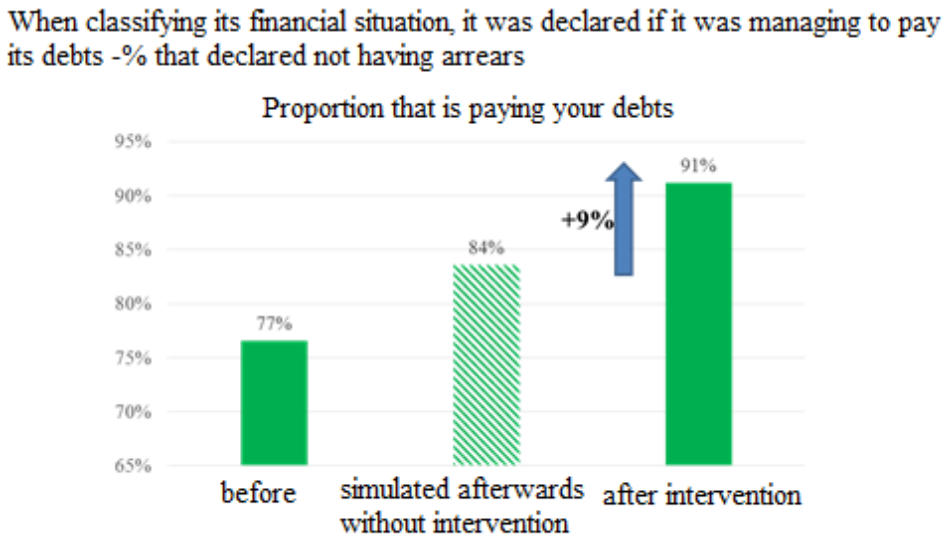


Figure 12. Impact on debt

Source: *Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil* (2017)

There was a 9% increase in retirees attending financial education workshops who said they were paying their bills on time.

The results of the qualitative analysis confirm that the program is very well suited to the target audience. The material is very well accepted by the participants and its format that includes the training of agents has also proved appropriate to this population that presents many difficulties, including reading and comprehension.

7. Conclusion

Based on the data demonstrated in this study, we consider that it is fundamental to create public policies aimed at women beneficiaries of the BFP and retirees with incomes of up to two minimum wages, but constructed jointly. That is, for them and with them. Social technologies need to be developed in a way that meets the needs faced daily, and for this reason, the final public needs to make and feel part of the process.

An important point for the construction and execution of the Program is the participation of governance, represented by CONEF, which support at all stages of development to achieve the final result.

The most important difficulty was found to locate women beneficiaries of the BFP and retirees with incomes of up to two minimum salaries, both for the territorial extension of the country and for the concentration in diverse places (such as churches, class associations, Reference Center of Social Assistance - CRAS, CCI - Center for the Coexistence of the Elderly, among others), different from students who can be identified in schools.

The subject of financial education is an issue that is not easily addressed, especially in adulthood. Generally, they have as premise to be an object of difficult understanding and with greater exigency and organization to reach the goals. However, the program developed breaks paradigms and shows the possibility of understanding, in an easy and simple way, how to control income and expenses and, above all, achieve life goals.

The greater the involvement of families in financial goals, the easier it becomes to control resources and expenditures.

One of the main points for managing the family budget is to support women beneficiaries of the BFP and retirees with incomes of up to two minimum wages creating reserves. This would prevent them from relying on more expensive ways to get money.

Through the financial education workshops given to the beneficiaries, it was possible to instruct them to save part of the income to use it only in case of emergency. After the three-month period of this instruction they were asked if they financed at least one emergency with their own resources. The result was, after the intervention, a 7% increase in women who were able to finance at least one emergency with their own resources. Which means that there has been learning about making financial reserves that help pay for unexpected expenses.

It was possible to verify that, after the intervention, there was an increase of 43% of women beneficiaries of the Bolsa Família Program who started the habit of creating savings, be it formal or informal. Habit that will guide them to realize their short, medium and long term goals. It increased by 68% the number of beneficiaries who participated in the financial education workshops, which in the last three months have

been able to save. Meaning that the content given to the beneficiaries caused a significant change in the thoughts and habits in which they were inserted.

Regarding to monetary values, it is noticeable that beneficiaries who previously saved an average of R$ 47.00, after the intervention managed to save on average R$ 116.30. That is, women can now save 71% more than before. Checking for shorter periods, the women, before the intervention, saved an average of R$ 12.40 per month and, after the intervention, this figure increased 81%, that is, the economy rose to R$ 37.10 per month. Again, these results reflect the impacts caused by acquiring knowledge about financial education and income management. After the intervention, the self-reported knowledge that beneficiaries had about their revenues and control of their expenses increased by 10%.

Based on questions asked to measure the knowledge about the content administered in the workshops (such as debt control and reserve creation), it was possible to verify that there was a 6% increase in relation to the women with and without the intervention.

It is observed that, after the intervention, there was a 13.2% increase in the number of retirees who began to calculate their monthly income to verify if the balance was positive or negative. Through the tools provided by financial education workshops, the retiree develops the skills necessary to understand how his financial life is and how to plan it to achieve the desired goals.

There was a 36% decrease in spending on basic necessities for retirees who participated in financial education workshops. Through financial photography, retirees are able to visualize the monthly expenses they have and, in this way, it is possible to analyze ways to reduce costs.

After the knowledge acquired with the financial education workshops, there was a decrease of 40% of retirees who declared themselves to be delinquent. Basic topics of financial education are addressed in the workshops and, in this way, it is easier for the retiree to understand if they are in default.

There was a 9% increase in retirees attending financial education workshops who said they were paying their bills on time. Through the debit booklet provided to the retiree he can write down all the debts he has and, in addition, with the calendar it is possible to make visible the due dates of the current accounts.

As a contribution to the next surveys, it is suggested that, after the understanding of controlling revenues and expenses and the creation of reserves, ways are presented of how to maximize the gains obtained, as well as the stimulus to the entrepreneurial behavior and the entrepreneurship so much for the women beneficiaries of the BFP and for retirees with income of up to two minimum wages.

8. References

BARROS, R. P., HENRIQUES, R., & MENDONÇA, R., “Desigualdade e pobreza no Brasil: retrato de uma estabilidade inaceitável”, RBCS Vol. 15 nº 42, 2000, p. 123.

CVces, I. E. “As Empresas Frente aos Objetivos do Desenvolvimento Sustentável”, Instituto Ethos, São Paulo, 2016.

ENEF, “Plano Diretor da Estratégia Nacional de Educação Financeira”, São Paulo, 2012.

FORTE, C. M. J., “Estudo de caso comparativo entre Programas de Microcrédito na América Latina: o impacto socioeconômico nas mulheres das cidades de Bogotá e Recife”, Universidade de São Paulo, São Paulo, 2006.

GIANNETTI, E., "Vícios privados, benefícios públicos?", Companhia das letras, São Paulo, 1993.
IBGE, "Síntese de Indicadores Sociais: uma análise das condições de vida da população brasileira", Instituto Brasileiro de Geografia e Estatística – IBGE, Rio de Janeiro, 2016.
MARCONI, M. D., & LAKATOS, E. M. "Fundamentos de Metodologia Científica". Editora Atlas S.A, São Paulo, 2003.
MDS, "Bolsa Família", accessed on September 18th, 2017, available at Ministry of Social Development website: http://mds.gov.br/assuntos/bolsa-familia/o-que-e, 2015.
MOREIRA, M. A., "Teorias de aprendizagem", Editora Pedagógica e Universitária LTDA. (E.P.U.), São Paulo, 1999.
METAS - AVALIAÇÃO E PROPOSIÇÃO DE POLÍTICAS SOCIAIS, "Relatório da Avaliação Experimental de Impacto Social do Programa de Educação Financeira para Adultos de Baixa Renda da AEF-Brasil", São Paulo, 2017.
Porta Brasil, "Mulheres ganham espaço no mercado de trabalho", accessed on September 20th, 2017, available at Porta Brasil: http://www.brasil.gov.br/economia-e-emprego/2017/03/mulheres-ganham-espaco-no-mercado-de-trabalho, 2017.
SCHARMER, C. O., "Teoria U: Como liderar pela percepção e realização do futuro emergente", Elsevier Publishing company Ltda, Rio de Janeiro, 2009.
SKINNER, B. F., "Sobre o behaviorismo", Editora Pensamento-Cultrix Ltda, São Paulo, 2011.
STICKDORN, M., & SCHNEIDER, J., "This is service design", BIS Publishers, Amsterdam, 2011.
VERONESI, L. B., "Maioria dos brasileiros chega à terceira idade sem qualquer reserva financeira", accessed on October 04th, 2017, available at Infomoney website: http://www.infomoney.com.br/minhas-financas/aposentadoria/noticia/3633751/maioria-dos-brasileiros-chega-terceira-idade-sem-qualquer-reserva-financeira, 2014.

Copyright Disclaimer
Copyright for this article is retained by the author(s), with first publication rights granted to the journal.
This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).

i Decree nº 7,397, of December 22, 2010 available at <http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/decreto/d7397.htm> Accessed on: 10/6/2017
ii Available at: <http://www.br.undp.org/content/brazil/en/home/library/odm/declaracao-do-milenio.html>. Accessed on: 09/25/2017
iii Available at: https://mdgs.un.org/unsd/mdg/Resources/Static/Products/Progress2015/English2015.pdf Accessed on: 09/25/2017

Female Saudi International Students Daily Practices on Social Media in Australia

Hanan Mohammed Alshehab
School of Languages, Literatures, Cultures & Linguistics Monash University

Abstract

The effect of Social Media (SM) technology on human life in the 21St century cannot be denied; the use of SM platforms can be seen in various fields, such as education, medicine, politics, social life, communication methods, and daily life. The research aimed to investigate SM's impact on Female Saudi International Students' (FSIS) English language learning and creation of identities. This study utilized a qualitative method to obtain in-depth knowledge of FSIS' practices on SM and the effects on their learning and identity. The semi-structured interview was used to collect the data from eight FSIS. Thematic analysis was used to analyze the data. Three main themes were generated: FSIS' daily practices, FSIS' digital identity, and FSIS'languages on SM. The findings show that FSIS is active on SM, having accounts on different SM platforms. They communicate with people from Saudi Arabia and of different nationalities. Also, the findings assert that FSIS has a strong digital identity on SM. Moreover, the findings emphasized that using SM helps some of the FSIS to improve their English language proficiency. They use SM as a learning tool for English language acquisition. The limitations and the implications of the study are stated in the Conclusion. For further research, suggestions are made to investigate more phenomena regarding Saudis' using of SM.

Chapter one: Introduction

1.1 Background of the Study

The effect of SM technology on human life in the 21St century cannot be denied; the use of SM platforms can be seen in various fields such as education, medicine, politics, social life, communication methods, and daily life. As a product, SM have advantages and disadvantages for their consumers. Many studies have been undertaken to examine the adverse effects; for example, Risto (2014) investigated the kinds of academic writing errors committed by the students who use SM platforms for communication. While much other research has considered the positive impact on people's lives of using SM, such as WhatsApp, Facebook, Instagram, YouTube, Twitter, Tango, and Soma. Mirkin (2017) examined the effect of implanting a social media literacy program for reducing levels of anxiety and self-esteem issues among SM platforms users, including helping them to explore the many facets of their identity. Also, another possible benefit of these platforms is the promotion of communication and the acquisition of English language skills. According to the fields of Education and Applied Linguistics in general, it is crucial to investigate the positive impact of using SM as a tool for learning and using the English language. FSIS have knowledge of how to use SM in their daily lives, but there is a need to explore how they use SM in their learning of the English language. Therefore, the findings

of this research will help educators to refine their educational programs by providing more information about how FSIS use SM in their lives to learn the English language.

1.2 Research aims

The research seeks to investigate SM impact on FSIS' English language learning and creation of identities. Furthermore, the study presents findings that could help Australian educators, academic teachers, international students, and people to know more about FSIS and to produce better strategies for international education.

1.3 Research design

This study utilises a qualitative method to obtain in-depth knowledge of FSIS' practices on SM, and the effect on their learning, and identity. In this research, the cultural and social backgrounds of the participants and how they influence participants' practices are presented. Qualitative research is ideal for providing clarity for the social, cultural, and situational factors that shape language acquisition and use. Interviews, especially semi-structured interviews, are a widely used and appropriate technique in qualitative research. A semi-structured interview provides a compromise between structured and unstructured interviews (D rnyei, 2007). In the interview which is considered by Block (1995) as social interaction, the roles of interviewer and interviewee are changeable which provide different types of data at different times. Therefore, the semi-structured interview is used to gain more information about FSIS practices on SM.

1.4 Research questions

This study answers the following issues:

1. How do FSIS interact on SM and what motivates those interactions?
2. Do the daily practices by Saudi women on SM create their digital identities?
3. What is the effect of using SM in their learning of the English language?

1.5 Organisation of the project

This chapter has introduced the topic and given the outline of the study. It has presented the research questions and aims. The second chapter reviews literature related to the topic, such as SM, FSIS, identity. The third chapter states the methodology used to collect the data, and tools to analyse them. The next chapter analyses the results and discusses the findings. The last chapter concludes the study and suggests implications related to using SM in learning the English language.

Chapter Two: Literature Review

2.1 Overview

This chapter reviews some topics that have a relation with the study. First, there will be a brief introduction of SM, followed by the background of FSIS, then the digital identity.

2.2 SM

It is crucial to introduce the term SM and what it implies. Dabbagh and Reo acknowledged that "Social media is a 21st century term used to broadly define a variety of networked tools or technologies that emphasize the social aspects of the Internet as a channel for communication, collaboration, and creative expression, and it is often interchangeable with the terms web 2.0 and social software" (2011, as cited in

Aifan, 2015, p. 2). Mondahl and Razmerita (2014) outline the function of SM as facilitating communication, delivering information and providing online socialisation. Interestingly, the communication on SM can happen between members of different societies in the world. Kietzmann et al. defined the function of SM as "Social media employ mobile and web-based technologies to create highly interactive platforms via which individuals and communities share, co-create, discuss, and modify user-generated content" (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011, p. 241).

All these definitions prove that SM includes all the applications and programs that enable people to find information, search for knowledge, enable knowledge sharing, have free video, and voice calls, and provide opportunities for social interaction, in an easy way. It is stated that "While there are dozens of social network sites, participation tends to follow cultural and linguistic lines"(Boyd, 2008, p. 123). Examples of SM include (but are not limited to) Snap Chat, Facebook, Twitter, WhatsApp, Instagram, Skype, Soma, Wiki, Second life, Wikipedia, YouTube, Blogger, Yahoo Messenger, and Google Talk. In this study, there is an investigation of the platforms that FSIS use in their daily lives.

There are many studies which investigate the effect of using SM for education. Lomicka and Lord (2016, p. 1) argued that "Our increasing dependence on and use of various technological tools has impacted every facet of our lives, and language teaching and learning are no exception". SM can serve the learning process in many ways. Campbell (2015) claimed that informal interaction on SM would support learners' acquisition of the language and social adaptation in the host country. Mondahl and Razmerita (2014) argued that SM make learning more amusing, and create a reflection- based type of knowledge that could be adopted in new contexts. Dogoriti, Pange,and S. Anderson (2014) argued that SM help teachers and students to upload files, photos, videos and other educational material that is relevant to their course and learning. It is claimed that SM have "the potential to transform language learning by offering synchronous and asynchronous interaction, and speaking, writing, reading and listening activities at a time and place of learners' own choosing (McBride, 2009, as cited in Brick, 2011, p. 19). All these examples indicate that learning happens on SM, and the learners can improve their skills. From my own experience, two female Saudi students and I enjoyed preparing a video presenting our reflection on translation theories we had studied in the class. The information lasted in my memory because I engaged in deep preparation for the video, discussed the theories and gave examples. SM therefore facilitates learning, having both a direct or an indirect impact on the learners

There are theories which support that language learning is a social activity, with people learning from each other. For example, Siemens (2014, p. 7) affirmed that:

> "Connectivism presents a model of learning that acknowledges the tectonic shifts in society where learning is no longer an internal, individualistic activity. …… Connectivism provides insight into learning skills and tasks needed for learners to flourish in a digital era".

Alsaleem (2013) used connectivism as a framework theory for her research. The study revealed that using WhatsApp journaling enhanced female Saudi students' voice and vocabulary choice of the writing activities which are already utilised in the writing class. Aifan (2015) agreed that SM impacted the

educational field and improved learning skills of students. This positive impact has occurred because the new tools allow learners to access information at any time, provide reflections, and share their information and experiences with others. Furthermore, Ortega (2009, p. 252) argued that language socialisation theory regards "language learning and social learning as constitutive of each other". Ortega (2009) pointed out that this theory confirmed that through social activity, the participants gain a membership, legitimacy in a group, and language knowledge. Thus, SM offers the opportunity for language learning on platforms through participation and communication. Most of the platforms enable the creation of groups which allow members to share, comment, learn from each other, and feel a sense of belonging to that group.

SM could contribute to reducing the risk of the challenges that international students face in their learning. They need to use SM for personal communication and educational purposes (Sleeman, Lang, & Lemon, 2016). Some international students move from a place where English is taught as a foreign language to a country where English is taught as a second language. Thus, they might face difficulties in the adaptation of the new way of teaching. Indeed, SM can facilitate their learning and study through accessing the university's web pages and the rich resources of libraries available online. Also, the students can find valuable information on their schools' accounts on SM. Moreover, it is argued that using technology in the education field can enhance learners' skills and independence (Aifan, 2015). For FSIS, they are accustomed to a teacher-centred teaching style and studying in female-only classes. SM may help Saudi students to be more independent in searching the knowledge they need in their education.

2.3 FSIS

Australian universities have attracted many international students. Australia is one of the countries which is accepted by King Abdullah scholarship program in Saudi Arabia. The growth of student number is 11.5% (January–December 2016) and among 554,179 international students from different nationalities studying in Australia, 6,500 are Saudi students (The Department of Education and Training, 2016). The increasing number of students indicates the excellent quality of tertiary education in Australian universities. Although Australia is so far from Saudi Arabia, many Saudi students prefer to come to Australia because of the excellent reputation of its education.

To gain better outcomes of education, Australian educators should know more about international students' lives in Australia. There are many challenges to be faced by international students as they move to a country that is different from their home, including culture shock, homesickness, loneliness, and different education styles (Binsahl, Chang & Bosua, 2015). All these difficulties have their impact on the level of adaptation to Australian culture and the education system. This indicates that FSIS could face some challenges when living in a western country. Further research is needed to investigate their needs and how they overcome the difficulties. The FSIS who come to Australia with their nuclear families might experience homesickness and loneliness as they are used to living in an expanded family. The findings of a study conducted by Binsahl, Chang, and Bosua (2015) in Australia revealed that the FSIS utilise Facebook to communicate with their family and friends in Saudi, and to know more about what is happening around them in Australia.

So, SM enable the students to communicate with their relatives and friends at home and make new relations in the host country.

It is essential to review the religious and cultural background of FSIS. Saudi students come from a conservative country, where religion and culture play a great role in their lives. Alsaggaf and Williamson argue that "religion and culture in Saudi Arabia not only shape people's attitudes, practices and behaviours but also shape the way they see and do things and perceive their lives"(2004, as cited in Raddawi, 2014, p. 42). Islam is the official religion in Saudi Arabia; it is fair to say that the religion urges women to be educated. It is stated that "Islam granted women not only the right to education, but also the right to inherit, own property, and full participation in all aspects of life" (Hamdan, 2005, p. 55). FSIS are educated, and they come to Australia to complete their studies; Bachelor, Master, and/or PhD.

However, the cultural factor could prevent some women from practising on SM; some families are afraid of the consequences of engaging online with males in discussions and sharing opinions. Hamdan (2005, p. 48) reported the view of Fatina Shaker, a female Saudi anthropologist who "believes that denial of women's rights is rooted in the hegemony of social practices, dubbed by Fatina as customary laws or traditions, rather than rooted in Islamic essence". While there are some families who prevent their daughters from practising on SM, there are many families who do not mind their daughters having accounts on SM. It is noticed that "the blooming of the new communication technologies brought significant changes to women realities in these societies by providing new space for self – expression" (Guta & Karolak, 2015, p. 116). Two articles by Al-Saggaf and Weckert (2004); (Alsagoff, McKay, Hu, & Renandya, 2012) revealed that male and female Saudis become more flexible in their thinking, discussions, and expressions after they engage the online community. Also, the researchers noticed that the individuals learned critical thinking skills. They are less naive, more mindful, challenge ideas, and respect other people's opinions. Fascinatingly, the female participants showed that there is an increase in their self- confidence, making them feel less inhibited about the opposite sex. The females stated that practising on SM made them outgoing, more talkative and less shy.

It can be argued that SM offers information, facilitating communication, and online socialisation for female Saudi without contradicting their religion. Guta and Karolak (2015) in their study of Saudi women on SM pointed that "the Internet creates thus a safe space where female body, predominant in daily life, is non-existent and only thoughts count". For Lauritano-Werner (as mentioned in Boyd, 2007, p. 131), "privacy is not about structural limitations to access; it is about being able to limit access through social conventions". Fortunately, the settings of the accounts on SM enable female Saudi to choose what is appropriate for them. For example, the privacy options for sharing (public, friends, followers) make them more comfortable to send their photos and videos to their personal networks, those people they have allowed in their networks. Most of the settings on SM are optional. Therefore, female Saudi can choose what is suitable for them. They can contact females and males on SM in general topics and engage in discussions and present opinions.

There is a limitation of research about Saudi students in general and Saudi females in particular (Binsahl & Chang, 2012, as cited in H. Binsahl et al., 2015). It is stated that "Despite the significant increase in the number of Saudi students enrolled in Australian universities, very little research has been done to understand their experiences and how they bridge the cultural differences"(Alsahafi & Shin, 2017, p. 54). Alsahafi and Shin (2017) found that Saudi students in Australia faced difficulties in making friends because of cultural differences and lack of English proficiency. There are few studies that showed up in the literature review about FSIS in Australia and their use of SM to reduce the difficulties they experience. Thus the purpose of this study is to highlight FSIS' utilisation of SM in Australia. Also, it aims to explore how using SM affects their learning of the English language. Moreover, FSIS adaptation to Australian education and stratgeies for making friends will be discussed. Last, but not the least, this research will seek to know how FSIS see themselves on SM.

2.4 The digital identity

It is stated that "digital identity is an individual's identity which is composed of information stored and transmitted in digital form. Digital identity is all the information digitally recorded about an individual which is accessible under the scheme"(Sullivan, 2012, p. 225). This digital identity could be weak or strong, as defined by Maia and Valente (2013, p. 58):

> "The weak digital identity is limited to virtual characters, avatars, or fakes, which play digital roles with no significant impact on the subjects' lives. The strong digital identity is constructed when subjects use digital technologies as a support to convey meanings that extend into the subjects' lives and reach beyond a virtual concept".

Therefore, it is inevitable to have a digital identity (weak, strong) if a user interacts on SM. It is stated that a user's identity can often be established through the conscious or unconscious presentation of thoughts, feelings, likes, and dislikes on online communication (Kaplan & Haenlein, 2010, p. 62). All the behaviours on SM can reveal users' identities to others. In this research, there will be an investigation of the similarities or differences between the online and offline identities of FSIS, and the effect of their online and offline identities on learning the English language.

It is significant to refer to the identity in this study because practising on SM leads to creating an online identity(ies) of the users. It is argued that "the Internet offers users the possibility to forge completely new online identities, which can be multiple, or to reshape their offline identity carefully choosing what information to put forward, thereby eliminating visceral reactions that might have seeped out in everyday communication" (Guta & Karolak, 2015, p. 118). It can be said that the digital identity of an individual could be all the explicit and implicit online information that people know about the individual who has accounts on SM and practices communication with others.

Identity has a vital role in human beings' lives. It is stated that identity is the mediator between the individual and the social world (Chryssochoou, 2003). People can be affected by other people, as they communicate with them. Existing social media research focuses on social interactions and identities on

social media. Chryssochoou (2003, p. 3) stated that "identity encapsulates simultaneously the way we think about ourselves and about the world in which we live". Identity is dynamic; it can be changed in daily life. It is argued that "identity is not a property […] of an individual, but […] it is interactively initiated over and over (though with a degree of consistency), so that the same individual can literally have different identities in different contexts" (Zhou-min, 2013, p. 80). Having more than one identity is not a problem, it indicates the ability of adaptation. Social psychological research is concerned with identity, and the three stages of socialisation, communication, and social influence to formulate one's identity (Chryssochoou, 2003). These three processes can occur easily through interacting on social media. Existing literature includes social media studies concerned about the interaction on social networking sites and the identities of their users (Beaver, 2016).

Identity from a sociolinguistic perspective is affected by language. It is argued that "language is then a 'double- edge sword; constraining identity by erecting boundaries between 'them and us' be they geographical or sociocultural, and liberating identity by offering fresh opportunities to cross barriers and boundaries."(Evans, 2014, p. 4). Interestingly, it is stated that language is a marker of identity and also contributes to shape our social perception of the self and others (Evans, 2014, p. 50). From these two quotations, it can be said that the identity of SM users is changed according to the language used. In the case of FSIS, if they speak Arabic and English on SM, this indicates that they have more than one digital identity. This explains identity on the level of type of languages. Also, identity could be affected on the level of standard and vernacular of a language. A study by Eckert (2012, p. 91) emphasised that although "the vernacular may be stigmatized on a global level, its association with local values and practices gives it positive value on the local level". This assumes that using SM exposes the users to vernacular language which would be not used at the academic level. That may help the users to know more about local people's lives. It appears that an SM user's identity is shaped by the interlocutors' interactions and their languages.

Chapter Three: Methodology

3.1 Overview

This chapter introduces the qualitative study and discusses ethical considerations. Also, it presents the participants' demographic information, the research design, and data collection instrument. Data analysis strategy will also be discussed.

3.2 The qualitative research

This study aims to explore FSIS'interact on SM and what motivates those interactions. Importantly, it explore FSIS' identities and how they are affected by using SM and. how using SM affects their English language learning. The research needs rich information to gain a better understanding of FSIS use of SM. Therefore, the qualitative approach is appropriate for this research. Merriam (2009, p. 14) stated that "qualitative researchers are interested in understanding the meaning people have constructed, that is, how people make sense of their world and the experiences they have in the world". D rnyei (2007) outlined the strengths of the qualitative research method. For example, the exploratory nature of qualitative research is

an effective strategy for exploring a new area. Qualitative research is concerned with participants' feelings, opinions, and experiences. Furthermore, it allows the researcher to engage in particpant responses and ask for further details at certain points straight away, which leads to broadening the understanding of the phenomena. The interview instrument helps the researcher to listen carefully to what temerges in the interview, and seek clarification. Thus, in this study, semi-structured interviews whether face to face or on mobile, were used with FSIS to explore their views of using SM as a way for communication and as a tool for learning the English language.

3.3 The recruitment of participants

After receiving approval to commence the project, potential participants were contacted through the WhatsApp application. I am a member of a female Saudi group in Whatsapp, where sending an announcement about conducting research is permissible. Also, the recruitment message was sent via Whatsapp to some female Saudi students in Australia who I know. The explanatory statement (see Appendix 2) and the aim of the research were posted. If they wished to participate, they were advised to send a message of agreement on Whatsapp and arrange a time and the place to conduct the interview. After that, consent to being interviewed was received from six female Saudis who agreed to do the interview on mobile phone, and two who preferred a face to face interview, so the total number of participants was eight FSIS. The two face to face interviews were conducted in a meeting room at the university library. My mobile recorded the interviews. The other participants did their interviews at times convenient for them, where the call was on speaker and another mobile used to record the interviews. In two weeks, the data were collected from all the participants. The consent form (see Appendix 3) was sent via email to the participants who signed them and returned back to me.

3.4 Ethical considerations

Monash University Human Research Ethics Committee (MUHREC) gave approval and all participants gave their consent. It was explained to participants that their participation is voluntary and their names would be anonymous in presenting the data (Allmark et al., 2009). Pseudonyms instead of real names were used.

3.5 Selection of participants

Certain criteria were applied to selecting participants. They were required to be FSIS in Australia, aged over 18 and with experience learning English in Australia or through study in university. They needed to have an interest in SM to tell their experience.

3.6 Participants' description

The sample size of the participants was small, which helped to gain the rich data that is needed to understand participants' experience. The interviews were conducted with eight FSIS in Australia. Most of them are current students undertaking Master or PhD studies, and some of them have finished a language program or have completed a Master degree. All of them are married, their ages ranged from 26-36 years.

They came from different places in Saudi Arabia. They live in Melbourne and are studying in various universities. They are English language speakers. Their language experience in Australia shows their history of learning English and how they use SM to improve their English skills. The full details are shown in (Table 1) below (pseudonyms are used).

Table 1: Description of participants

Participant	Age	Area in Saudi Arabia	No. of Children	Languages	language program	Last Level of Education	Current status	Length of Residence
Monerah	27	Riyadh	1	Arabic English	language program in Australia	Bachelor	Master in Education in early childhood	2 years
Sarah	27	Aseer	1	Arabic English Turkish	Not applicable	Master	housewife	One year, seven months
Norah	Approximately 30	Riyadh Born in Kuwait	2	Arabic English Turkish	language program in Australia	Bachelor	housewife	One year, seven months
Razan	34	Dammam	3	Arabic English	Not applicable	Master	PhD in Pharmacy	3 years
Lobnah	30	Jeddah Born in America	2	Arabic English	Not applicable	Master	PhD in Applied Linguistics	2 years
Lyla	31	Dammam	1	Arabic English	language program in Australia	Bachelor	housewife	6 years
Arwa	26	Riyadh	0	Arabic English	language program in Australia	Bachelor	Master in Applied Linguistics	2 years
Afnan	36	Jeddah	4	Arabic English	language program in Australia	Master	PhD in computer science	9 years

3.7 Data collection instrument

The semi-structured interview was used to find answers to the research questions about FSIS practices on SM and how SM affects their English language learning and their identities. This kind of interviews allows the interviewer to prepare a set of open-ended questions for guidance, and the interviewee is encouraged to elaborate on certain issues (D rnyei, 2007). The interview guide helped to focus on the domain of the study, and offered a list of useful questions to ask. D rnyei (2007) suggested a variety of questions for the interview protocol, such as: (a) factual or personal questions (age, area in Saudi Arabia where the participants live, current marital status, number of children, level of education, years of residency in Australia), (b) content questions, for example ("What is your favourite platform?," "What is your goal in each platform that you have on SM?"), (c) clarification questions (why, how, what do you mean), and (d)

final closing questions ("Is there anything else you would like to add?"). All the participants were asked the 31 questions in the protocol (see appendix 1), and the researcher asked for clarification on any emerging points that participants raised. Follow-up interviews via WhatsApp were used for checking on some of the interview information.

For ensuring participant' privacy, the interviewees chose the method for conducting the interview, either on mobile phone or face to face, and their preferred place and time. Most of the participants wanted the interview on mobile from their homes. Conducting the interview in a comfortable place is an important factor for making participants communicate freely (Allmark et al., 2009). The interviews were in the Arabic language and took around 30- 60 minutes. The conversation started by a greeting and thanking participants for their initiative for doing the interview. Some information is given prior to the researcher asking questions to elicit an accurate understanding of the question; for example, the definition of SM, digital identity, emotional energy. The definitions are added at the end of the interview protocol (see Appendix 1).

3.8 Data analysis

This section introduces the research tools for analysing the qualitative data. The researcher examines and organises the obtained data according to "participants' definitions of the situation, noting patterns, themes, categories, and regularities"(Cohen, Manion, & Morrison, 2013, p. 537).

The structured and the unstructured data are derived from the semi-structured interview which challenges the researchers to structure them (Kulatunga, Amaratunga, & Haigh, 2007). Content analysis is s suitable approach to analysis because it helps to organise and break down the large amounts of data into categories or codes (Kulatunga et al., 2007). According to Weber (1990 as cited in Kulatunga et al., 2007, p. 503) "category is a group of words with similar meanings or connotations". I employed conceptual content analysis which is also known as thematic analysis. This kind of analysis "attempts to find similar cognitions under the same concept" (Kulatunga et al., 2007, p. 502). Also, it enables the researcher to deal with pre-established codes and emerged codes. According to Kulatunga et al. (2007), the researcher should be familiar with the text and the pre-testing coding to illustrate the implicit terms before beginning the data analysis procedures. Pre-established codes using theoretical background can help to reduce the researcher's subjectivity.

Following Kulatunga et al. (2007), three main steps were involved in systematic procedures for thematic analysis. First, the transcript data was in Arabic for each interview. I repeatedly read the transcriptions and divided the data into meaningful categories related to a particular concept to generate initial codes. For example, I found that there was information about practices on SM, English language on SM, Arabic language, identity, online relations. Secondly, a middle range approach between deductive (themes are theory-driven), and inductive (themes are data -driven) coding processes was used for creating the pre-established codes and to generate new codes (Miles & Huberman, 1994). I conducted the coding based on

the research question then examined the emerged codes and undertook coding by using descriptive keywords derived from the transcript. Thirdly, the codes were revised and linked to the research questions to build up arguments and arrive at conclusions. The final themes were named to establish the main themes for the results. The themes for this study are FSIS' daily practices, FSIS' digital identity, and FSIS'languages on SM.

I then translated into English the sections that I used for presenting participant's voices in my research, in order to support the main themes with quotes from the participants. The verbatim transcription helps the researcher to manage the data by including word by word and all the emotional expression of the informal conversation (Liamputtong, 2011, p. 166). I included the verbal and non- verbal features, such as laughter and pauses. Each version of the Arabic-to-English (forward translation) and English-to-Arabic (backwards translation) was revised and compared (Santos, Black, & Sandelowski, 2015).

Chapter Four: Results and Discussion

4.1 Overview

This chapter reports on the collected data from eight interviews of FSIS. Also, it discusses the results with respect to the literature review in chapter two and the research questions. From the process of coding the data, I extracted three main themes which will be discussed in this chapter:

- FSIS' daily practices on SM
- FSIS' digital identity
- FSIS'languages on SM

4.2 Research results and discussion

I would like to present each theme from the participants' point of view, then my interpretation of their views. This will be followed by a discussion in relation to the literature review.

4.2.1 FSIS' daily practices on SM

FSIS are fascinated by the facilities offered by SM platforms for users. Most of the participants expressed their opinions about the newest platforms. The communication with their relatives, and old and new friends are the main goal of their practice on SM, followed by their desire to know about other cultures, news, brands, fashion, food, academic trainers, and healthy lifestyle. All the participants are active on SM; they have many platforms where they communicate with others, whether Saudis or people from different nationalities. Information about their online practices is shown in (Table 2), inlcuding details of their favourite platform, the number of accounts they have on SM, the used devices, the time in which they become active, and the approximate hours for their daily use of SM.

Table 2: FSIS' daily practices on SM

Participants' Name	Favourite platform	Accounts on SM	Devices	Active time	Daily use approximate (hours)
Monerah	Snapchat	two accounts on Facebook, one account on Instagram, Snapchat, Whatsapp	Mobile	morning, afternoon, evening	5
Sarah	Whatsapp	one account on Whatsapp, Instagram, Snapchat, Facebook	mobile, laptop	Afternoon	3-4
Norah	Whatsapp	one account on Whatsapp, Instagram, Snapchat, Facebook, Twitter, Skype	Mobile	after 9 P.M	1
Razan	Whatsapp	two accounts on Instagram one account on Whatsapp, Facebook	mobile, laptop	Evening	1
Lobnah	Snapchat	one account on Whatsapp, Instagram, Snapchat, Facebook, Twitter	mobile, laptop	morning, evening in the car	3
Lyla	Whatsapp	two accounts on Instagram one account on Whatsapp, Snapchat, Facebook, Twitter, Soma, Skype	Ipad, tablet, laptop, mobile	morning, evening	6
Arwa	Snapchat	Snap chat, Instagram, Youtube, Whatsapp	Mobile	morning, evening	3-4
Afnan	Whatsapp	Whatsapp, Instagram, twitter, facebook, Telegram, Tango	Mobile, laptop	On the train	2-3

As shown in Table 2, there is a similarity of the applications used between the participants. This agrees with "While there are dozens of social network sites, participation tend to follow cultural and linguistic lines"(Boyd, 2008, p. 123). Some of the participants stated that they used an application because their relatives and friends have it. Lobnah said:

1a: "Snapchat is found when I was in Saudi Arabia, but I did not download it […] why I downloaded it […] for mum […] for siblings, [...] for uncles, all of them used it and stopped using Instagram, so it is the way of communication now".

Alternatively, they use certain applications because people in Saudi Arabia use it. Lyla said:

2 a“ Whatsapp from the first. It means from the beginning of Whatsapp all people open it; I open it..that it is…I did not remember a specific reason”.

Lyla used WhatsApp because platform is used by most Saudis, having the feature of privacy which Saudis seek, and easy management and usability of the platform. From Table 2, it is apparent that WhatsApp and Snapchat are the most popular platforms for participants. When I asked them about their favourite platform they provided facts and reasons why they preferred them:

3a: Snapchat is more reliable, it shows the action directly. It is the newest platform for Saudis (Monerah).

3b: Snapchat is easy to use, private, to be yourself (Lobnah).

3c: Snapchat is for fun, it can take photos of everything, and it is very quick to send the messages, it is private(Arwa).

3 d: I preferred the groups on Whatsapp; it is practical, quick, and private (Razan).

Most of the participants asserted that the privacy of the platforms they use was important. The privacy options allowed FSIS to engage in SM in keeping with their conservative culture. FSIS’ using of SM concord with the findings of Guta and Karolak (2015) in their study of Saudi women on SM, who pointed out that “the Internet creates thus a safe space where female body, predominant in daily life, is non-existent and only thoughts count”. So Saudi women are active and communicate on SM which provides a safe place for them.

When I asked the participants if they could spend one day without participating on SM, they stated that:

4a:“While I am studying […] yes […] it means […] but after graduation, no”(Sarah)

4b: No, never […] I can not

Me: why?

4b: uh at least I communicate with my family through them as a daily news […]Twitter honestly I know worlds’ news, and I communicate with useful official accounts for research purposes (Afnan)

4c: Yeah I try to

Me: why?

4c: just to spend time with my family (Lobnah).

4d: No impossible

Me: why?

4d: [laughs] because I feel that social media is like addiction every day I should check to know what changes in the community, and what happens”(Monerah).

4e: Up to now, no

Me: why?

> 4e: I do not know.. Addiction you can say [laugh] honestly [….] here I need for communication with my family in Suadi Arabia […] I can not close it, or spend one day without honestly I do not speak with my brothers and sisters via calls, most of our communication on Whatsapp you know (Lyla).

So their active time on SM is varied according to the priority for home responsibilities or study time. Also, these differences may be the result of different personality traits. In one of the studies, it is stated that "high extraversion people had longer Facebook experience, daily time use and weekly time use, and more number of friends, photos, and groups than low extraversion people"(Kuo & Tang, 2014, p. 16). Some of the Saudi women prefer to use SM every day, like Lyla and Monerah; they described their practices as addiction. They can not stop using SM because they want to be related to their families and communities. They spend around 5-6 hours in a day for communicating on SM. Some differences may be the result of personality traits, as levels of Facebook use have been linked to extraversion (Kuo & Tang, 2014). When she was studying, Sarah did not use SM every day, but her use became high after graduation when she used it almost every day. She prefers to be active in the afternoon because family responsibilities are less at this time. Lobnah tries to stop using SM to spend more time with the family. She stated that " I prefer to be active in the car because I am not driving". She is so organised, careful to spend time with family, to study, and to be active on SM. Also, Afnan has these characteristics; she prefers to practice on SM in the train. She has four children, so she is very busy, but she tries to find time to be active on SM.

I noticed their desire to stop using SM every day for entertainment and their curiosity for watching for all the newest things on the platforms, but they keep using SM for studying or learning every day. It is stated that:

> 5a: " I downloaded Twitter from around 8-10 years, I was active at the beginning then I felt that it takes my time all people argue, argue, argue. I decided to stop it because it takes time more than any another application, now I returned again to use it for studying, there is many doctors who share many benefit materials about the research, what is the difference between the quantitative and qualitative methods, so I decided to use it for learning purpose. Also, I used WhatsApp for collecting the data for my research and for studying reason. I have a group of PhD students who are active and also share I used it for my work; there is a committee for developing the curriculum, they ask us for our opinions, so it is a way for communication and studying"(Lobnah).
>
> 5b: "in Twitter, I communicate with accounts that responsible, beneficial for research, for postgraduate students, for news, religious persons, also, I follow the account for my supervisor because sometimes, he notified for a near conference if someone like to participate, also if he likes a paper he write a note, so I follow him, in Instagram I follow accounts for health, exercises because I have pain in my back, family consultants, cooking"(Afnan)

Some participants reveal their opinions on having accounts on Snapchat:

> 6a: "in Snapchat just the girls on your contact […] to be myself, because in Instagram you cannot be yourself, all these people are following you but in Snapchat, I can take photos all the day long for everything, I can cook and take pictures of myself, it is ok, I feel comfortable with using it" (Lobnah).
>
> 6b: "Snapchat appears when I am here, I need to know my family news especially my siblings"(Lyla)
>
> 6c: "Snapchat I did not use because I should put a terminus [laugh] for this world because if I enter I will not finish. I asked a lot of female Saudis they said […] it consumes their time so […] honestly; I did not enter it up to now" (Razan)
>
> 6d: "No never, I do not have account on Snapchat, it takes time" (Afnan)

SM platforms' creators are competitive, every platform appears with a distinctive feature, so some people prefer to use the newest platform that appears. It is stated: "What we have seen over the past ten years is that many platforms started out in one particular domain (e.g., online search or social networking) and gradually encroached upon each other's territory while trying to contain users inside their own fenced- off turf" (Van Dijck, 2013, p. 9). I think now most platforms have the feature which Snapchat has about "your story" which lasts for 24 hours. Lobnah and Lyla were active on Facebook and Twitter when they appeared; then they become more active on Whatsapp and Snapchat which are the most popular platforms nowadays among Saudis, but still, they use their accounts in other applications. This shows their readiness to try a new life on a new platform. They are open-minded to trying new platforms and communicating in new ways. However, Razan and Afnan revealed their fears about Snapchat because it takes most of the users' time. This fear may be because they are PhD students who are busy, and they need the time to concentrate on their studies.

The participants reported their use of SM for personal purposes. None of the participants had the desire to be famous on SM by collecting the biggest number of followers on each platform. Some examples here:

> 7a: "at this moment no, but maybe next year when I finish my studying, I will open it and make it public account, but now I intend to make it private because if I open it, I will not concentrate".(Razan)
>
> 7b: "I do not care"(Arwa)
>
> 7d: "I do not have the goal to collect followers."

They use SM for communication and getting information. Most of them asserted that using SM relieves their homesickness for Saudi Arabia.

> 8a: " I was in Australia in 2010 then I returned to Saudi, I don not know if this will be considered as a part of my living period now. At that time there was no SM, and these platforms like now, you know, it was new in Saudi Arabia, they were not available until at the beginning of 2010 or the end of 2009, I came to Australia and lived around one year then I returned. I felt

homesickness. There was no communication. It was rare. I communicated through calls; I used international calls to contact my family. It costs, and the atmosphere was gloomy. If I did not go out and see for example and know an Australian woman who could speak and understand me, I could adapt the Australian society and know what happened to me otherwise I will not be happy and that exactly what happened to me. I was not happy never. But now when I came back, there is a big difference honestly firstly I communicate easily on SM and searching easily, I find the information easily not like before when people were new and did not know where they go and from where they can buy things"(Norah).

8b: "When I came there were no SM except the Facebook […] SM did not have any effect when I arrived because SM is not found […] however, after that may be SM have an effect […] When I came 2009 there is no Whatsapp, Twitter, Instagram, Telegram, Snapchat, but now my using of SM helps me to know more about Australia that I did not know. Whether places, people. My life is changed now especially when I use Tango to communicate with my family"(Afnan).

8c: "Of course, honestly, it means, I expect that if there are no social media, it means not the homesickness will happen to me, may be more than homesickness, maybe I will return I will not complete. I feel that social media make me more close from my family when I call them a video rather than a voice, I know what the improvement happened to my country"(Monerah).

8d: "Yes like Snapchat […] but […] it means (*hesitation*) never I felt homesickness because I used to live in Jeddah and my family in Riyadh, so already I far from them"(Lobnah)

8e: "I do not know maybe I see videos for my family on Snapchat, it is fabulous that I feel that I am close from them, but it is not relief the homesickness, I feel that there is no relation" (Arwa)

Norah and Afnan expressed their feelings now because they tried the life without SM in 2009-2010. So they appreciated them as they became close to their families and helped them to adapted the Australian community. However, the history of the popularity of SM in Saudi Arabia began after 2009 when the Arabic language was added to the platforms. "Twitter, for example, until March 2012, did not have an Arabic language interface, and this fact seems to have inhibited the growth of its Arabic-speaking user base. Facebook experienced a massive increase in Arabic-speaking users after introducing its Arabic interface in February 2009"(Samin, 2012, p. 3). This indicates the importance of SM in FSIS' life to help them continuing studying abroad far from their families.

The using of SM helps to make some of the FSIS feel more comfortable living in Australia far from relatives. Therefore SM helps to connect them with their families. As is seen in the example of Norah and Afnan, their lives changed after they started using SM. Their relations with their relatives on SM helped these students to continue living happily in the Australian community. Arwa did not feel that SM provides a way to relieve homesickness. This may be because she was always in touch with her family, and she did not experience life without SM like Norah and Afnan. The research findings show similarity in the purpose of using SM with other studies, but the platforms used are different. A study conducted by Binsahl et al.

(2015) in Australia revealed that the FSIS utilise Facebook to communicate with their family and friends in Saudi and friends. My research results show that the most favourite application of participants is the one to communicate with family, such as Whatsapp which is used by most Saudis. Also, they use those platforms which provide more privacy, such as Snapchat.

SM are appreciated because they offer the opportunity to discover the Australian community. It is found that:

> 9a:"I followed some Australian accounts on Snapchat, I learnt a lot about their daily life, culture, customs. Also, I knew halal restaurants and popular places to visit on Instagram (Monerah)
>
> 9b: "Using these platforms helps me to discover the community and the place where I live"(Norah).
>
> 9c:"I followed Australian accounts to know and share in the activities occurred in Melbourne (Razan).
>
> 9d:"I followed on Twitter the leader of Saudi club in Australia, who supported us in our settlement in Australia. I returned to be active on Facebook because most of my Australian, Chinses and Indian friends used it, so I wanted to be in touch with them" (Lobnah).
>
> 9e:"I prefer to use Instagram rather than Google to search for tourists places in Australia; I trusted the people who show their experiences with photos and videos"(Arwa)

The participants showed a positive attitude towards using SM, as a way to get to know the Australian community.

4.2.2 FSIS' digital identity

This theme informs about the nature of FSIS' digital identities and FSIS' online relationships.

4.2.2.1 The nature of FSIS' digital identities

For this point, I asked about having a digital identity that is different from the real identity. Some of the participants were not sure about the answer, some of them replied "no" directly (such as Norah), or described what a digital identity is; "it is a fake identity" (such as Lobnah). The definition of digital identity (See Appendix 1) was therefore explained to participants. I divided the results into two categories, the difference between the real and digital identities, and the different identities on the platforms. The participants stated that:

> 10a: "ever no […] I will not declare my age even in the real identity, this is called discreetness, and it does not have relation with identity"(Norah)
>
> 10b: " No it is not different, the same name, but little information about me, all my accounts are private, I put my first name without the family name, for example, my living area in Australia and Saudi Arabia, simple information about me"(Arwa)

10c:“ Nothing is different from my real identity, mostly I do not declare all the information about me, I am discreet, and these are private things”(Afnan)

10d: “ No it is the same as my real identity, if some information I do not like to show publicly, I will not put them but if I put some information they are true. I do not like people who fake their identity. If you access my profile, you will not know 100% information about me”(Razan)

On SM profiles, it is not compulsory to fill all the information about the user. Some participants seemed unaware that they have a digital identity or what are the components of the digital identity. Norah did not see any relationship of digital identity with age. The age is a very sensitive topic, she declared, even in person, she will not say her age. She told me when I collected the data that her age was “approximately 30”. This is practice in daily conversation but for official communication, for example, at university, hospital or airport, the age is a part of identity. The participants declared that their digital identities are not fake, but they did not write all the information. They believe that privacy is more important than showing your full identity on SM. These findings agree with Lauritano-Werner (as mentioned in Boyd, 2007, p. 131), “privacy is not about structural limitations to access; it is about being able to limit access through social conventions”. The participants are aware of their privacy limitation, and they decide what to show or hide. They have the ability to manage levels of disclosure which can be interpreted as them having different identities.

FSIS’ digital identities are not fake, they share, communicate with their followers on SM. Lobnah stated that she feels it is her responsibility to correct most of the rumours posted on Whatsapp because this application is used by most Saudis. Sarah believes that SM helps her to send positive messages to her followers, such as a picture or poetry. So, they have strong digital identities, made up of multiple identities, levels of disclosure, and with tension between communication and cultural constraints.

When the participants were asked about having different online identities on the platforms, they answered:

11a: “ Maybe in Whatsapp groups, different groups, means different identities, with my family not like with my crazy friends, never the same in Monash group (*a group of Saudis in Australia*) where I am formal. In my family group I am the youngest, so whatever I always said they look at me as the youngest, my personality is different, with my friends there are laughter, jokes, I will not send like these to Monash group. However, in general, I like to send benefit things I send things that increase the awareness of people. So people’s communicating determine how I behave”(Lobnah)

11b: “ My behaviour changes depend on where I am” (Arwa)

11c: “ The same identity on all the platforms, if I discreet for example I have certain level of privacy on Instagram, the same level is on Facebook, the same level is on Whatsapp” (Norah)

They showed that the difference is embodied in the behaviour on the platforms because it depends on the people they contact. Lobnah’s and Arwa’s answers are affirmed by what emerged in the literature review, “identity is not a property […] of an individual, but […] it is interactively initiated over and over (though

with a degree of consistency), so that the same individual can literally have different identities in different contexts" (Zhou-min, 2013, p. 80). However, Norah contradicted that, and she insisted that there be no differences between her digital and real identities and her identities on the different platforms. She declared that " I am a human being feels that my privacy is my property, this has no relation to nationality, religion, age, this is my nature, my privacy will lose its pleasure if I am interested in putting a certain picture or writing certain comment ". It is found that there is a connection between the sense of identity and the personality traits (Lounsbury, Levy, Leong, & Gibson, 2007). Conscientious people "were cautious and conservative about online activities and preferred not to tell others about their Facebook usages"(Kuo & Tang, 2014).

According to keeping the emotional energy on the platforms, the participants stated that:

> 12a: "In Whatsapp, there are family, friends groups, if there is a touch between two persons about a certain topic, we try to reform the matter"(Monerah)
> 12b: " in Snapchat I care, and I think it depends on the newest platform, I was caring in Instagram then no. In Snapchat I care of the replies when I posted something funny, and all the followers comment I become happy, and it affects me I am feeling pleased"(Lobnah)
> 12c: " in Whatsapp if there is a situation on SM, I control my temper vigorously and if there should be a reply I prefer to communicate privately" (Sarah)
> 12d: "If I like it, I will press like button in Instagram, If I like a statement, and it is beneficial, I press like button. In Whats app sometimes I communicate privately with the member who shares in the group to praise, at times I feel sad Why I did not to praise her in the group, she deserves it in the group. Sometimes I comment in the groups" (Afnan)
> 12e: " in the small groups in Whatsapp, I feel that I should give care for the members who share their personal photos, pictures about their success, their children, their cooking, I care to comment. I have this principle as she cares and shares, so she cares to listen to our opinions. However, in the large groups, when I feel that my comment is late and does not affect and already there are many comments, I do not care to comment. In Facebook, I care if the situation is crucial like a wedding, a new baby, death"(Razan)
> 12f: "Mostly I criticised privately, I do not like to comment in the group, but in a situation like today, you write I need help to collect the data for my research, I able to send privately. I will participate with you without replying in the group, but my principle is to help each other, and I want to stir up some feelings in others to help" (Norah)

It is argued that "mediated sharing allows for personal expression, such that the memorability, salience and personal significance of the event can be enhanced. It also allows for enthusiastic feedback to be conveyed, and for a deepening of social relationships. Indeed, research finds that mediated communication and face-to- face communication are strikingly similar regarding their degree of emotional expression and social connectedness" (Choi & Toma, 2014, p. 533). The emotional energy is expressing the feelings towards the

individual's sharings. It can be positive, like comment susing praise words, pressing the 'like' button on Facebook, retweeting on Twitter, and commenting in WhatsApp. Alternatively, it can be negative by commenting with offensive words, making no comments or indicating the significance of posts. FSIS do not keep their emotional energy equally on all their platforms. They frequently comment on their preferred platform, and their interest in other posts. Some of them prefer to comment privately. Razan stated she appreciates and comments for someone who shares a photo or video.

Most of the participants have one account on the platforms, some of them have two accounts on a platform, for a purpose. They stated that:

13a: "I have two accounts on Facebook, one for formal use, the second is for fun"(Monerah).

13b: "I have two accounts on Instagram; one is personal, the second is for my hobbies"(Razan).

13c: "I have two accounts on Instagram, Melbourne Souq is for Saudi international students service (advertisement for selling used items), the second is my personal use (Lyla).

The participants stated that they have more than one digital identity. These findings agreed with Page (2013, p. 17) who describes identity in online interaction " from a discursive perspective, identities are plural, constantly negotiated, and fluid, manifest and made meaningful through the participants' discourse and enacted about localised contexts of interaction". Lobnah has different identities on Whatsapp groups. She is the youngest participant, and states that she is more comforting and humorous in the family and friends group, but she is more formal in the international Saudi female group. Arwa also stated she is more comfortable when she sends temporary photos and videos on Snapchat because all the followers are family members and friends, but she is more careful on Instagram because the photos remain forever. Also, she pointed out that on Whatsapp there is a difference in the way of speech, communication, and level of respect. I can interpret their choice to put two accounts on one platform as a result of their identities and how they see themselves, and how they want people to see them.

It is noticed that their identities are not an obstruction for their communication on SM and their studying in Australia. The participants were asked about the impact of their identities (the real and online) on their attitudes of learning English in Australia.

14a: " for me, the identity does not affect negatively, I am full covered (wearing the burqa), and I communicate with others" (Afnan).

14b: "I am more enterprising to learn from SM because it is an opportunity, it exposes me to all languages and cultures, I can learn English even if it is not academic, I acquire new words, and this encourages me" (Arwa).

14c: " I am open-minded"(Lyla).

14d: "Mother's identity is different from the study mood, I use English more in mother's identity because my children speak English"(Lobnah).

> 14e: " This is my language, and I loved it, I learned it in the school and whole of my life, I feel that I am counter a change, I was not open at the beginning then gradually I accept the status"(Razan).

Lyla pointed out that learning English makes her able to communicate with people and participate in activities; using SM increases her knowledge because she searches in English resources on SM. Interestingly, Lobnah reported that her identity as a mother encourages her to speak English with her children who talk English. Razan used to follow the American system she learned in Saudi Arabia; she pointed out that everything is different in Australia, the system, the language, teaching methodology, and number of assignments. She declared that she was angry when she came to Australia, and then she gradually became used to the new system.

All the participants confirmed that their identities are not an obstruction for their communication on SM and their study in Australia. Even Razan, who stated that she faced difficulties in adapting to Australia in the beginning, managed her situation. This agrees with the findings that international students need to use SM for personal communication and educational purposes (Sleeman et al., 2016) to reduce the difficulties they face. Razan stated that:

> 15a: "I join a Saudi group for females on WhatsApp, honestly I felt that I communicated, my life changed. When I came, I felt alienation, loneliness. I am an outgoing person, I love people, but in the first year I felt that I isolated from the people. I felt that I did not want to go out or see anybody. Then I knew a group of lovely females; I engaged with them. I went out with them, and I care to see them if I have spare time...I communicated with them via WhatsApp and know their news….. I prefer to go in person to visit the council to see the activities for kids more than using SM
>
> Me: Do you follow any Australian accounts on SM?
>
> 15a: "Oh you remembered me yes I use Facebook to know about the activities in Melbourne. I forget the name[…] yes I follow two accounts on Facebook."

Arwa's answer about learning non-academic words (or, vernacular words) has similarity with the study by Eckert (2012, p. 91) who emphasised that although "the vernacular may be stigmatized on a global level, its association with local values and practices gives it positive value on the local level". So Arwa finds that SM offers her the chance to learn about everyday life in Australia not just for the purpose of university.

4.2.2.2 FSIS online social relationships

The participants are asked about having males and females friends on SM. they stated that:

> 16a: "they are not friends, they are followers".
>
> 16b: "I can make fake digital identity and follow his friend, but I do not like that I deleted the account on Twitter, I returned now because I follow some influential Saudi academic persons who provide information for PhD students".
>
> 16c: " I prefer to deal with females [...] I do not prefer to deal with males on SM

Me: What about male teachers?
16c: […] it is a different story, I can communicate with a man in the street, my neighbour, in supermarket, in university, this is different. They see my identity that I am wearing hijab so there are certain boundaries in the speech, he communicate with you to send a message, but on SM I do not know his reality, what in his heart, mind, I put bad impression for him. However, if I see him in person and the situation ended like sale process that ok
Me: What about male teachers which she prefers on SM or in person?
16c: I prefer SM to communicate with male teachers. I prefer to send an email and express the points and the circumstances because I will be shy when I stand in front of him and express for him [...] When I write it better"(Norah)

All the participants except Norah reported that they have male and female and Saudi and non-Saudi followers on their platforms. Most of their male followers are classmates who they have come to know hrough their study in Australia. Their relations are both formal and for study purposes. Also, they have male followers from their extended families. Lobnah stated that on Snapchat she has just female followers, and she sends her photos and videos there, but on Instagram, she has female and males followers,and she is formal. She stated that her husband asked her to unfollow his male friend on Twitter. She has male followers, but they are not her husbands' friends. She stated, " I followed doctors on Twitter now, and I do not think one of his friends is a doctor". Arwa stated that the males are followers not friends, to show that her relation with them is formal and not as a friendship relationship.

It is important to discuss the online relationships of FSIS with a male, female Saudi and non-Saudi communicators. Al-Saggaf and Begg (2004, p. 43) outlined what people do in online communities "People join online social communities to meet other people, make new friends, talk about the meaning of life, discuss their social problems, fall in love, and so on". It is known that Saudi culture has the segregation of the genders, although on SM, there is no strict separation. I think that FSIS on SM are conservative with respect to the norms of their culture. Although SM offer the opportunity to contact the opposite gender, the FSIS in this study still keep some boundaries between them. Norah stated that she prefers to communicate online rather than offline with male Australian teachers. She communicates with her male teachers via email. However, she does not like to communicate with males who are strangers on SM.

4.2.3 FSIS' languages on SM

This theme is presented through a discussion of three points: online activities, Language and identity on SM, and English proficiency.

4.2.3.1 Online activities

This section is about the online activities in which FSIS participated in English and that could potentially help their learning or use of English on SM.

17a: "I follow a famous person in Snapchat and Instagram because I feel that he improve my listening skill every day, I obtain new words, sometimes I learn the accent, and more various things, when I add the news web, everyday I will listen at the beginning it will be difficult but after continuous use for more than three months it will be easy and I will use to the way of speech. I used to read the transcription for the videos, I write in the snap chat when I comment. For example, a woman put a photo for her daughter birthday, I commented, and I liked the idea and asked her how it prepared it. Also, in snap chat I follow a person who explains ten English words every day . I follow Simon site, I studied from it, and it was so beneficial"(Monerah)

17b: " I follow famous Australians in psychology on Snapchat. Also, I follow Australian accounts on Snapchat and Instagram where I learn how they talk, pause, do the intonation, knows the meaning of the taboo words. I believe that photos send messages to people, so I love to send positive messages. Also, I write poetry in my status that has a positive meaning. I do not like to speak English with persons do not understand unless they want to learn English. I do not like to show off" (Sarah)

17c: " I listen to Ted talk videos, I think it improves my learning because it contains the transcription and I read it sometimes I learn vocabulary, their way of speech, they speak normally so I learn the language they do not feel weak their language to make you understand, I learn when they pause […]. Also, there is a language exchange website, it is a very fabulous website. You can register, and you have a language, and you want to develop another. You should state what is the native and what the other language you like to learn […] After you agree to communicate with someone you can contact through Skype one class for one class for the other and me it is free, and you can search for people in Melbourne. I refuse some invitations because the time difference between us " (Norah)

17d: " mostly it will comment, I put a photo and comment or send a comment for a person sent a photo, it depends on the individual who sent the photo if he/she speaks English. For example my siblings, I send in English to my two brothers because of they are active and reply in English but my sister If I sent in English, she replies in Arabic. Sometimes I make a video for my kids or me when they speak in English. I use TV shows application to know about American shows because I dedicated to them. I like to watch the show; I see when the show will appear on the app. After watching the show, I send comments on something or read the comment. Sometimes I see something, and when I read the comments, I recognise that this has relation with the American culture. (Lobnah)

17e: I have two groups with foreigners in Whatsapp, I write in English. I used it for one year to teach them Arabic language so I need to speak in English. I record voice notes. Also, they make another group to teach me English for one hour for each listen in Skype"(Lyla)

17f: "Sometimes I write wisdom in English, possibly I read from a person comment, and I find a strange word, so I translate and learn. Sometimes I assess someone grammar, so I need to search about the grammar" (Arwa)

17g:"mostly I search in English for places, information, conferences, article, journal, the author in the Google. Also, on the university website, I use English. I search for editors, tutors. On Freelancer.com, I communicate with them in English to ask for a tutor, and they reply by someone suitable for your order. This improves my writing and reading because I deal with English speakers. I am careful to write the order in an understandable way." (Afnan)

17h: "I share a photo that has a meaning, also I create a new photo from two photos and comment in English and share it. Because in English it will reach to a big number of people, but Arabic is specified to Arabs, I have two accounts as I said one is for my hobbies, so I have ideas and I write them in English"(Razan)

The participants reported that they use English to contact their friends from different nationalities. Lobnah uses the English language more than learning the language on SM. Lyla learns English from the members in the groups because it is the language of communication. This agrees with Siemens (2014, p. 7) who affirmed that "connectivism presents a model of learning that acknowledges the tectonic shifts in society where learning is no longer an internal, individualistic activity". So SM platforms offer a place to undertake learning within a group. Razan uses English in her comments on a photo. Lobnah is the only one who reported that she uses English with her brother on WhatsApp. Online activities have connections with the participants' hobbies (as for) Razan, their desire to increase the level of their skills (as for Norah and Monerah), their studies (as for Afnan), and for teaching (as for Lyla), and their watching of TV show (as for Libnah).

4.2.3.2 Language and identity on SM

One of the interesting points is the effect of the language used on SM on participants' identities. I asked the participants to imagine their reactions to a situation that might happen to them and whether they would react in Arabic and English for a negative or a positive situation. I wanted to explore the differences in their ways of speech, their chosen words, their moods, and their behaviours on SM.

18a: " I need to be lovely to send the idea I want, but in the Arabic language; Arabs understand each other" (Monerah)

18b: "I will be more confident in my language, and hesitated in English" (Sarah)

18c: "I can express easily in Arabic, but in English, I want to know what they say"(Afnan)

18d: "I feel normal to write in Arabic or English in a reply for a positive situation like congrats, but it depends on the people who see this comment if they are understanding Arabic or not. Sometimes I use the English language in a case when I want to ridicule someone or if someone replies to an irritating comment, and he does not understand English. Sometimes I use the Arabic language to ridicule someone does not understand Arabic" (Lobnah)

Monerah stated that she tries to be a kind, lovely person in both languages but more so in English. Sarah reported that she is more confident and shows her identity in the Arabic language. She hesitates in English. Afnan was hesitatant in English, and talked about spending time googling to find the appropriate comment

for someone admitted to hospital when her Australian supervisor had an accident. She concluded that "wishing you a speedy recovery" is suitable. Identity changed according to the language of the communicators. Lobnah uses English and Arabic in her comment on a situation that happened to her in Coles (a supermarket in Australia). Australian women commented on her shopping "it is a big shopping", she replied, " it is for the whole month". She stated that her idea would not be reached if she said it in Arabic. She reported that the followers who did not understand English asked about what the Australian woman said. Lobnah considered the English language to be an important factor in showing her identity on SM. This supported the literature review that language shapes identity. Also, these findings support the claim that "language is then a 'double- edge sword'; constraining identity by erecting boundaries between 'them and us' be they geographical or sociocultural, and liberating identity by offering fresh opportunities to cross barriers and boundaries."(Evans, 2014, p. 4). Therefore, there are some differences in identity according to the language used. I think people could be more confident, expressive, more detailed in their first languages, but they could be hesitatant and use stereotypical expressions when using other languages. Identity also affected by the culture of the spoken language.

4.2.3.3 English proficiency

The participants answered questions about their level of English proficiency before and after using SM, with different responses.

> 19a: " You can say that my level of all the skills was sufficient before using SM, there is a huge different after using SM, I am very good in speaking, writing, reading, and good in listening" (Monerah)
>
> 19b: " My English language level in all skills was sufficient before using SM, but after using it becomes very good" (Norah)
>
> 19c:"listening is sufficient, the speaking level is developed because I record my voice for the teaching class in the group, I developed reading by books, not by SM. Writing become better" (Lyla)
>
> 19d: " I learn little from Snapchat, and Instagram but I think I learn more from Youtube. The listening was sufficient before, and it becomes very good after using SM. Also speaking is the same. Reading, I do not think SM has a relation I do not learn from SM. I do not think that it has effect in writing, I use Google more than SM" (Arwa)
>
> 19e: "I think SM are not the reason because I did not use them until I have good English, I can say my language become sufficient, and of course SM help me a lot" (Sarah)
>
> 19f: "I used to speak English from when I was a kid […] possiple it is learning the culture more than learning the language" (Lobnah)
>
> 19g: "I do not think that SM have an effect on my English. I speak English, and my level is excellent. If I want to develop my language, I will use more academic way not by using SM" (Razan)
>
> 19h: "honestly I do not think that SM have an effect, but I care when I am writing not to make mistakes, and write full sentences especially when I send to my supervisor or my friends in the

> office. For reading, I read more before using SM when I should take the newspaper with me on the train, but after using SM, I postpone […] No effect in speaking because I did not use any platform for speaking. I think the effect of writing that I used to use the abbreviations like "u" for you, "r" for are to say how you are? , it becomes how r u? I felt that it is a wrong way and I stopped using that" (Afnan)

These results agree with the research by Aifan (2015) who claims using technology in the educational field can enhance learners' skills. One of the research questions sepcifically asked about the effect of using SM as a tool for learning English. The responses were categorised into three sets: positive change, no change, and negative change. Some participants reported that they have a significant positive change in their English language skills after they use SM, such as Monerah. Norah and Lyla also reported that their English skills become very good after using SM. Arwa pointed out that using YouTube enhanced her listening and speaking skills; she learned a lot of vernacular words that she will never learn at university. Some participants, such as Sarah, reported that SM are not the reasons for enhancing their English level. Sarah pointed out that she used SM after she learned English, so she does not think that SM are the reason for her development of the academic English language, but she does believe that SM helps in learning the English language generally. She pointed out that she learned on Snapchat the informal language which helps her to understand local people she communicates with every day. She stated that SM "is a place, not a replace". While Lobnah stated that she learned more about the Australian culture than the language on SM (because she has spoken English since childhood, as she was born in America), and she thinks that she is perfect in English. Razan, like Lobnah, stated that SM communication does not have an effect on her English. On the other hand, Afnan stated that she was reading more before using SM, especially the newspaper while commuting on the train, but after using SM, she always postponed reading to the next available time. She stated that her identity as a Ph. D student affects her English proficiency; she is more competent in reading academic articles and academic writing, but less in speaking and listening because most of her time is spent reading and writing. It is possible that the informal learning that occurs on SM could support formal learning. SM may enhance learning skills and offer opportunities for users to be exposed to the culture, the customs, and the daily life experience of English language speakers. Those students who studied a language programme in Australia found that SM help them to increase the level of their skills, except Afnan because she is a PhD student and feels that she needs more academic skills.

To sum up, FSIS share, communicate, and have strong digital identities on SM. They have strong relations with their relatives and friends, as SM helps them to be in touch with them every day. They invest emotional energy in their dealings with others on SM by commenting, praising, sharing, liking, or retweeting others participation.

Chapter Five: Conclusion

5.1 Overview

This chapter highlights the main findings of the research and relates them to the research questions mentioned in the first chapter. Also, this chapter introduces the limitations and the implications of the study. Finally, it provides suggestions for further research.

5.2 Contributions of the study

This study aims to explore FSIS' practices on SM and the effect on their identities and their English language proficiency. Specifically, this research investigates the three questions:

1- How do FSIS interact on SM and what motivates those interactions?
2- Do the daily practices by Saudi women on SM create their digital identities?
3- What is the effect of using SM in their learning of the English language?

A qualitative research method was used, with semi-structured interview as the data collection instrument. A thematic analysis method was employed to analyse and interpret the data. The main themes of the study are FSIS' daily practices, FSIS' digital identity, and FSIS'languages on SM.

The findings show that FSIS are active on SM, and they have accounts on different SM platforms. They communicate with people from Saudi Arabia and different nationalities. From the results, they still demonstrate behaviour consistent with their conservative culture even though they have males and females followers on the platforms. The communication is formal in the platforms which contain male and female followers; it can be more humorous and funny with relatives and only female followers platforms. The participants are enthusiastic to share their photos and videos with their relatives overseas and share everyday life with them. They use English and Arabic languages depending on the people with whom they communicate, and the situations that they encounter. Most of them use their mobiles, which makes participation on SM much easier. They listen to Australian English speakers on SM and enjoy learning the Australian language and the culture. Their main purpose of using SM is for communication with others, and to know more about the world around them. Also, they are eager to keep their relations active with their relatives from Saudi Arabia, and with their old and new friends.

The findings also assert that FSIS have a strong digital identity on SM. It is argued that creating the digital identity is inevitable for SM users. FSIS are active users of SM. They have digital identities similar to their real identities. Privacy is important for FSIS practices on SM. They do not like to show their private life on SM. I think that this is their right and it is not a hinder for their communication. They show different identities on different platforms, depending on the people with whom they communicate and on the nature of the platform. They prefer platforms that offer privacy for users and allow control over who can see their sharing. They have strong identities which has an effect on others. They do not have fake digital identities, as they do not prefer these. Their identities changed from formal on some platforms (or even within groups as occurred on one platform) to humorous and funny on other platforms in other contexts.

Moreover, the findings emphasised that using SM helps some of the FSIS to improve their language proficiency. They use SM as a learning tool for learning the English language. They see SM having an effect on developing their listening, reading, writing and speaking skills. They watch videos of Australian people, which improves their listening and also their speaking skills. Using SM increases their knowledge of the English language and how to use it in the Australian community. They even learn the informal language like slang, which while a taboo enables them to understand the people around them in everyday life. Others highlighted that they learned more about the culture than the language through SM. They stated that they learn about the Australian culture by following famous people on the SM platforms. Also, their communication with their Australian friends helps them to develop their engagement with the community. They admitted that learning on SM is not formal but actually helps their formal learning.

5.3 Limitations of the study

There were some limitations of the study. First, there was only a limited number of participants for this study. More participants could have allowed for more exploration of FSIS' practices on SM. This limitation resulted because of the restriction on time for the project. This project was conducted in the last semester of the year in a limited period of three months. More time would have helped to recruit more participants and allow for more investigation of the phenomenon.

Secondly, in the nature of qualitative research, the researcher is a part of the study. It involves reflexivity which allows including the investigator' values, biases, and assumption in reporting the data (D rnyei, 2007). It is expected to see the first person singular. So the results were co- constructed product of the participants' and my perceptions. I consider myself as insider researchers because I am female Saudi international student in Melbourne, and I am using SM in my daily life. I see the impact of SM on my studies in Australia and how they help me to adapt to the Australian community. However, it is not necessary to hold the same views with the participants and the way of practising on SM may be different for different users. Therefore, while the interpretation of the data are affected by my experience and views, there were attempts to reduce the bias by including more examples of the participants' views.

There are efforts to ensure the reliability and the validity of the study by using techniques, such as the researcher being the translator of the data. This method is considered as a check on the validity of interpretations (Temple & Young, 2004). However, it has a limitation when the data translated; it is subject to the researcher' position, social background, understanding of the phenomenon. I tried to be close to the data, and I always returned to the Arabic version to check the actual meaning, but still, I am not a professional translator.

5.4 Implications and suggestions for further research

The findings of this research show that FSIS' use SM in their learning of English language and the Australian culture. This might encourage educators to activate the use of SM in their teaching methods. The new generations are native users of SM, and teachers should be ready to deal with these creative methods in an efficient way.

Also, this study contributes to the linguistics knowledge of language learning skills. Participants reported that their English language learning skills improved through using SM. The results show that participants became better at listening to the news and reading the transcription. Also, participants gain more vocabulary and language expressions from the everyday watching of Australian persons who demonstrate their culture and language. This could suggest designing online activities using these platforms to enhance learners' skills.

For further research, I suggest investigating more phenomena about Saudis' use of SM. More studies are needed to explore how FSIS use English to teach the Arabic language for foreigners on SM platforms. This could help educators to legitimate SM as a formal learning tool. Also, FSIS' writing on SM platforms could be a topic for further research by undertaking discourse analysis of the participants' samples of their everyday communication. This could help to investigate their writing strength and weakness. There is a need to explore more about international Saudi females' and males' practices on SM and the effect on their identities. It could be a case study of males and females participants and investigate the effect of gender on using SM.

5.5 Closing comment

As international students, I and all the participants appreciate SM platforms as they are ways of communicating to maintain our social relations. They are worthy time investments, as SM facilitate my life in many ways. They keep me connected with my relatives in Saudi Arabia. They help me to create new friendships with many people that I may not see in person after returning to Saudi Arabia. They open my mind to other cultures and let me know more about other people's perspectives and think critically about what I read. I am thankful to the creators of SM platforms, who have enabled me to announce freely my research in WhatsApp and facilitate my communication with the participants in this project.

Declaration

This project contains no material that has been accepted for the award of any other degree or diploma in any educational institution and, to the best of my knowledge and belief, it contains no material previously published or written by another person, except where due reference is made in the text of the project.
The research for this project received the approval of the Monash University Standing Committee for Ethical Research on Humans (project number: 8018).

Signed: Hanan Mohammed Alshehab
28/5/2017

Acknowledgements

First, I would like to thank Allah the Great and Almighty who provides me with the power to complete this project.

My thanks to my mother, Sarah, and my father, Mohammed, from whom I gained the patience to work hard in this life to achieve my goals. Their prayers for me strengthen my efforts.

Many thanks for my dedicated family who supports me, my beloved husband Bandar, my darling daughters, Afnan and Badriah, and my beautiful sons, Ibrahem and Malek. They came with me to Australia, and their presence warms my heart. They have helped me a lot in the house cleaning when I have become so busy and have needed to concentrate on my research.

I would like to thank Dr Simon Musgrave who agreed to be my supervisor. I feel proud that the Monash University Coordinator of Research Methods, who has great experience in research, is guiding me. Thanks for all his effort, feedback, and collaboration to complete this project. I appreciate his advice, which will help me in my future studies.

I would like to thank all the participants who sacrificed their time to help me. Without their support, this study could not be completed. They trusted and encouraged me, and gave me the good impression that my topic is interesting.

References List

Aifan, H. A. (2015). *Saudi Students'attitudes Toward Using Social Media To Support Learning.* University of Kansas.

Al-Saggaf, Y., & Begg, M. M. (2004). Online communities versus offline communities in the Arab/Muslim world. *Journal of Information, Communication and Ethics in Society, 2*(1), 41-54.

Al-Saggaf, Y., & Weckert, J. (2004). The effects of participation in online communities on individuals in Saudi Arabia. *ACM SIGCAS Computers and Society, 34*(1), 1.

Allmark, P., Boote, J., Chambers, E., Clarke, A., McDonnell, A., Thompson, A., & Tod, A. M. (2009). Ethical issues in the use of in-depth interviews: literature review and discussion. *Research ethics review, 5*(2), 48-54.

Alsagoff, L., McKay, S. L., Hu, G., & Renandya, W. A. (2012). *Principles and Practices for Teaching English as an International Language*. New York/London: Routledge.

Alsahafi, N., & Shin, S.C. (2017). Factors Affecting the Academic and Cultural Adjustment of Saudi International Students in Australian Universities. *Journal of International Students 2017 Vol 7 Issue 1, 7*(1), 53-72.

Alsaleem, B. I. A. (2013). The effect of "Whatsapp" electronic dialogue journaling on improving writing Vocabulary Word Choice and Voice of EFL Undergraduate Saudi Students. *Arab World English Journal, 4*(3), 213-225.

Beaver, V. (2016). *Social media sister: Applying interaction ritual theory to sorority women and their social media usage.* University Of West Georgia.

Binsahl, H., Chang, S., & Bosua, R. (2015). Identity and belonging: Saudi female international students and their use of social networking sites. *Crossings, 6*(1), 81-102. doi:10.1386/cjmc.6.1.81_1

Binsahl, H. M., Chang, S., & Bosua, R. (2015). *Exploring the Factors that Impact on Saudi Female International Students' Use of Social Technologies as an Information Source.* Paper presented at the PACIS (p. 201).

Block, D. (1995). Social constraints on interviews. *Prospect, 10*(3), 35-48.

Boyd, D. (2007). Why youth (heart) social network sites: The role of networked publics in teenage social life. *MacArthur foundation series on digital learning–Youth, identity, and digital media volume*, 119-142.

Boyd, D. (2008). Why youth (love) social network sites : the role of networked publics in teenage social life. [Chapter] *Why youth love social network sites : the role of networked publics in teenage social life*: MIT Press.

Brick, B. (2011). Social Networking Sites and Language Learning. *International Journal of Virtual and Personal Learning Environments (IJVPLE), 2*(3), 18-31. doi:10.4018/jvple.2011070102

Campbell, R. L. a. (2015). *Interaction and social networks with target language speakers during study abroad and beyond : the experiences of learners of Japanese.* Thesis (Ph.D.) Monash University, 2015.

Choi, M., & Toma, C. L. (2014). Social sharing through interpersonal media: Patterns and effects on emotional well-being. *Computers in Human Behavior, 36*, 530-541.

Chryssochoou, X. (2003). Studying identity in social psychology: Some thoughts on the definition of identity and its relation to action. *Journal of Language and Politics, 2*(2), 225-241. doi:10.1075/jlp.2.2.03chr

Cohen, L., Manion, L., & Morrison, K. (2013). *Research methods in education*: Routledge.

Dogoriti, E., Pange, J., & S. Anderson, G. (2014). The use of social networking and learning management systems in English language teaching in higher education. *Campus-Wide Information Systems, 31*(4), 254-263. doi:10.1108/cwis-11-2013-0062

D rnyei, Z. n. (2007). *Research methods in applied linguistics: quantitative, qualitative, and mixed methodologies* (Vol. Oxford applied linguistics). Oxford: Oxford University Press.

Eckert, P. (2012). Three waves of variation study: The emergence of meaning in the study of sociolinguistic variation. *Annual review of Anthropology, 41*, 87-100.

Evans, D. (2014). *Language and Identity: Discourse in the World*: London ; New York : Bloomsbury Academic

Falahah, & Rosmala, D. (2012). Study of Social Networking usage in Higher Education Environment. *Procedia - Social and Behavioral Sciences, 67*, 156-166. doi:http://dx.doi.org/10.1016/j.sbspro.2012.11.316

Finlay, J. M., & Bowman, J. A. (2017). Geographies on the Move: A Practical and Theoretical Approach to the Mobile Interview. *Professional Geographer, 69*(2), 263-274. doi:10.1080/00330124.2016.1229623

Guta, H., & Karolak, M. (2015). Veiling and Blogging: Social Media as Sites of Identity Negotiation and Expression among Saudi Women. *Journal of International Women's Studies, 16*(2), 115-127.

Hamdan, A. (2005). Women and Education in Saudi Arabia: Challenges and Achievements. *International Education Journal, 6*(1), 42-64.

Ivan Ferrer, M., & José Armando, V. (2013). Digital Identity Built on a Cooperative Relationship *Digital Identity and Social Media* (pp. 58-73). Hershey, PA, USA: IGI Global.

Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons, 53*(1), 59-68.

Kietzmann, J. H., Hermkens, K., McCarthy, I. P., & Silvestre, B. S. (2011). Social media? Get serious! Understanding the functional building blocks of social media. *Business Horizons, 54*(3), 241-251.

Kulatunga, U., Amaratunga, R., & Haigh, R. (2007). Structuring the unstructured data: the use of content analysis (pp. 498- 509). usir.salford.ac.uk.

Kuo, T., & Tang, H.-L. (2014). Relationships among personality traits, Facebook usages, and leisure activities–A case of Taiwanese college students. *Computers in Human Behavior, 31*, 13-19.

Liamputtong, P. (2011). *Focus group methodology: Principle and practice*: Sage Publications.

Lomicka, L., & Lord, G. (2016). Social networking and language learning. *The Routledge Handbook of Language Learning and Technology*, 255- 268.

Lounsbury, J. W., Levy, J. J., Leong, F. T., & Gibson, L. W. (2007). Identity and personality: The big five and narrow personality traits in relation to sense of identity. *Identity: An International Journal of Theory and Research, 7*(1), 51-70.

Maia, I. F., & Valente, J. A. (2013). Digital identity built on a cooperative relationship. *Digital identity and social media*, 58-73.

Merriam, S. B. (2009). *Qualitative research a guide to design and implementation*. San Francisco: Jossey-Bass.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*: sage.

Mirkin, N. A. (2017). *The Impact of Social Media Platforms on Identity Development in Adolescence.* The Chicago School of Professional Psychology.

Mondahl, M., & Razmerita, L. (2014). Social media, Collaboration and Social Learning - a Case-study of Foreign Language Learning. *Electronic Journal of E-Learning, 12*(4), 339-352.

Ortega, L. (2009). *Understanding second language acquisition* (Vol. Understanding language series). London: Hodder Education.

Page, R. E. (2013). *Stories and social media: Identities and interaction*: Routledge.

Raddawi, R. (2014). *Intercultural Communication with Arabs: Studies in Educational, Professional and Societal Contexts*. American University of Sharjah: Springer.

Risto, A. (2014). *The Impact of Texting and Social Media on Students' Academic Writing Skills.* Tennessee State University.

Samin, N. (2012). Saudi Arabia, Egypt, and the social media moment. *Arab Media & Society, 15*, 146-165.

Santos, H. P. O., Black, A. M., & Sandelowski, M. (2015). Timing of Translation in Cross-Language Qualitative Research. *Qualitative Health Research, 25*(1), 134-144. doi:10.1177/1049732314549603

Siemens, G. (2014). Connectivism: A learning theory for the digital age. Retrieved from http://er.dut.ac.za/handle/123456789/69

Sleeman, J., Lang, C., & Lemon, N. (2016). Social Media Challenges and Affordances for International Students. *Journal of Studies in International Education, 20*(5), 391-415. doi:10.1177/1028315316662975

Sullivan, C. (2012). Digital Identity and Mistake. *International Journal of Law and Information Technology, 20*, 223-241.

Temple, B., & Young, A. (2004). Qualitative research and translation dilemmas. *Qualitative research, 4*(2), 161-178.

The Department of Education and Training. (2016). Data and Research. Retrieved from https://internationaleducation.gov.au/research/pages/data-and-research.aspx

Van Dijck, J. (2013). *The culture of connectivity: A critical history of social media*. Oxford University Press.

Zhou-min, Y. (2013). Understanding identity discourse: a critical and sociolinguistic perspective. *Journal of Multicultural Discourses, 8*(1), 79-85. doi:10.1080/17447143.2012.749881

Appendix 1

Hanan Alshehab Interview Questions

To warm up the interview, the interviewer will ask some factual questions to collect data about participants' background then ask questions about the practices of social networking sites (SNS) and its effect on English language proficiency and identity:

Participants' background:

1) How old are you?
2) Where were you born?
3) What is your current marital status?
4) Do you have children? How many?
5) What is the highest level of education you have completed?
6) When did you come to Australia? Why?
7) What languages do you speak?

Practices on SNS

8) What is your favourite platform? Why?
9) How many accounts do you have on SNS?
10) What devices do you use to practice interaction on SNS?
11) How many hours do you spend on SNS? When do you prefer to be active on SNS?
12) Can you spend one day without interacting on SNS? Why? Why not?
13) What is your goal in each platform that you have on SNS?
14) How many followers do you have on SNS platforms? Are they Saudis or different backgrounds?
15) Does SNS help you to adapt to Australia? If so, how?
16) Does SNS help you to relieve homesick for Saudi Arabia? If so, how?

Practices' effect of SNS on the English language: 17)Do you use English for SNS? How long have you been using English for SNS?

18) In general, how would you rate your English language proficiency before you engage in SNS?

- Listening skill: bad, sufficient, good, very good
- Speaking skill: bad, sufficient, good, very good
- Reading skill: bad, sufficient, good, very good
- Writing skill: bad, sufficient, good, very good

19) In general, how would you rate your English language proficiency after engaging in SNS?

- Listening skill: bad, sufficient, good, very good
- Speaking skill: bad, sufficient, good, very good
- Reading skill: bad, sufficient, good, very good

• Writing skill: bad, sufficient, good, very good

20) How often do you interact in English on SNS?

21) Which platform do you use English? Why

22) Do you follow Australian official accounts like news, community services, universities, councils? Why?

23) What sort of online activities do you do in English?

24) Do these activities help in learning English?

Digital Identity:

25) Do you think that you have a digital identity separate from your identity? How?

26) Does your identity change on the different platforms? How?

27) Describe your identity when you engage in a situation on SNS in the Arabic language, and how it differs in English?

28) In what ways, do you think that your identity(ies) have an impact on your learning of English language?

29) How do you sit profile's privacy on SNS?

30) Do you have English speaker's friends (male, female) on SNS?

31) Which platforms do you keep the emotional energy between the individuals?

The definitions

SM:

Falahah and Rosmala (2012, p. 158) identified that "Social media take on many different forms, such as Internet forums, weblogs, social blogs, microblogging, wiki, podcast, photo or video sharing, rating and social bookmarking". SM include all the applications and programs that enable people to find information, search for the knowledge, enable knowledge sharing, have free video, and voice calls, and provide opportunities for social interaction, in an easy way.

The digital identity:

"Digital identity is an individual's identity which is composed of information stored and transmitted in digital form. Digital identity is all the information digitally recorded about an individual which is accessible under the scheme"(Sullivan, 2012). The digital identity could be all the explicit and implicit online information that people know about an individual that has accounts on SM and practices communication with others. This digital identity could be weak or strong as defined by Ivan Ferrer and José Armando (2013, p. 58) "The weak digital identity is limited to virtual characters, avatars, or fakes, which play digital roles with no significant impact on the subjects' lives. The strong digital identity is constructed when subjects use digital technologies as a support to convey meanings that extend into the subjects' lives and reach beyond a virtual concept".

The emotional energy:

It is argued that "mediated sharing allows for personal expression, such that the memorability, salience and personal significance of the event can be enhanced. It also allows for enthusiastic feedback to be conveyed, and for a deepening of social relationships. Indeed, research finds that mediated communication and face-to- face communication are strikingly similar regarding their degree of emotional expression and social connectedness" (Choi & Toma, 2014, p. 533). The emotional energy is expressing the feelings towards the individual's sharing. It can be positive like the comment by using praise words, pressing like button on Facebook, retweet on Twitter, comment in WhatsApp. Alternatively, it can be negative by commenting offensive words, no comments or no showing of the significance of the posts.

Appendix 2

Project: Female Saudi International Students' Daily Practices on Social Networking Sites

Chief Investigator: Dr. Simon Musgrave
Lecturer
School of Language, Literature, Cultures, and Linguistics
Monash University
Phone: +61 3 9905 8234
email: simon.musgrave@monash.edu

Student's name: Hanan Alshehab
Phone : +61434382391
email: hmals4@student.monash.edu

You are invited to take part in this study. Please read this Explanatory Statement in full before deciding whether or not to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the phone numbers or email addresses listed above.

My name is Hanan Alshehab, and I am a Master's student in Applied Linguistics at Monash University. I am conducting a research project under the supervision of Dr Simon Musgrave, a lecturer in the School of Languages, Literatures, Cultures, and Linguistics at Monash University, Australia. My research will be submitted as a research project and will be written from the data I collect in this research.

The aims of my research project are to investigate the practices of social networking sites by female Saudi international students. The research project will find out how female Saudi international students interact on Social networking sites. Also, it will explore the digital identity that female Saudi international students construct. More importantly, it will investigate how their practices on SNS affect their English language skills, and how their digital identity differs from their real identity.

You are invited as a Saudi speaker of English to participate in my study; participation will involve an interview which will be recorded and which will take approximately 30-60 minutes. If you are interested, you can contact me via the email or phone number above to arrange a time for the interview. You will be given a consent form to complete. Because recording the interview is important, I will need to have your agreement to be interviewed and also to be recorded. Signing the consent form will indicate that you have consented to take part in this research.

In the interview, you will be asked some questions about your daily practice on social networking sites and its effects on your English language. Also, you will be asked questions about whether you have a digital identity or not and if the answer is yes there will be questions about how it is different from your real identity.

Participation in this project will not cause you any mental, emotional, or physical harm or inconvenience, beyond losing a small amount of your time. There are no risks because of participation in this project. Please note that you are welcome to ask for clarification, and you must understand that your participation is voluntary. You can withdraw or refuse to participate at any time with no penalty and without offering an explanation.

I would like to inform you that the data will be reported anonymously, no names or personal information will be included, and the data will be reported using codes. The data will be accessed only by the researcher and the supervisor(s).

To protect you, the data will be stored on the researcher's computer for one semester, and after that, they will be destroyed as will the recording. This study may also be published as an article in a journal. However, participants will not be identified in the final report.

If you have any queries or would like to receive a summary of the research findings, please do not hesitate to contact Hanan Alshehab on 0434382391 or email hmals4@student.monash.edu. The findings will be released after 10/7/2017.

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the Executive Officer, Monash University Human Research Ethics (MUHREC):

Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Chancellery Building E,
24 Sports Walk, Clayton Campus
Research Office
Monash University VIC 3800
Project No. :8018
Tel: +61 3 9905 2052 Email: muhrec@monash.edu Fax: +61 3 9905 3831

Thank you,

(insert Chief Investigator's signature)

Chief Investigator's name

Simon Musgrave

MONASH University

Appendix 3

CONSENT FORM

Project: Female Saudi International Students' Daily Practices on Social Networking Sites

Chief Investigator: Dr Simon Musgrave
Second Investigator: Hanan Alshehab

I have been asked to take part in the Monash University research project specified above. I have read and understood the Explanatory Statement, and I hereby consent to participate in this project.

I consent to the following:	Yes	No
1-Being interviewed	☐	☐
2-Being recorded	☐	☐

Name of Participant:

Participant Signature :

Date :

Technology Transfer: A Bibliometric Analysis

Dimitrius Pablo Sabino Lima de Miranda, Armoni Da Cruz Santos, Suzana Leitão Russo
Postgraduate Program in Intellectual Property Science/ Federal University of Sergipe

Abstract

In a global context of highly competitive, new technologies have become an indispensable element for companies, the tool normally used to gain such advantage is the transfer of technology. In order to provide an overview of how this issue has been studied by the academic community, this article presents a bibliometric analysis of published studies on the technology transfer in the Scielo and ScienceDirect bases between the years 1973 to 2016. It was concluded the year with more publications on the subject in both bases was in 2013, the journal with the highest number of articles in the Scielo base was the Journal of Technology Management & Innovation with concept Qualis B2, while the Innovation magazine with concept A1 had more items on the base ScienceDirect.

Keywords: technology; technology transfer; bibliometric analysis

1. Introduction

In a context with globalization of markets and rapid integration of economies, companies are forced to focus on their competitive priorities. However, for this objective to be achieved a continuous adaptation of business strategies is required and technology has been recognized as an indispensable element for support the global strategy of companies in their quest for survival in a highly competitive environment (LUCATO et al, 2015). The relevance of the technology in a modern world, the breakthroughs of market openings and the de-bureaucratization of international trade have brought a great deal of importance to the topic of technology transfer (LARK-SAAVEDRA et al., 2014)

Through a simplified vision, the transfer of technology can be understood as a movement of know-how, the exchange of technical or technological knowledge from one organizational environment to another. This concept brings the idea that, in any transfer of technology, there is a wide interaction environment that converges in several sources and users of technology (PEREZ; VARGAS, 2014). Currently, transfer technology is a central tendency of innovation processes, since innovation highlights the transference constituent interconnections, from learning among heterogeneous beneficiary organizations to users of the knowledge produced (PEREZ; VARGAS, 2014).

Despite the importance, data and theories about this subject are still sparse and this scope was rarely delineated or systematized (CLOSS, FERREIRA, 2012). In view of this, as important as publishing research in a particular area of science, it is necessary to systematically review the totality of this production. This process allows the strengthening of knowledge, indicates more efficient ways to solve problems as well as opens new avenues for research, among other advantages (CLOSS; FERREIRA, 2012).

Based on the need for a better understanding of the studies about technology transfer, this article aims to

present the result of a bibliometric analysis of the studies published on the subject in the Scielo and Sciencedirect Bases, it is worth mentioning that the two databases used in this research are some of the most important in terms of relevance and comprehensiveness of the publications available.

2. Literature Review

2.1 Transfer Technology

The transfer of technology is a process performed between two organizations in which certain knowledge is acquired, developed, used and improved in order to improve a methodology, process, product or element of that product (LUCATO et al, 2015). The movement of technology can take place in many ways, for example from one company to another company or from a research institution to a company.

According to Rogers, Takegami and Yin (2001, p.254) technology transfer is "the movement of technological innovation from an Research and Development (R&D) organization to a recipient organization". For a better explanation, universities are a kind of research institution and in this theoretical field, it is worth mentioning the triple helix model (ETZKOWITZ; LEYDESDORFF, 2000), one of the most referenced about the different agents of the innovation process and, consequently, the processes of technology transfer. This model characterizes the interrelationships between three major entities: the university, the government and the companies, with the aim of exploring ways of creating a favorable environment for innovation (CLOSS, FERREIRA, 2012).

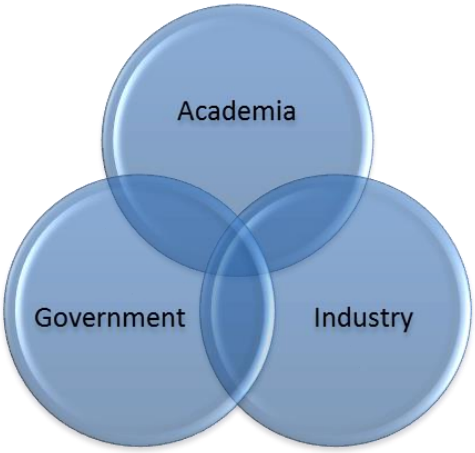


Figura 1. Triple Helix
Source: Adapted from ETZKOWITZ; LEYDESDORFF, 2000

Collaborations from the university-business relationship have become increasingly important (FABRIS et al, 2015). Based on the triple helix model, universities and companies have a kind of mutual dependence, since companies have the need for innovative products within their commercial environment while universities have the ability to develop such products through research. The third element of the propeller, on the other hand, the government has the duty to articulate, to stimulate and to support the relation between

the other elements of the propeller (CLOSS; FERREIRA, 2012).

Technology transfer can be achieved in different ways: directly, indirectly or in both ways. Transfer is direct when the technology is embedded next to equipment, facilities, instruments or components. The process is considered indirect when it is done through patents, drawings or other document, emphasizing the fact that the transfer can happen with the combination of the two forms (LUCATO *et al*, 2014).
It should be noted, however, that the process of technological development takes place in different ways in developing and developed countries (LUCATO *et al*, 2015). While in the first world economies the creation of technology starts with adaptation, absorption and negotiation. In turn, in the case of emerging countries, the technology is absorbed and adapted to the local conditions however, the generation of its technological capacity only begins when the negotiations regarding the new technology are carried out with the developers (TAKAHASHI, 2005 *apud* LUCATO, 2015).
The economic, market, product performance, the economic domain of the obtained or even the satisfaction with the new technology can be criteria to evaluate the success in the transfer process of technology. For success in the transfer process, the results are dependent on a set of internal and external factors, for example, infrastructure and experience in the process of technology transfer are (TAKAHASHI and SACOMANO, 2002; LUCATO et al, 2015).

3. Methodological Approach

This research is characterized as exploratory, since it aims to provide greater proximity to the topic addressed, in this case, technology transfer. Regarding the procedures, it is possible to classify it as a bibliographical research, since it is developed in material already elaborated, in this case scientific articles of index bases (GIL, 2002). It should also be noted that research can be concomitantly characterized as systematic, since the systematic review is a review model that uses rigorous and clear methods to identify, select, collect data, analyze and describe relevant contributions to its research (CORDEIRO et al, 2007).
The present research was carried out in two methodological stages, constituted as follows: initial data collection and bibliometric analysis. At the data collection stage, all articles published in Scielo (www.scielo.org) and Sciencedirect (www.sciencedirect.com) were searched for "Transferencia de Tecnologia" term in Portuguese and Spanish, since in both language the term is written in the same way, and “Technology Transfer” in English. Thus, the two terms were considered at the moment of the searches in the databases already mentioned, using the Boolean operator OR, the research was carried out following the form: "transferencia de tecnologia" OR "technology transfer". It should be clarified that searches for terms were carried out concomitantly in the title and abstract, restricted to articles in periodicals and only those in the English, Portuguese and Spanish languages.
During the second stage, a bibliometric analysis of the articles found was carried out with the objective of identifying the number of articles published in the two databases between 1973 and 2016, which periodicals had a greater number of publications with the theme technology transfer during the period quoted above and which was the Qualis concept of these journals. The results obtained with the present study are presented in the following sections.

4. Presentation and Analysis of the Results Obtained

In the searches carried out in the databases, 85 articles were found in the Scielo database and 58 articles in the Sciencedirect database, totaling 143 articles, with reference to the theme "Technology Transfer". The years of publications of the texts found are between 1973 and 2016. Figure 2 shows the evolution of publications per year, in the Scielo database, during the period studied.

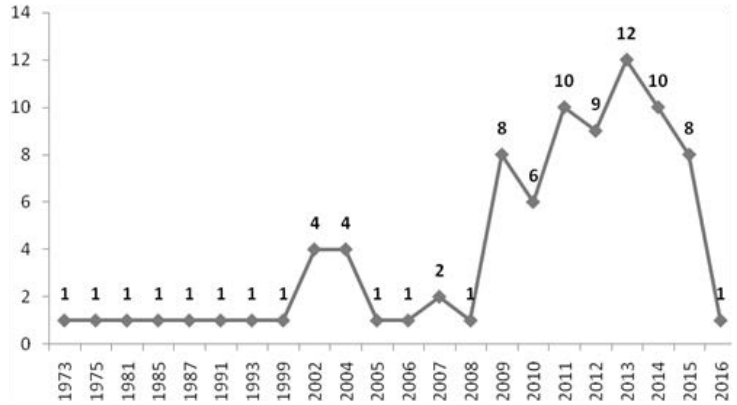


Figure 2. Publishing Articles at the Scielo Base
Source: Prepared by the Authors

It can be seen from Figure 2, the year of 2013 was published 12 articles related to the theme, which represents 14% of the data. Following the analysis, it is possible to see that in the interval from 1973 to 1999, 8 articles were published, totaling approximately 9%. Between 2002 and 2008, 13 articles were published, representing 15%. As of 2009 there was a growth of publications related to the theme compared to previous years. From 2009 to 2014 the publications presented oscillations, and ended up declining in 2015 and 2016.

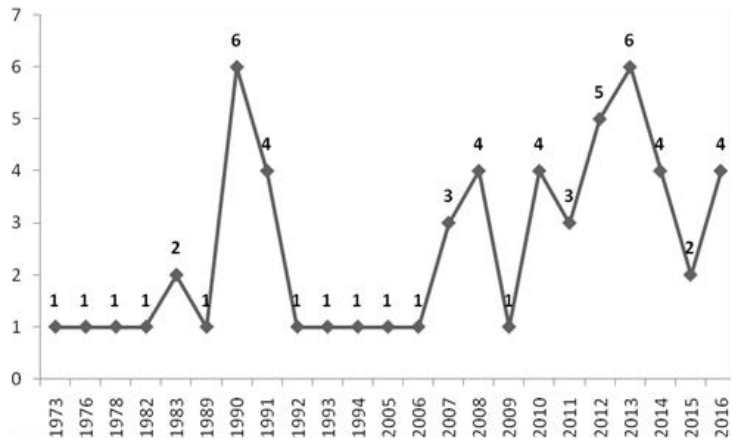


Figure 3. Publications Base Articles ScienceDirect
Source: Prepared by the Authors

Figure 3 deals with the publications on the subject found in the ScienceDirect database, showing that between 1973 and 1989, 7 articles were published, representing 12%. It should be noted that in 1990, 6 texts were published, representing 10%, only in that year, showing a growth in relation to previous years. In 1991 and 1992, there was a fall, where 4 (7%) texts were published in 1991 and 1 (2%) was published in 1992. In 1993, 1994, 2005 and 2006, there was one publication every year, adding 4, during this period, which is 7%. In 2007 and 2008, there was a growth of the publications, being added 7, which represents 7%. Returning to decrease in 2009, having a publication and thus oscillating in its growth until 2016.

Figure 4. Periodicals with the publication number of the Scielo database
Source: Prepared by the Authors

Figure 4 shows the number of journals publications that had more than one publication in the Scielo database, leaving out 38 journals that had only one publication that represent 45% of the articles published. The following journals were published in the journal SciELO Nova, Brazilian Journal of Seeds, Revista de Administração Pública, Revista Mexicana de Ciencias Agrícolas, Revista Panamericana de Salud Pública, and South African Journal of Industrial Engineering. 16% of searches. The journals Revista de Administração Contemporânea and Universidad, Ciencia y Tecnología each published three texts, adding up 7% of the searches. The periodical Gestão & Produção published 4 texts, representing 5%. The Journal of Business Administration released 7 articles, which returns us 8%. Finally the Journal of Technology Management & Innovation with 16 texts on the subject which represents 19%.

Figure 5. Periodicals with the publication quantitative of the ScienceDirect database
Source: Prepared by the Authors

Figure 5 presents the journals with more than one publication related to the theme found in the ScienceDirect database, journals with one publication represent 40% of the searches totaling 23 text. The magazines Cuadernos de Economía y Dirección de la Empresa, Gaceta Sanitaria, Investigaciones de Historia Económica - Economic History Research, Clinical Medicine and the European Journal of Management and Economy of the Company had every 2 publications, totaling 17%. The Solar Energy newspaper presents 3 publications, representing 5%. The journals Studies Management and European Investigations of Direction and Economy of the Company had 4 published texts each, that represent 14% of the searches. The World Patent Information published 5 texts on the subject, thus totaling 9%. Technovation presented the largest number of publications, with 9 published texts representing 16%.

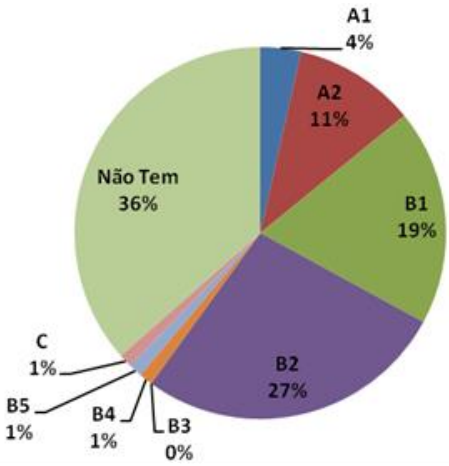


Figure 6. Qualis of Scielo Newspapers
Source: Prepared by the Authors

In relation to Qualis of the Scielo journals, as shown in Figure 6, it was found that 1% presents Qualis A1, which is equivalent to 3 publications. For the A2 concept, we have 11% that equals 9 texts. The journals

with B2 concepts, which represent 27% of the texts, were the ones that published the most, thus adding 23 texts. Nevertheless 36% of the texts, in their magazines did not have concept Qualis that in numbers are 31 publications.

The journals with Qualis A1 were Bulletin of the World Health Organization, Brazilian Journal of International Policy and Mental Health. With Qualis A2 were Revista de Administração Contemporânea, RAE Electrónica, Revista de Administração Pública, Cadernos de Saúde Pública and Revista Direito GV. The Journal of Technology Management & Innovation was the most published journal in which it presented Qualis B2, and had 16 publications representing 19% of the texts sought.

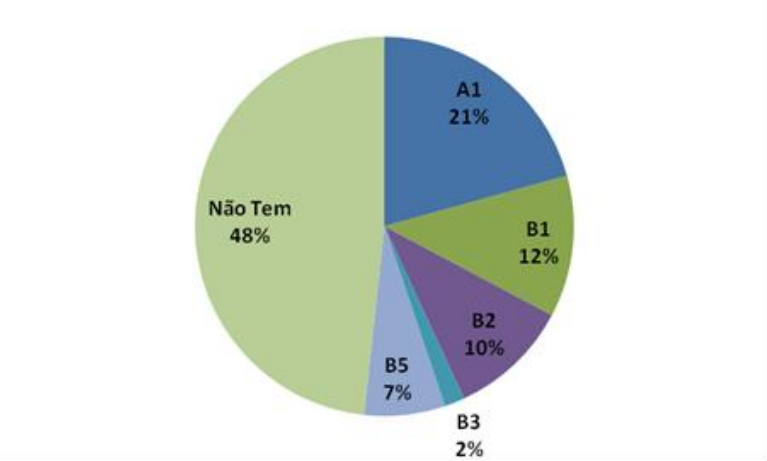


Figure 7. Qualis of ScienceDirect Newspapers
Source: Prepared by the Authors

Figure 7 shows the Qualis of the journals found in the ScienceDirect database, with 21% having A1 concept, which in numbers represent 12 search texts. With concept B1 it has 12%, which represents 7 texts. With concept B2 are 10% that add up to 6 texts. The journals that do not have Qualis concept express 48% of the texts of the search, which in number are 28 texts.

The periodicals with concept A1 are Technovation and Solar Energy, of which Technovation was the one that published more texts of the periodicals, totaling 9 texts found in the search of the subject in the base. The second periodical with the highest number of publications was the World Patent Information with Qualis B1 totaling 5 texts. The B1 concept journals are the World Patent Information and Health Gazette. With concept B2 are Clinical Medicine, Spanish Urological Records, Intensive Medicine (Portuguese and English version) and Iberoamerican Magazine of Automation and Industrial Informatics.

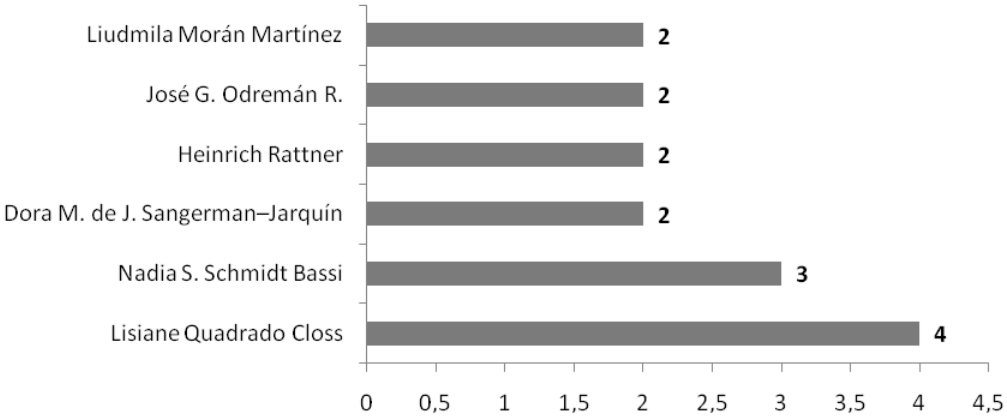


Figure 8. Authors with more articles published in Scielo
Source: Prepared by the Authors

Figure 8 presents the authors with more publications in the Scielo database according to the Lisiane Closs theme with 4 articles each, followed by Nadia Bassi with 3 articles, and authors Dora Sangerman-Jarquín, Heinrich Rattner, José Odremán and Liudmila Morán Martinéz with 2 articles each. The article of the research "Intervenentes in the transference of university-company technology: the case PUCRS" of the author Lisiane Closs was quoted 25 times.

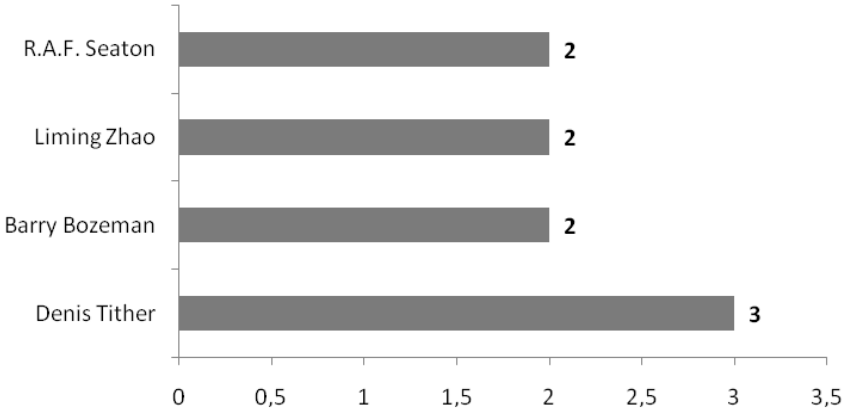


Figure 9. Authors with more articles published in ScienceDirect
Source: Prepared by the Authors

Figure 9 shows the authors with more publications in the ScienceDirect base according to the topic is Denis Tither with 3 articles, followed by authors Barry Bozeman, Liming Zhao and R.A.F. Seaton with 2 articles published each. Denis Tither's article "The case study of technology transfer and funding mechanisms in an industrially supported multi-centered research university" was quoted 10 times in other publications.

5. Conclusion

This article is based in a bibliometric analysis of the articles of the Scielo and Sciencedirect base that had as technology transfer theme. Being addressed the evolution of publication annually, periodicals and concept Qualis.

An analysis of the number of articles found between the years 1973 and 2016 was carried out, showing that the year that had the most publications in both bases was 2013 and in the base Science direct is added the year of 1990, in which the base had 6 publications in both 1990 and 2013. The journal with the largest number of articles in the Scielo database was the Journal of Technology Management & Innovation with concept B2, while in the ScienceDirect base the magazine Innovation with concept A1 had more articles in the base.

6. Acknowledgement

The research is financed by CAPES(Scholarship by CAPES - Coordenação de Aperfeiçoamento de Pessoal de Nível Superior/Brazil)

7. References

A.B. Smith, C.D. Jones, and E.F. Roberts, “Article Title”, Journal, Publisher, Location, Date, pp. 1-10.

BARBIERI, J. C.; ÁLVARES, A. C. T. Estratégia de patenteamento e licenciamento de tecnologia: conceitos e estudo de caso. Revista Brasileira de Gestão de Negócios, v. 7, n. 17, p. 58-68, 2005.

BENNETT, D.; ZHAO, H. International technology transfer: perceptions and reality of quality and reliability. Journal of Manufacturing Technology Management, v. 15, n. 5, p. 410-415, 2004

ERENSAL, Y. C.; ALBAYRAK, Y. E. Transferring appropriate manufacturing technologies for developing countries. Journal of Manufacturing Technology Management, v. 19, n. 2, p. 158-171, 2008

BOZEMAN, B. Technology Transfer and Public Policy: a Review of Research and Theory. Research Policy, vol. 29, núm. 4-5, abril, pp. 627-655, 2000.

CHANG, T. et al. A case study for implementing a B2B collaborative information system: a textile case. Journal of Manufacturing Technology Management, v. 20, n. 3, p. 330-347, 2009.

CHICÁN, A. National and firm competitiveness: a general research model. Competitiveness Review: An International Business Journal, v. 18, n. 1-2, p. 20-28, 2008 .

CLOSS, L. Q.; FERREIRA, G. C. A transferência de tecnologia universidade-empresa no contexto brasileiro: uma revisão de estudos científicos publicados entre os anos 2005 e 2009. Gest. Prod., São Carlos , v. 19, n. 2, p. 419-432, 2012 .

CORDEIRO, A. M. Revisão sistemática: uma revisão narrativa. Revista do Colégio Brasileiro de Cirurgiões. Volume 34; 1-2; 2007.

ETZKOWITZ, H.; LEYDESDORFF, L. The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. Research Policy, n. 29, 2000.

FABRIS, J. P., CAMARGO, M. E., RUSSO, S. L., ZAYAS-CASTRO, J. Technological Innovation, R&D

Activities and Innovation System between Organizations. Systemics, Cybernetics and Informatics. v. 13, n. 6, 2015.

GIL, A. C. Como elaborar projetos de pesquisa. São Paulo, v. 5, p. 61, 2002.

LARQUE-SAAVEDRA, B. S. et al . Transferencia de tecnología: el programa de trigo del CEVAMEX-INIFAP en Tlaxcala, México. Rev. Mex. Cienc. Agríc, Texcoco , v. 5, n. 7, p. 1301-1316, nov. 2014 .

LUCATO, W. C. et al . Gerenciamento da transferência internacional de tecnologia: estudo de caso na indústria têxtil brasileira. Gest. Prod., São Carlos , v. 22, n. 1, p. 213-228, Mar. 2015 .

STEZANO, F. Redes ciencia-industria para la transferencia en México, Estados Unidos y Canadá. Regímenes institucionales y tecnológicos y mecanismos de intermediación, Facultad Latinoamericana de Ciencias Sociales, sede México, México D.F, 2011.

PEREZ, F. A. S.; VARGAS, A. O. M. Incentivos que encuentran los académicos mexicanos para adoptar relaciones de transferencia de conocimientos y tecnología con el sector empresarial. Sociológica (Méx.), México , v. 29, n. 83, p. 47-85, dic. 2014 .

PORTER, M. E. What is strategy? Harvard Business Review, v. 74, n. 6, p. 61-78, 1996.

REISMAN, A. Transfer of technologies: a cross-disciplinary taxonomy. Omega, v. 33, p. 189-202, 2005.

ROGERS, E. M.; TAKEGAMI, S.; YIN, J. Lessons learned about technology transfer. Technovation, v. 21, n. 4, p. 253-261, 2001

TAKAHASHI, V. P.; SACOMANO, J. B Proposal of a conceptual model to analysis of success of technology transfer Project: study in pharmaceutical firms. Gestão & Produção, v. 9, n. 2, p. 186-200, 2002.

TAKAHASHI, V. P Transfer of technological knowledge: a multiple case study in the pharmaceutical industry . Gestão & Produção, v. 12, n. 2, p. 255-269, 2005.

WELSH, R.; GLENNA, L.; LACY, W.; BISCOTTI, D. Close enough but not too far: assessing the effects of university industry research relationships and the rise of academic capitalism. Research Policy, 37, pp.1854-1864. 2008.

Copyright Disclaimer

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).

Female College Students Perceptions of Virginity and Oral Sex

Margaret Bergeron, PhD, RN
Anderson College of Nursing, University of North Alabama
Florence, Alabama

Abstract

Limited research exists on perceptions of virginity and oral sex among female college students. The majority of research studies on female college students focus on virginity related to participation in only vaginal sex. This research is part of a larger qualitative descriptive study which explored female college students' perceptions about the factors which influenced their participation in oral sex. Sixteen female college students ranging from 18 to 24 years of age participated in semi-structured interviews. Primary data included verbatim transcripts, demographic data and sexual health questionnaires. All participants had engaged in oral sex. Defining virginity emerged as a main theme from the thematic data analysis. Overall findings provide insight about views regarding oral sex and virginity status among college aged women.

Keywords: oral sex; virginity; female college students; perceptions

Introduction

Oral sex involves oral arousal to the vagina, anus, or penis. Oral sex was the most commonly reported sexual behavior among 42,549 U.S. undergraduate students in a study on sexual health disparities, with 72% of participants who reported oral sex participation (Buhi, Marhefka, & Hoban, 2010). Jozkowski and Satinsky (2013) examined heterosexual sexual behaviors in a sample of 970 undergraduate students and discovered 86.9% had engaged in performative oral sex and 88.2% had engaged in receptive oral sex. Higgins, Trussell, Moore, and Davidson (2010) surveyed 1504 undergraduate students and found that 83% reported they had experienced oral sex. In a study of sexual health risk among 29,952 sexually active female college students, approximately 94% of all sexually active females had engaged in oral sexual activity (Lindley, Barnett, Brandt, Hardin & Burcin, 2008).

Evidence suggests young adults have redefined oral sex as a behavior which does not constitute or classify as a sex act (Hans, Gillen, & Akande, 2010; Lindberg, Jones, & Santelli, 2008). This change in the meaning and classification of oral sex for young adults has occurred over the last few decades (Hans et al., 2010). Among young adult females, oral sex was viewed as a common and acceptable behavior with limited risk of contracting an STI or becoming pregnant (Malacad & Hess, 2010). Oral sex may be viewed by young women as a way to maintain virginal status.

Literature Review

Research with female college students has revealed that they do not believe oral sex is the same as vaginal sex in terms of intimacy and virginal status (Chambers, 2007; Eshbaugh & Gute, 2008). Female college students have indicated that participation in oral sex maintains one's status as a virgin because they consider oral sex to be an abstinent behavior (Hans & Kimberly, 2011). Female college students have reported that oral sex is simply not as intimate compared to vaginal sex, and therefore, not sex (Eshbaugh & Gute, 2008). One explanation for this perception of oral sex as less intimate than vaginal sex stems from the common belief among college students that oral sex simply does not classify as sex (Eshbaugh & Gute, 2008, Hans et al., 2010).

Definitions of sexual behaviors can provide an increased understanding of why college students consider certain behaviors as "sex," or "not sex." Sewell and Strassberg (2014) explored definitions of "having sex" among 267 male and 327 female heterosexual undergraduate students and found three main themes related to what constituted full definitions of sex. These themes were as follows: degree of sex, sexual situation, and type of sex. Degree of sex related to behaviors that were deemed as "close to but not real sex," sexual situations related to behaviors that were "sexual, but not sex," and type of sex such as "a form of sex, but not penile-vaginal sex." Findings suggested gender differences about definitions of sex among undergraduate students. These gender differences with sex may relate more to why certain behaviors fit with the female definition of sex, compared to the male definition of sex (Sewell & Strassberg, 2014).

Factors specific to the sexual situation can influence how college students define sexual behaviors, such as oral sex. College students may differ in which factors influence how they choose to define a specific sexual behavior.

In a study which explored individuals' definitions of sex, a sample of 51 female and 49 male college students were asked to write about one of four types of sexual situations related to personal sexual experiences and behaviors (Peterson & Muehlenhard, 2007). The sexual situations to be described were categorized as the following: almost but not quite sex, just barely sex, uncertainty about if the experience was sex, and disagreement about whether the experience qualified as sex. Findings showed that oral sex experiences were reported as "not quite sex" by 22 of the participants, with 5 of those 22 participants writing "oral sex is not sex." Oral sex was reported by 13 other participants as "just barely sex," yet all of these 13 participants also wrote that "oral sex is sex." Inconsistencies with definitions of sex and factors which influenced these definitions were found. One female participant in the study wrote that an experience counted as "an act of sex" depending upon her sharing the experience with others. The participant wrote that she only tells people about her vaginal sex experiences, not her oral sex experiences, when asked questions about with whom she has had sex. However, this same female participant also expressed that "it's all sex in the end" (Peterson & Muehlenhard, 2007).

Certain narratives by young women in the study also revealed inconsistencies with labels attached to specific sexual behaviors, such as oral sex. One female participant wrote her definition of sex included "even just seminal fluid involved," yet she defined her own oral sex experience as a "blow job" but considered it "not quite sex." This same woman who did not identify a "blow job" as sex also checked "no" related to a question about if she had ever had sex and checked "yes" to being a virgin. Peterson and

Muehlenhard (2007) found that many of the respondents in their study were motivated to label their sexual experiences as "not sex," even when the experiences constituted the definition they listed as "sex." The most common motive for women to label experiences as "not sex" was the ability to maintain personal classification of themselves as virgins (Peterson & Muehlenhard, 2007).

Other studies regarding the classification of sexual behaviors related to virginity and abstinence behaviors among college students also demonstrated ambiguity and conflict. In a 2010 study of 477 college students, only 20% of the participants believed that oral sex constituted having sex (Hans et al., 2010). In the study by Hans and Kimberly (2011), 454 college students were surveyed about sexual behaviors and found that the majority believed that oral sex maintained virginity status and was consistent with abstinent behavior.

Methods

The design of this study was qualitative descriptive inquiry. Prior to the start of the study, the researcher submitted the study protocol, informed consent form, flyer, and all data collection instruments to the university's Institutional Review Board (IRB) for review and approval. The target population for this study was female college students aged 18 to 24 years. The inclusion criteria for the study's sample included the following: 1) female, currently enrolled at the university; 2) age 18 to 24 years old; 3) single, never married; 4) able to read and speak English; 5) must be willing to participate in individual interviews about personal sexual behaviors and 6) must have participated in oral sex. Purposeful sampling was utilized with this study in order to select participants, but only after the completion of a screening process. The screening determined if potential female participants had previously participated in oral sex, because only those who have engaged in oral sex were enrolled in the study.

Maximum variation sampling was also applied, which allowed for more exploration and increased comprehension in participants with preselected criteria (Sandelowski, 2000). The preselected criterion with screening was age, because the researcher wanted good representation from all ages within the set inclusion criteria of ages 18 to 24 years. The researcher also sought to include variation among sexual orientation and race as criteria, which was sought through the inclusion of different recruitment sites to maximize differences with potential participants. A total of 16 female college students were enrolled in the study. This enrollment number met the typical sample size for qualitative descriptive design studies range of 3 to 20 participants (Magilvy & Thomas, 2009).

The primary method of data collection with this qualitative study was the use of individual semi-structured interviews with participants. All 16 of the interviews were conducted in a private conference room in an isolated campus building. Anonymity of all participants was protected by the researcher's request for participants to use an alias or the random four digit code during the interviews.

The demographic and sexual health questionnaire data were analyzed using IBM SPSS Statistics Version 23 (IBM Corporation, 2015). The qualitative data included the 16 individual interviews that were analyzed using thematic data analysis methods aided by NVIVO 11 Starter version (QSR International Pty Ltd., 2015). The participants ranged in age from 18 to 24 years, with a mean age of 20.3 years. The majority were White/Caucasian (n = 12, 75%), heterosexual (n = 13, 81.4%), and more than half (n = 11, 68.8%)

identified that they were single. The mean age for initiation of oral sex was 17 years with a range from 12 to 21 years old.

The majority (n = 13, 81.9%) of the participants indicated they did not consider themselves to be virgins and all 13 indicated they had participated in vaginal sex. Three (18.9%) of the participants considered themselves to be virgins, yet had engaged in oral sex but not vaginal sex or anal sex. The majority (n = 13, 81.3%) of participants had engaged in vaginal sex. Six (37.5%) of the participants had engaged in anal sex. Half of the participants had engaged in oral sex in the last 30 days and six (37.8%) of those eight participants reported they were currently in a relationship that involved oral sex. Two (12.6%) of the participants who had engaged in oral sex in the last 30 days indicated they were not currently in a relationship which involved oral sex. Approximately 63% (n = 10) of the participants had 3 or more lifetime oral sex partners; one participant indicated a total of 30 lifetime oral sex partners. Three participants (18.8%) indicated that they had engaged in oral sex with someone they had known for less than 24 hours.

Findings resulted from thematic analysis, which reflected the young women's perceptions about oral sex and their oral sex experiences. The theme, "defining virginity," was related to the young women's beliefs about virginity and participation in oral sex. The participants differed in their beliefs about loss of virginity with participation in oral sex.

The participants also differed on oral sex participation and virginity status. All of the participants in this study indicated on the sexual health questionnaire and during the interview that they had engaged in oral sex. Three of the young women reported that they had only engaged in oral sex, but not vaginal or anal sex. Despite having engaged in oral sex, the three young women maintained that they were virgins. They believed the act of vaginal penetration during sexual intercourse equated to the loss of virginity. Ava expressed, "Uh, well in my personal opinion how I define sex is like, vaginal penetration." In a separate interview, Olivia made a similar statement:

> I think a lot of people don't really um, think of oral sex as sex, like what you think of like, personally. I still consider myself a virgin in that sense because I haven't had penetrative sex yet, but um, I have had oral.

Another young woman, Lily, had similar beliefs. She explained, "I personally believe that [you are still a virgin] because you can't have a baby from having oral sex and you can from having vaginal sex." In another interview, Grace stated, "I guess I don't picture it as, I don't like picture it [oral sex] as sex, I guess." During the interview she also remarked, "I consider oral sex much different than vaginal sex." When asked to explain this statement she continued, "I was raised very strict, so I kind of pictured oral sex as not, (long pause) not so bad."

Only two of the young women, Avery and Emma, believed that a person who had participated in oral sex was not a virgin. Avery explained, "technically no, you haven't had sex, a typical definition of penetration...if you haven't done that, then you might consider that to be virginity kept. But, I think it is the same as vaginal sex." Emma explained:

> I just feel like that [oral sex] is crossing a boundary that is the line. I mean, a lot of people think of losing your virginity as you have ruptured whatever is down there…but I feel like if you have gone to the line of [oral] sex with someone, then you have crossed that line. Sex is sex.

Religion related to virginity status was mentioned by a few of the women. This factor is relevant considering the study was conducted in the southeast, commonly known as the Bible Belt. Sophia, who identified as not a virgin on her sexual health form, described how she engaged in oral sex and was able to maintain feeling "pure." She shared:

> I wanted to be a virgin until like I am married…you know, it [oral sex] was something that I could still, you know, kind of be an angel and I can still be pure…you know, we didn't have to worry about getting pregnant.

Another young woman, Grace, felt a person could have oral sex and still be a virgin. She described how she never received oral sex in order "to keep [her] innocence or something." She explained that she did not receive oral sex from her boyfriend until after they had engaged in vaginal sex. Grace shared, "I guess letting him on me, maybe I did kind of feel like it would take away…like my innocence or something…that's why I didn't feel comfortable until after we had vaginal sex."

Several of the young women felt that they could not give a simple answer about virginity status related to participation in oral sex because they thought being a virgin was individualized.

Claire was open to the idea of different views about virginity, that each individual determines how he/she views virginity. Anna also expressed this sentiment, "it really depends on them, I wouldn't want to give a definition for someone else to go by, it is pretty much all on what they think." Anna felt that virginity status was something that each woman defined for herself.

Hailey, who identified as a virgin, discussed the importance of why she felt that virginity status was individualized. She strongly stated, "I define virginity as something somebody claims for themselves…I worked as a volunteer [at a crisis center] and one of the things we told victims of sexual assault or abuse is that nobody can take your virginity. That is something you give." Hailey believed that each person should define their own virginal status and should be comfortable when they choose to "give" their virginity to someone.

Participants' perceptions about virginity differed regarding a woman's participation in oral sex versus vaginal sex. The majority of young women in this study believed that a woman could engage in oral sex and still classify as a virgin. Findings suggest that because young women believe that oral sex is not the same as vaginal sex, virginity is preserved. Consistent with existing research, some of the young women in this study viewed participation in oral sex as a way to stay "pure" and maintain one's status as a virgin, because there is no vaginal penetration (Bersamin, Fisher, Walker, Hill, & Grube, 2007; Byers, Henderson, & Hobson, 2009; Esbaugh & Gute, 2008; Fahs, 2016; Hans & Kimberly, 2011).

Only two of the participants differed on their opinions of virginity with oral sex and believed that if you engage in oral sex, you are no longer a virgin. Although this is a limited number of participants, this is an important finding because these two participants believed that oral sex still constituted as a sex act, and for that reason a loss of virginity. This finding was consistent with previous work of Hans and Kimberly (2011) who also found that a minimal number of college students felt that oral sex did not maintain virginity.

Several of the participants had a difficult time defining the term virgin because they felt that young women had different conceptualizations of what it means to be a virgin. These findings suggest that some women acknowledge the importance of personal beliefs and self-concept related to virginity status. This was

consistent with findings in a study (Sprecher & Treger, 2015) of virgins at a Midwestern university that found women typically support personal beliefs, such as religious involvement and moral upbringing, as reasons for maintaining virginity. However, Sprecher and Treger (2015) only addressed virginity as related to vaginal sex, not oral sex.

Conclusion

The findings of this study on oral sex and views about virginity have important implications for sexual health education. In order to design and implement an educational intervention, it is imperative to first explore the existing perceptions about sexual behaviors. The findings provide insight on how young women view oral sex related to virginity. Findings from this study suggest that the majority of college aged women believe that oral sex is not sex, therefore virginity is kept.

Most sexual research addresses vaginal sex, with oral sex often viewed as a type of comparison sex (Lefkowitz, Vasilenko, & Leavitt, 2016; Wood, McKay, Komarnicky, & Milhausen, 2016). Minimal attention has been given to the oral sex experiences of young women (Buhi et al., 2010; Chambers, 2007; Vannier & O'Sullivan, 2012). More research is needed on young women's perceptions about virginity and oral sex, as well as how individual differences may exist with attitudes about oral sex and virginity among young women.

References

Bersamin, M. M., Fisher, D.A., Walker, S., Hill, D.L., & Grube, J.W. (2007). Defining virginity and abstinence: Adolescents' interpretations of sexual behaviors. *Journal of Adolescent Health, 41,* 182-188. doi: 10.1016/j.jadohealth.2007.03.011

Buhi, E. R., Marhefka, S. L., & Hoban, M. T. (2010). The State of the union: Sexual health disparities in a national sample of US college students. *Journal of American College Health, 58*(4), 337-346. doi:10.1080/07448480903501780

Byers, E. S., Henderson, J., & Hobson, K.M. (2009). University students' definitions of sexual abstinence and having sex. *Archives of Sexual Behavior, 38,* 665-674. doi: 10.1007/s105-007-9289-6

Chambers, W. C. (2007). Oral sex: Varied behaviors and perceptions in a college population. *Journal of Sex Research, 44*(1), 28-42. doi:10.1080/00224490709336790

Eshbaugh, E. M., & Gute, G. (2008). Hookups and sexual regret among college women. *Journal of Social Psychology, 148*(1), 77-89. doi:10.3200/socp.148.1.77-90

Fahs, B. (2016) Methodological mishaps and slippery subjects: Stories of first sex, oral sex, and sexual trauma in qualitative sex research. *Qualitative Psychology, 3*(2), 209-225.

Hans, J. D., Gillen, M., & Akande, K. (2010). Sex redefined: The reclassification of oral-genital contact. *Perspectives on Sexual and Reproductive Health, 42*(2), 74-78. doi:10.1363/4207410

Hans, J. D., & Kimberly, C. (2011). Abstinence, sex, and virginity: Do they mean what we think they mean? *American Journal of Sexuality Education, 6*(4), 329-342. doi:10.1080/15546128.2011.624475

Higgins, J. A., Trussell, J., Moore, N. B., & Davidson, J. K. (2010). Young adult sexual health: Current and prior sexual behaviours among non-Hispanic white US college students. *Sex Health, 7*(1), 35-43. doi:10.1071/sh09028

IBM Corporation. (2015). *IBM SPSS statistics for windows, version 23.0.* Armonk, NY: IBM Corporation, Inc.

Jozkowski, K. N., & Satinsky, S. A. (2013). A gender discrepancy analysis of heterosexual sexual behaviors in two university samples. *Journal of Community Health, 38*(6), 1157-1165. doi:10.1007/s10900-013-9728-3

Lefkowitz, E.S., Vasilenko, S.A., & Leavitt, C. E. (2016). Oral vs. vaginal sex experiences and consequences among first-year college students. *Archives of Sexual Behavior, 45,* 329-337. doi: 10.1007/s10508-015-0654-6

Lindberg, L. D., Jones, R., & Santelli, J. S. (2008). Noncoital sexual activities among adolescents. *Journal of Adolescent Health, 43*(3), 231-238. doi:10.1016/j.jadohealth.2007.12.010

Lindley, L. L., Barnett, C. L., Brandt, H. M., Hardin, J. W., & Burcin, M. (2008). STDs Among Sexually Active Female College Students: Does Sexual Orientation Make a Difference? *Perspectives on Sexual & Reproductive Health, 40*(4), 212-217. doi:10.1363/4021208

Magilvy, J.K., & Thomas, E. (2009). A first qualitative project: Qualitative descriptive design for novice researchers. *Journal for Specialists in Pediatric Nursing, 14*(4), 298-300. doi:10.1111/j.1744-6155.2009.00212.x

Malacad, B. L., & Hess, G. C. (2010). Oral sex: behaviours and feelings of Canadian young women and implications for sex education. *The European Journal of Contraception and Reproductive Health Care, 15*(3), 177-185. doi:10.3109/13625181003797298

Peterson, Z.D., & Muehlenhard, C.L. (2007). What is sex and why does it matter? A motivational approach to exploring individuals' definitions of sex. *Journal of Sex Research, 44*(3), 256-268.

QSR International Pty Ltd. (2015). *NVivo qualitative data analysis software, Version 11.*

Sandelowski, M. (2000). Whatever happened to qualitative description? *Research in Nursing and Health, 23,* 334-340.

Sewell, K. K., & Strassberg, D. S. (2014). How do heterosexual undergraduate students define having sex? A new approach to an old question. *Journal of Sex Research, 52*(5), 507-516. doi:10.1080/00224499.2014.888389

Sprecher, S., & Treger, S. (2015). Virgin college students' reasons for and reactions to their abstinence from sex: Results from a 23-year study at a Midwestern U.S. university. *Journal of Sex Research, 0*(0), 1-13. doi: 10.1080/00224499.2014.983633

Vannier, S. A., & O'Sullivan, L. F. (2012). Who gives and who gets: Why, when, and with whom young people engage in oral sex. *Journal of Youth and Adolescence, 41*(5), 572-582. doi:10.1007/s10964-012-9745-z

Wood, J. R., McKay, A., Komarnicky, T., & Milhausen, R. R. (2016). Was it good for you too?: An analysis of gender differences in oral sex practices and pleasure rating among heterosexual Canadian university students. *The Canadian Journal of Human Sexuality, 25*(1), 21-29. doi: 10.3138/cjhs.251-A2

Multivariate Analysis of Brazilian Agricultural Production

BRUNO CÉSAR GÓES, VINÍCIUS PALÁCIO, BEATRIZ RODGRIGUES DE GODOY, DIOGO DE LUCCA SARTORI, FERNANDO FERRARI PUTTI

Abstract

Agribusiness is one of the most important sectors for Brazil, expressing positive values in the trade balance, with a share of 23% of GDP, besides the great generation of employment along its chain. In this way, Brazil stands out due to the expressive volume of agricultural production, making it one of the largest exporters of food in the world. In this way, it sought to apply the multivariate analysis through multidimensional scaling between the area, production and gross value of agricultural products, in order to observe the similarities and dissimilarities between them, which resulted in three discrepant products, which are of great importance to the Brazilian economy, being soy, sugar cane and corn, besides the formation of two distinct groups of products with similar characteristics.

Keywords: Agribusiness, economics, multidimensional scheduling.

1. Introduction

In recent years, agribusiness has been contributing positively to the Brazilian economy. It accounts for 23% of GDP and is responsible for 46% of the exported products, besides offering 25% of the jobs in the country (MAPA, 2016).

Agribusiness GDP (inputs, primary production, agribusiness and services) grew in the last year, 2016, both in the agricultural and livestock sectors in which it registered a rise of 4.48%, resulting in the balance of the trade balance to be positive, differing from other sectors of the economy, which had accumulated negative indexes in the last 8 years (CEPEA, 2016; MAPA, 2016).

Among the main commodities of the sector that obtained growth in exports we can highlight two products derived from the sugar cane crop; refined sugar, with an increase of 52.7% (US $ 20 million) and raw sugar with 44.6% (US $ 863 million) (MAPA, 2017).

Regarding the product most exported by Brazil, we have soybeans in which, in addition to bran and oil, they are responsible for more than US $ 25 billion in exported value (EMBRAPA, 2017).

Soy and maize are components of the raw material for the manufacture of feed, the latter being responsible for more than 67.2 million tons produced in 2016, occupying the fifth place in exported volume (COLUSSI, 2016; SINDIRAÇÕES, 2017). The corn crop stood out in the harvest of 2014/2015, with a total production of 84 million tons, being the third in the world, in addition to exporting more than 22 million tons, reaching second place in the world ranking (DILLY et al., 2017).

Sugarcane is one of the most important crops for the Brazilian economy, although it is not for export trade. In this way, the country is the largest producer of culture in the world, driven by the production of ethanol, in which it supplies the domestic market for biofuels, in addition to the production of sugar, in which Brazil is responsible for more than half the world market (LIMA; CASTRO, 2016).

We also have other products that stand out in their production, such as coffee and beans. Coffee is a product that has its production with an international bias and historically linked to the Brazilian economy, however, was losing ground in the agricultural economy over the years due to the relative decline of its importance in revenues (BLISKA et al., 2009). Regarding the bean culture, which is considered a typical Brazilian food, its plantation is totally focused on the national supply, with the surplus not being significant to the final export values (ASSUNÇÃO; WANDER, 2015).

On the other hand, family farming is responsible for the production of agricultural products that have specific characteristics and regional characteristics. These cultures represent the diversity of products and are mainly associated with the national supply. Despite its economic importance for Brazil, it stands out for the variety of foods in its production (MALUF, 2004).

In this way, analyzed the system of agricultural production, destined for export and also the internal supply of the country. With the possession of area data for product planting, the quantities (tons) produced and the gross value of all products planted on national land, was performed, by the method of multidimensional scaling modeled by Euclidean distances, the relation of similarities and dissimilarities between them, trying to understand if these distances between the products in this model, have direct relation with the export of agricultural products and, with the local / regional supply of Brazil. With the data of the main exported products it was possible to consider that there is a relation between the groups constructed by the multidimensional scaling and the export data.

2. Materials and Method

In order to fulfill the objectives of the article, we developed a work of applied nature with quantitative approach, in which multidimensional scaling was used to analyze the factors planted area, production and production value for 59 Brazilian agricultural products in 2014, with data obtained from FAOSTAT.

The data were analyzed analogously to the methodology used by Góes et al. (2015), which consisted in the use of multivariate statistics using Minitab software, and for this work the use of XLSTAT software. The multidimensional scaling was performed to find, by measures of distances, the structure of the set of observations. The data are positioned to two or three dimensions, generally, so that their distances agree with the differences. In this work, we used the Euclidean distance model based on Kruskal's accepted values of stress (1) (GIL, 2002; HAIR et al., 2009).

Stress values are used to indicate the quality of the model and the adjustment data. Kruskal's Stress formula (1) was used, values smaller than 0.05 would be considered acceptable in this study. By recommendation of the Kruskal model, Stress of 20% or more are considered poor models; 10% considered reasonable; 5% are good models; and excellent 2.5% (HAIR et al., 2009; MARQUES, 2016).

The result in the analysis of multidimensional scaling, agricultural products were adopted as the variables interconnected by factors: planting area, production and gross value of production.

3. Results and Discussion

As in the work of Góes et al. (2015), after the multivariate analysis, it was possible to verify the relationship

between the factors studied, in this case: planting area, production and gross value of the production of Brazilian agricultural products, observ a similarity between them, in which it originated in the formation of two groups: one with 46 elements and the other with 10 elements, in addition to three other products with great disparity in relation to the others.

The multidimensional scaling, the Euclidean distances model, was performed with the purpose of analyzing the relations of the products by their distances in the two-dimensional model. To validate the technique, according to the recommendations of Cooper and Schindler (2011), two criteria should be accepted: Kruskal's stress index (1) and / or the coefficient of determination (R^2).

Thus, by realizing application with the data in the XLSTAT software, the model presented a Kruskal (1) stress index of 0.002, but the software did not calculate the R^2 value. Due to the low level of stress, the technique used presents high reliability as the results show (Figure 1).

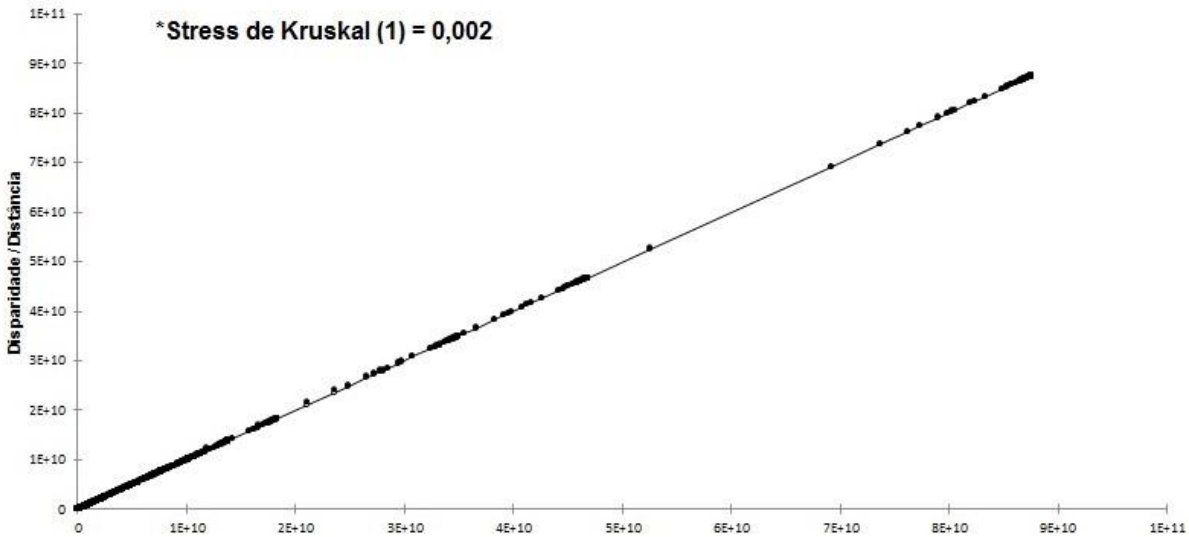


Figure 1. Shepard Diagram - Kruskal stress

Source: Prepared by the authors.

After analyzing the two-dimensional graph (Figure 2), it is possible to observe the disparity of the points, 49, 50 and 23, respectively represented by the soybean, sugarcane and corn crops, and that can be classified as products of great economic importance for Brazil, differing from the others. It also found the formation of two groups of agricultural products with characteristics of similarities between them, one with 10 elements and the other with the remaining Brazilian agricultural products, 46 in total.

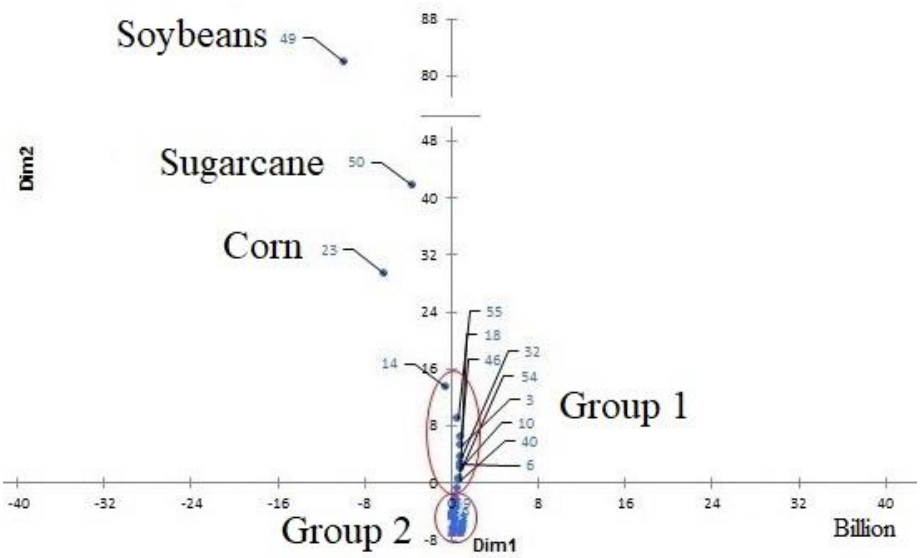


Figure 2. Two-dimensional analysis of Brazilian agricultural products.
Source: Prepared by the authors.

After determining the average of the factors of each element formed in the analysis, the superiority of the agricultural products, soybean, sugarcane and corn, in relation to the groups formed, as shown in Table 1, can be observed in numbers.

Table 1. Comparison of the mean of the groups with the discrepant products and export volume.

Products	Area (ha)	Production (tons)	Valor Bruto (10^6US$)	Exportação (ton.)
Milho	15.432.909	79.881.614	39.948.206.125	26.624.890
Soja	30.273.763	86.760.520	87.483.524.333	42.796.106
Cana-de-açúcar	10.419.67	736.108.487	46.757.611.094	0
Grupo 1 (10)	579.545	3.963.300	8.058.015.269	2.506.586
Grupo 2 (46)	38.373	201.749	253.901.013	2.790.416

Source: Prepared by the authors with database (FAO, 2017).

As observed in Table 1, soybean is the product with the highest export volume with 57.28%, followed by maize, together accounting for more than 92% of the volume exported, surpassing the US $ 29 billion. On the other hand, sugarcane, although not a crop destined for export, is surprised by the volume produced with more than 736 million tons.

Thus, a possible similarity factor among agricultural products belonging to group 1 (10 elements), is the production focused on foreign trade, since it has a larger area of planting for its crops besides representing 3.35% of agricultural exports, while the other products (group 2), for a total of 46, correspond to the percentage of 3.73 of the production destined for foreign trade, since it has a smaller production area.

5. Conclusion

The existence of three agricultural products in Brazil with great prominence in relation to the planted area, quantity produced and gross value of the production, are: soybean, sugarcane and corn, possessing expressive values of the factors studied the relation to agricultural products remaining.

Soybeans and corn, offer great production, besides being the two largest products of the country destined to the foreign market. On the other hand, sugarcane, although not a product aimed at foreign trade at its origin, the demand for production area is due to the use of biofuels with the adoption of flex fuel cars in 2008, being the Brazil is the largest producer of crops in the world and the second in the production of ethanol, in addition to the production of sugar abroad.

The data show us the formation of two groups of agricultural products with characteristics of similarity, a group with 10 products, in which they stand out by the volume of production destined for export, while the other with 46 included products is made to supply the domestic market. It is interesting the grouping originated by multidimensional scheduling, since we can observe the similarities between the products, and the discrepant points, standing out from the others.

7. References

ASSUNÇÃO, P. E. V.; WANDER, A. E. Análise dos tipos de comercialização de feijão-comum no estado de Goiás. Informações Econômicas, SP, v. 45, n. 1, p. 35-47, 2015.

BLISKA, F. M. M.; VEGRO, C. L. R.; AFONSO JÚNIOR, P. C.; MOURÃO, E. A. B.; CARDOSO, C. H. S. Custos de produção de café nas principais regiões produtoras do Brasil. Informações Econômicas, SP, v. 39, n. 9, 2009.

COLUSSI, J.; WEISS, C. R.; SOUZA, A. R. L.; OLIVEIRA, L. O agronegócio da soja: uma análise da rentabilidade do cultivo da soja no Brasil. Revista Espacios, v. 37, n. 16, 2016.

DILLY, R. F.; MASSUQUETTI, A.; FREITAS, G. S.; FERNANDES, J. J. Exportações mundiais de milho: um estudo da competitividade e do Grau de concentração do Brasil e dos estados unidos da América (EUA) no período 2000/2014. Revista Brasileira de Estudos Regionais e Urbanos, v. 11, n. 1, p. 1-19, 2017.

EMBRAPA – Empresa Brasileira de Pesquisa Agropecuária. Soja em números (safra 2016/2017). Embrapa Soja, Londrina, 2017. Disponível em: https://www.embrapa.br/soja/cultivos/soja1/dados-economicos/. Acesso em: 15 jun. 2017.

FAO – Food and Agriculture Organization of the United Nations. Production share of Soybeans by region 2014. 2014. Disponível em: http://www.fao.org/faostat/en/#data/QC/visualize. Acesso em: 15 jun. 2017.

GIL, A.C. Como elaborar projetos de pesquisa. 4. ed. São Paulo: Atlas, 2002. 175 p.

GÓES, B. C.; PUTTI, F. F.; GABRIEL FILHO, L. R. A.; CREMASCO, C. P. Análise dos componentes da produção agrícola da Alta Paulista. Colloquium Humanarum, v. 12, n. Especial, p. 44-53, 2015.

HAIR, J. F.; BLACK, W. C.; BABIN, B. J.; ANDERSON, R. E.; TATHAM, R. L. Análise multivariada de dados. São Paulo: Bookman, 2009.

LIMA, M. P.; CASTRO, M. C. G. A produção de cana de açúcar no Brasil uma análise dos impactos

socioeconômicos da implantação do complexo sucroalcooleiro no município de Vicentinópolis. ANAIS - Seminário de Pesquisa, Pós-Graduação, Ensino e Extensão do CCSEH – SEPE. Anápolis, p. 1 -6, 2016.
MALUF, R. S. Mercados agroalimentares e a agricultura familiar no Brasil: agregação de valor, cadeias integradas e circuitos regionais. Ensaios FEE, v. 25, n. 1, 2004.
MAPA - Ministério da Agricultura, Pecuária e Abastecimento. Agronegócio brasileiro: perspectivas 2016 CDES, Mapa BRASIL, 2016. Disponível em: http://www.agricultura.gov.br/noticias/ministra-apresenta-potencial-de-crescimento-do-agronegocio-ao-conselhao/1.pdf. Acesso em 15 jun. 2017.
MAPA - Ministério da Agricultura, Pecuária e Abastecimento. Balança comercial do Agronegócio – junho 2017. Secretaria de Relações Internacionais do Agronegócio, 2017. Disponível em: http://www.agricultura.gov.br/noticias/exportacoes-do-agronegocio-atingem-us-9-27-bilhoes-segundo-melhor-resultado-historico-para-junho/nota-junho-2017-balanca-comercial.docx. Acesso em: 02 jul. 2017.
MARQUES, M. D. Logística reversa de embalagens de agrotóxicos: uma análise da região da Alta Paulista. 2016. 103 f. Dissertação (Mestrado em Agronegócio e Desenvolvimento) – Faculdade de Ciências e Engenharia, Universidade Estadual Paulista, UNESP, Tupã, 2016.
SILVA, A. F.; FACHINELLO, A. L.; CASTRO, N. R.; GILIO, L.; GIACHINI, G. F. Relatório PIBAgro-Brasil. CEPEA – ESALQ/USP, Piracicaba., p. 1-18, 2016. Disponível em: http://www.cepea.esalq.usp.br/upload/kceditor/files/Relatorio%20PIBAGRO%20Brasil_DEZEMBRO.pdf. Acesso em: 15 jun. 2017.
ZANI, A. Efeitos da gangorra agropecuária. Sindirações, Boletim Informativo do Setor, 2017. Disponível em: http://sindiracoes.org.br/wp-content/uploads/2017/05/boletim_informativo_do_setor_maio_2017_vs_final_port_sindiracoes.pdf. Acesso em: 15 jun. 2017.

Implementation Process of Corporate University in Network (CUN)

Patricia de Sá Freire*
Adjunct Professor; patriciadesafreire@gmail.com

Gertrudes Aparecida Dandolini*
Titular Professor; gertrudes.dandolini@ufsc.br

João Artur de Souza*
Titular Professor; joao.artur@ufsc.br
*Department of Knowledge Engineering; Federal University of Santa Catarina

Abstract

The scientific literature points out that there are difficulties for the implementation of corporate university models since it is required the management of cultural, behavioral and structural changes, involving all the stakeholders of an organizational system. Among these difficulties, there is the commitment of leaders, definition of corporate education as organizational strategy, corporate university delimitation, identification of products and services, quality requirements and customers that will be suit. Also, promotion of the recognition system and people's reward, the systematization of best practices and error handling; definition of the centralization and decentralization of education activities across network; besides the strategic alignment design, the technologies, partnerships and evaluation of results. The most current studies describe that, to decrease these locks, the implementation must be perceived as an interaction process between the initial conditions and the expected results. That is, the implementation cannot be considered only as the exact moment of decision-making, but rather, it must be understood as a process composed of different steps to be taken to its effectiveness. In this context, this article aims to propose the most contemporary implementation process of a model of corporate university, identified in Scopus database as Corporate University in Network (CUN), considering the need for care of the different expectations and stakeholder interests in the organizational ecosystem. For such, a bibliographical research of descriptive end was carried out in which it is the Corporate University in Network model is presented, deepen its strategic rationale and taking them in consideration in the process considered for its implementation. As a result, we described the major stages of evolution towards the CUN model, and we proposed an implementation process, consisting of thirteen interrelated actions to achieve the final stage.

Keywords: Corporate University in Network; Stakeholders; Corporate Education; Process implementation; Evolution stage for CUN.

1. Introduction

In the knowledge society context, with globalization and hyper-competitiveness reaching even small

businesses, this context convened the area of personnel management to participate more actively in corporate strategy. Its new assignment is to build a solid path to organizational development regarding, especially, the decrease in talent turnover (Meier and Hicklin, 2007), the essential knowledge and management skills (Hamel and Prahalad, 1990, Nicolai and Dautwiz, 2010), and the motivation for collaborative work (Xie and Ke, 2011, Oliveira and Pombo, 2016) and high performance (Albuquerque et al. 2015). This mission has determined the evolution of what is understood by training, development and corporate education because the required transformations to the organizational development are intrinsically related to people's qualification.

Among the metamorphoses occurred and observed in the knowledge society, it is important to cite the accelerated globalization and technological complexity, the relaxation of labor and capital accumulation, the production practices reconfiguration and reengineering, among others (Baeri, 2009). The changes and new demands of that contemporary society propel a differentiated education in training for work.

Due to the capacity of conceptualization, abstraction, generalization and, mainly, the survey and analysis of multiple cases to verify the consistency of applied models, the partnership between academic universities and corporate education assumes new proportions. This makes it stop looking only at the situational needs of the organization and move towards the development of dynamic capacities for innovation (Teece, 2000, 2009).

Indeed, in this century, the actions of organizational development began to receive more attention from senior management, as well as strengthening the area of human development. Thus, in the restructuring process of the training sector, employee-training actions with restricted focus on improving performance of the task became insufficient. In Brazil, in the 1980s, it was recognized the need to go beyond the operational training, starting to develop skills related to management, including the training of leaders in managing people, technology and processes to reduce the risk in their decision-making.

For a historical overview since the 1920s, the sector responsible for people management training has been implemented according to the following different models: Training, T&D (training and development), people development, corporate education, and even Corporate University. It can be noticed that the different corporate education models have been constantly evolving, reaching in 2016, the most contemporary model, named Corporate University in Network (CUN) by Freire et al. (2016). Briefly, a list of six corporate education models that have arisen since the 1920s can be cited, which are the evolution stages for the CUN model (Table 1).

Table 1. Evolution stages to CUN model

1º	2º	3º	4º	5º	6º
Training Department	E-learning Platform	Corporate Education	Corporate University	Stakeholder University	Corporate University in Network
1 RANGE directed to the internal actors. 2 Low INTERCONNECTION 3 Recognition of Human Capital 4 Low use of EDUCATION TECHNOLOGY 5 Narrow FOCUS for the TASK. 6 Free courses LEVEL 7 With no alignment between Business STRATEGY and learning strategy.	1 RANGE directed to the external actors. 2 Medium/high INTERCONNECTION 3 Recognition of Human Capital 4 High use of EDUCATION TECHNOLOGY 5 Narrow FOCUS for the TASK 6 Free courses LEVEL 7 No alignment between Business STRATEGY and learning strategy.	1 RANGE directed to the internal actors. 2 Medium/high INTERCONNECTION 3 Recognition of Human Capital 4 High use of EDUCATION TECHNOLOGY 5 Narrow FOCUS for the TASK 6 Free courses LEVEL 7 - With alignment between Business STRATEGY and learning strategy	1 RANGE directed to the internal and external actors of the productive chain 2 Medium/high INTERCONNECTION 3 Recognition of Human Capital 4 High use of EDUCATION TECHNOLOGY 5 TASK FOCUS on management and strategy 6 Free courses LEVEL 7 Alignment between Business	1 RANGE directed to the wide internal and external actors of the productive chain 2 High INTERCONNECTION 3 Recognition of Human Capital 4 High use of EDUCATION TECHNOLOGY 5 Focus on the TASK, management and strategy 6 Include Academic University for programs and courses certification 7 With alignment between Business STRATEGY and learning strategy 8 Institutionalize a learning culture 9 High actors interaction focusing on research integration, competence development, and KM 10 Steady and long-term actors 11 Uses network learning based on relationships and interactions through communication	1 RANGE directed to the wide internal and external actors of productive chain 2 High INTERCONNECTION 3 Recognition of human, relational and social capital 4 High use of EDUCATION TECHNOLOGY 5 Focus on the TASK, management and strategy 6 Academic University for programs and courses certification included 7 With alignment between Business STRATEGY and learning strategy 8 Institutionalize a learning culture 9 High actors interaction focusing on research integration, competence development, and KM 10 Steady and long-term actors, but open to fluidity on entrance and exiting of actors 11 Uses network learning based on relationships and interactions through communication 12 KM as transversal course to the CU actions 13 CE as strategy to CU instrumentalization 14 CUN as forming unit of network m

Elaborated by the authors based on Margherita and Secundo (2009) and Freire et al. (2016).

As Freire et al. (2016) explain, the evolution of corporate education models comes from the training Department model to the Corporate University in Network (CUN), first proposed by the authors in October 2015, and published in February 2016.

The first stage - training department - has the narrow focus on task training with the range targeted at internal actors, low interconnection by low usage of education technologies. It keeps the focus on human capital. There is no alignment between business strategy and learning; courses remain in the level of free courses.

The second stage starts to use an e-learning platform, but keeps the range targeted at internal actors and focus on developing human capital through task training. In addition, it is still not worrying about keeping the alignment between business strategy and learning, offering free courses level. However, this stage, to have a high use of educational technologies, provides a medium/high interconnection (Margherita and

Secundo, 2009).

The third stage, called in Brazil corporate education, is an evolution of the previous stages regarding strategic alignment. That is, we maintained previous guidelines related to the reach, the interconnection, the human development, the focus on the task, the education technologies, and the course level. However, courses and educational programs are designed with the objective of supporting the achievement of the organization's strategic goals.

The fourth stage is the corporate university. This stage aims to increase the scope of its educational activities, directing them to the external and internal actors of the productive chain. This stage also assumes the alignment between business strategy and learning, increasing training focus on task for the development in strategic management and education. Even keeping the medium/high interconnectivity, the focus on human capital, a high use of educational technologies and the level of the courses as free, the corporate university (CU) seeks to institutionalize a corporate culture of continuous learning.

The CU stage corresponds to "a strategic umbrella for the development and education of employees, customers and suppliers, seeking to optimize the organizational strategies, as well as a learning lab" (Morrison &Meister, 2000, pp. 8). For Phillips (1999), the CU is a process in which employees, customers and suppliers participate in educational experiences to improve job performances and enhance learning for the business impact. In the other hand, for the researcher Renaud-Coulon (2008), CUs are educational structures that help to implement – through education – strategies of the organization in human, financial, technological, economic, environmental and social terms.

Freire et al. (2016) relate the CU setting with the contextual requirements of the productive system in which the organization is located. These are internal and external demands that eventually set up a model able to meet different requirements. One of the external determinant factors is the acceleration of innovations in information and communication technologies (ICT), which imposed a more urgent pace to the organizational changes, registering an obsolescence context of available knowledge. As a result, a demand for more applicable knowledge raised and in shorter and shorter deadlines, leading the people management area to extend the strategic focus, the level of training activities, the content comprehensiveness, the target audience range, the massive education technologies use, and stakeholder interconnection.

Having this context recognized, the fifth stage emerges, elaborated by Margherita and Secundo (2009): "Stakeholder University", whose mission is the strategic skills development of these same employees and all interested parties in the organization.

Comparing the model "Stakeholder University" (SU) to the previous stage models, this one has the widest reach by targeting its educational activities both to internal and external actors, not only those directly related to the organizational production chain, but also to those interested in its results. In this question, SU favors the partnership building with academic universities, neglected in other stages. To this end, it is necessary to maintain a high interconnection between actors, both with a focus on human development, as in the development of social capital. It uses network learning founded in relations and interactions through collaboration to develop social capital. As for the other elements, the SU offers the same guidelines such as seeking a high use of educational technologies, having the focus on the task, in the management and strategy, and respecting the alignment between business strategy and learning.

Privileging the fixed and long-term actors, the SU model makes necessary a high interaction of actors with focus on the integration of research, skills development, and knowledge management (KM) to institutionalize the learning culture as determined by any corporate university model.

Going further, the most contemporary model arises: CUN. Freire et al. (2016) model the sixth stage that is the Corporate University in Network (CUN). The authors, in accordance with Margherita and Secundo (2009), also argue that, in this new century, is no longer possible to restrict the training initiatives of the internal public to the training for tasks, nor to only include customers and suppliers in the learning network. Therefore, it is the CUN basic premise to seek strategic alignment among all stakeholders in the organizational ecosystem, to promote not only individual learning, but also collective learning.

Comparing the CUN model with the ones before, the first stands out by keeping all the orientations of the SU model, but it extends its educational activities focus to beyond the human and social capital development, strengthening relational capital by believing that both the human and the social development are dependent on relations between individuals, groups and organizations. To this end, the stakeholders of organizational ecosystem are long-term and fixed, but they are fluid in the entrance and the exit of partnerships. Still, we consider the KM as a cross discipline to CUN actions, it uses engineering tools and the knowledge media to the instrumentalization of the University as a promoter, observatory and knowledge memory which is imperative to network development.

Based on these considerations, the CUN model was configured to meet decisive guidelines of a new design of training development and education area (T, D&E), with the priority mission of developing both the human capital, the relational and the social, as shown in Figure 1.

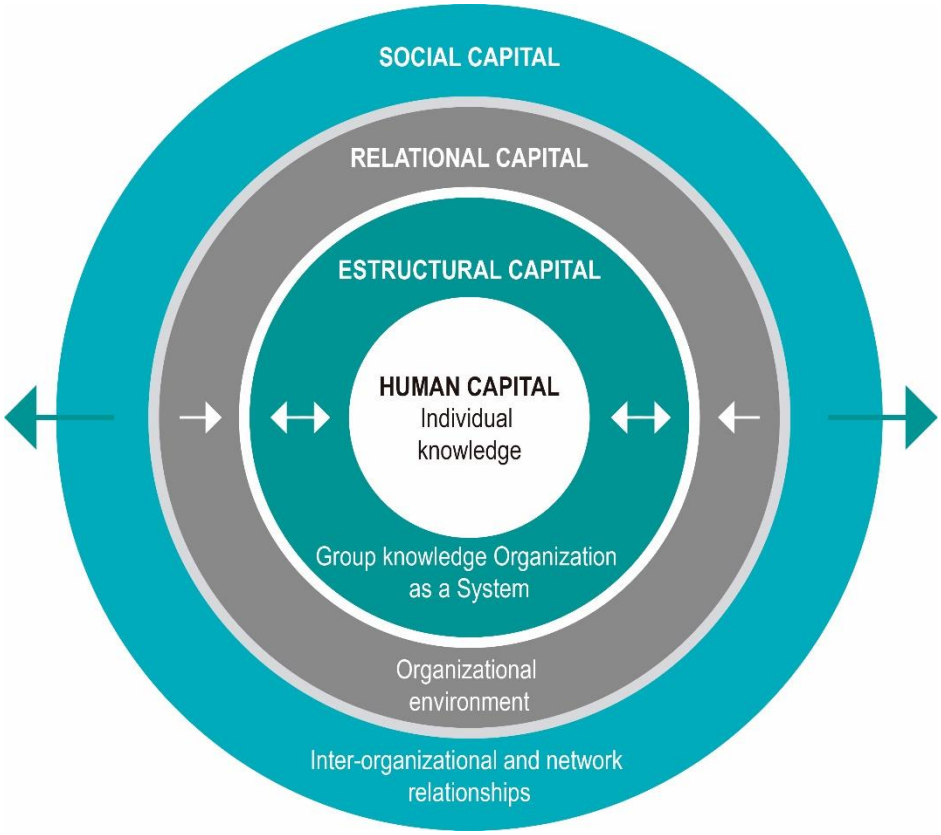


Figure 1. Construction of Intellectual Capital by the logic of learning.
Source: Elaborated by the authors based on Freire (2013).

Freire (2013, pp. 119) explains that by the organizational learning logic, "one can understand that building the intellectual capital begins with the human capital (individual learning). When these individuals and groups interact, sharing knowledge, they build the structural capital." Moreover, as a result, the relational capital is built as a result "of the organizational cognitive relationship", as a system and its environment (Campos and Pablos, 2007, pp. 6). The elements of intellectual capital are divided between exogenous and endogenous. The endogenous connects people to the organization. The exogenous elements make the link between organizations and the surrounding agents. These are elements relate the organization to its surroundings that, when managed, can create the social capital of the organization. Social capital, according to Putnam (1995, pp. 153), who first defined the term in the organizational context, means the "traces of the life of social network, standards and trust, which enable participants to act together, more effectively, to seek shared objectives".

As a network model, the CUN proposes the use of practices, techniques and tools of knowledge management, e.g. collaborative mechanisms and sharing, for the construction of a high level of confidence, cooperation and connectivity between the organization and, particularly, its employees, the traditional university, science and technology institutes, suppliers and consumers and participants of the productive and social arrangements by creating value for all stakeholders (FREIRE et al. 2016). This model is suitable for the knowledge society, because it targets the organizational development and its ecosystem.

Rodriguez y Rodriguez (2016, pp. 1) indicate that there are difficulties for the Corporate University model implementation, once it is required the management of cultural, behavioral and structural changes, involving all the participants and beneficiaries of the system. Among these difficulties are: commitment of leaders; definition of corporate education as organizational strategy; the corporate university; identification of the "products and services, quality requirements and customers that will be attended"; promoting the recognition and reward system "of the people" and "systematization of best practices and treatment of errors"; definition of the centralization and decentralization of education activities across network; in addition to the design of the strategic alignment of technologies, partnerships and evaluation of results.

Ramos (2001, pp. 3) reinforces that the barriers for a corporate university implementation refer "to the doctrinal character of programs carried out, difficulties in its relationship with the traditional universities and the possible resistance to professional training and development of changes." To reduce these blockages, the implementation must be perceived as a process of interaction between the initial conditions and the expected results. That is, as already pointed Pressmam and Wildavsky (1984), we cannot consider implementation only as the exact moment of decision-making, but rather, we understand as a process consisting of different practices to be carried out for its effectiveness.

Nevertheless, Margherita and Secundo (2009) and Freire et al. (2016) did not model an implementation process of their corporate university models -- Stakeholder University, and Corporate University in Network, respectively.

An example of complex issues related to implementation process of a CUN arises when one thinks of communication practices between participants and those interested in learning network. There are techniques, practices, and tools of internal communication to mobilize the internal public for participation in trainings and skills required in the people management area. Practices such as card point release, bonus

and requirements of position motivate employees to participate. However, how to implement a CUN model in an organization, taking into account the different expectations and the stakeholders interests?

In this context, it was defined as the research objective that gave rise to this article, to model the Corporate University in Network implementation process, considering the importance of the use of knowledge management to meet the different expectations and interests of stakeholders of organizational ecosystem.

To achieve this objective, a literature research was carried out with a descriptive and prospective purpose (Alves-Mazzotti, 2001, Bobbio, 1997, Patton, 1988, and Serra, 2006), in which it is presented the most contemporary corporate university model, identified in the database Scopus, - Corporate University in Network - deepening its strategic fundamentals and taking them into account in the proposed process for its implementation.

This article is structured in five sections, including this introduction and the list of references for this study. The second section describes the Corporate University in Network model, deepening its principles and guidelines to be respected during the modeling process of its implementation. In the third section are the CUN deployment process proposed in this work. Finally, the last two sections are the final considerations and references.

2. Identity Model of Corporate University in Network (CUN)

The CUN model was developed by researchers at the Postgraduate Program in Engineering and Knowledge Management at the Federal University of Santa Catarina, linked to the Center for Integration Engineering and Knowledge Governance (ENGIN), having been published in the international scientific journal Spacios, in 2016 (Freire et al, 2016).

With the goal of strategic alignment between all stakeholders - beneficiaries, and internal and external participants, productive and social clusters - of organizational ecosystem, we define CUN as an intelligent ambiance of continuing education, not necessarily in the physical environment, which manages and institutionalizes a learning culture in the network. As such, its concept is based on Social Constructivism theories (Vygotsky, 2007), Organizational Learning (Crossan et al., 1999) and Andragogy (Knowles, 1990), using practices, techniques and tools of Knowledge Management.

The definition of the pedagogical line for the CUN is fundamental for supporting its educational practice of "Stakeholder University" (Margherita and Secundo, 2009). Paulo Freire's liberating pedagogy is added to the historical-social constructivist pedagogy of Vygotsky (2007), to achieve a pedagogical orientation based decisively in education as a dialogic process necessary for awareness and commitment to positive transformation of the productive and social arrangements constituting the organizational ecosystem.

To the constructivists, knowledge is related to the experience. Constructivist logic states that the human being is an open system that, when interacting with the environment around establishes a relationship of mutual interference. The individual acts in the environment, transforming it to meet their needs and, in turn, the environment interferes with the human development (Freire and Spanish, 2014). In this process, the individual ends up transforming himself, because "when man modifies the environment through their own behavior, this modification will influence their future behavior" (Luria, 1988, pp. 196).

The history-social theory of Vygotsky (2007), with a contextual approach, believes that the construction of

knowledge by the subject is made from its interaction with the environment. However, the author points out that the object only makes sense to the subject when brokered by a mediating element, allowing, thus, interpreting the symbols that these objects represent, i.e. "the simple stimulus-response process is replaced by a complex mediated. In this process, the direct impulse to react is inhibited, and it is incorporated a helper stimulus which facilitates the operation complementation by indirect means "(Vygotsky, 2007, pp. 33). On Freire and Spanhol (2014) understanding, the individual is not only passive or active, but also interactive. It is producer and receiver because it forms knowledge and it is constituted for intra and interpersonal relations. Thus, knowledge is the result of a process built by the individual through the search for information, within the mean itself - concepts and meanings. This is a non-linear process of construction of human knowledge.

Also, the guidelines of andragogy model were incorporated, which referred to the "art and science of helping adults to learn" (Carvalho et al., 2010, pp.4). These guidelines for adult education must support the CUN actions as for personal development and professional career of young people and adults, by involving them in a spiral of knowledge and learning building. Educational programs, to show the andragogy, must enable an appropriate environment for discoveries, but they also must contemplate meaningful learning, considering the student's previous knowledge. It is started from teaching practices that bring context and work experiences into the learning environment, making the student a questioner and inquirer entity, from their own experience situations in the routine work, for in the adult "interests for learning are directed to the skills development that it is used in their social role, in their profession" (Chandra, 1999, pp. 2). In addition, as a mediator and not simply as a knowledge transmitter, the teacher or tutor must act as a facilitator of learning, from exchanges of knowledge with the adult student, highlighting their experiences of life.

The choice and content management must be challenging and lead effective changes in professional learner's lives. Thus, the CUN must show clearly the following guidelines coming from andragogy:

- Need to know: To awake in the adult the conscience to learn something new. Adults seek to understand what the consequences and gains are, from a new learning, highlighting the reasons related to the new learning;
- Student's self-concept: Adults are responsible for their learning. If is not necessary to impose method to the pupil, but to construct it together with the pupil, in accordance with the personal, professional and/or contextual reality;
- Role of Experiences: Contemplate elements that are part of the student's reality, for the adults to consider their historical learning background;
- Learning Readiness: Adults feel ready to learn aspects that will make difference in their daily lives;
- Motivation: Proposition of content aligned to the conditions and interests of the student. The intrinsic (or emotional) aspects, such as job satisfaction, motivate the adults more than external aspects, such as salary improvement, and getting better jobs.

Due the dynamism of the CUN model, various settings are possible. However, whatever the settings

established, they must be able to promote collective learning of essential knowledge to the organizational strategy success, in its operational, tactical, and strategic levels, as well as of all stakeholders in its results, whether individuals, groups, organizations or society.

From this point of view, Freire et al. (2016) describe the guidelines to be observed in the CUN structuring, which are here highlighted. It must be defined, first, what "CUN strategy" must be used, keeping it aligned with the "organization's strategy." The CUN goals can be identified between developing skills, only, or supporting corporate change management, or meeting customers/users/citizens expectations, or preparing the companies for strategic transformations, or, finally, promoting academic research to take the company to innovation (Margherita and Secundo, 2009).

Then, the CUN must be configured according to the fundamental guidelines: Level of Involved Activities; Strategic Focus of the Program; Strategic Focus of the CU; CU's Archetypes; CU's Factors; Scope of the Content Offered; Knowledge Management. These guidelines are presented and identified in table 2.

Table 2. Guidelines for a corporate University in Network (CUN)

Guidelines	Characteristics	Theoretical Reference
Level of Involved Activities	• Training / Operational Formation • Training / Management Development and Executive Leaderships Formation • Courses that allow to get some college credits • Package of courses that allow to obtain a diploma at the University	Allen, (2002)
Strategic Focus of the Program	• School - focus on the task - objective of improving the efficiency of the individual • College - focus on the delivery - objective of lining up the organizational goals with the individual abilities • University - focus on human capital development - objective of co-creating and co-producing for strategic deployment.	Rademakers (2005)
Strategic focus of the CU	• Competence and Development • Change management • External customer (final customer, user, citizen) • Strategic Business • Academic research	Margherita and Secundo (2009)
CU Archetypes	• Training Department • E-learning platform • Corporate Universities • *Stakeholder University*	Margherita and Secundo (2009)
Factors for CU Implementation	• Alignment and execution. • Development of skills to support the needs of business • Learning and Performance Evaluation • Partnership with the Academy, and Support Technology for Learning	Abel and Li (2012)
Comprehensiveness Content Offered	• Generalist • Management • Operational	Antonelli, Cappiello and Pedrini

		(2013)
Knowledge Management	• Organizational Memory - Focus on Content • Organizational Memory - Focus on Process	Freire et al. (2012)
	• Identification of Critical Knowledge • KM processes • ICT strategies • Techniques of Communication • Knowledge Systems • Knowledge Governance - Learning and Leadership	Pacheco *et al.* (2012)

Source: Adapted from Freire et al. (2016).

From the CUN guidelines, Freire et al. (2016) have structured the seven strategic foundations for the promotion of network learning, which are:

- identification and understanding of the expectations and interests of each internal and external stakeholder of the organizational ecosystem;
- Be constituted as a collective learning environment taking care of any intended corporate university configuration;
- respect for knowledge management principles for the development of human, social and relational capital of the organizational ecosystem;
- promotion of collaboration among employees and other actors of different productive and social clusters of the organizational ecosystem for the co-creation and co-production of value for all;
- structuring for top-level connectivity for confidence development, cooperation and collaboration between the different actors, whether internal or external, operational, managerial or strategic;
- strengthening of partnerships between the corporate university and the academic universities, to promote the training of teachers, meet the requirements of the Ministry of Education, recognize academic credits for regular courses and diploma certification;
- creation and management of content that meet the level of the task, the activity, the processes and the strategy.

These seven principles are considered as determining elements for the definition of the implementation of the Corporate University in Network model.

Therefore, different from other models of corporate education, the CUN model is positioned in accordance with the CU guidelines added to the knowledge management principles, assuming the practices for the management of organizational memory and knowledge engineering tools (Freire et al., 2016) as structuring of the 21st century organizations. These practices, by facilitating the meeting of content and development of individual and group skills aligned to the strategy, influence the increase in effectiveness and excellence reach of the services provided.

The use of practices, techniques and tools of engineering and knowledge management (EKM) provide the CUN with computer-based training to facilitate the identification of essential skills and essential knowledge to the establishment of the organizational strategy. It even facilitates the processing, storage and distribution

of information and knowledge by eliminating geographical barriers in access, from inside and outside the organization. It even supports the knowledge retention essential to the operation effectiveness, through the establishment of knowledge bases, and channels of interaction and sharing. With the use of EKM, it is possible the integration, interaction and inclusion of skills of several stakeholders, and, consequently, the promotion of collective learning.

In relation to the strategic foundations previously analyzed, two new elements are transversal to the guidelines proposed by Freire et al. (2016). They are:

1. Education technologies (ET): Incorporation of ET in face-to-face teaching, to the teaching learning environment for distance education and technologies for mass education.
2. Participants Interconnection: Use of practices and integrative, inclusive, interactive tools of engineering and knowledge management.

In short, Freire et al. (2016) build a metaphor in Figure 2, which has as central the definition of model identity.

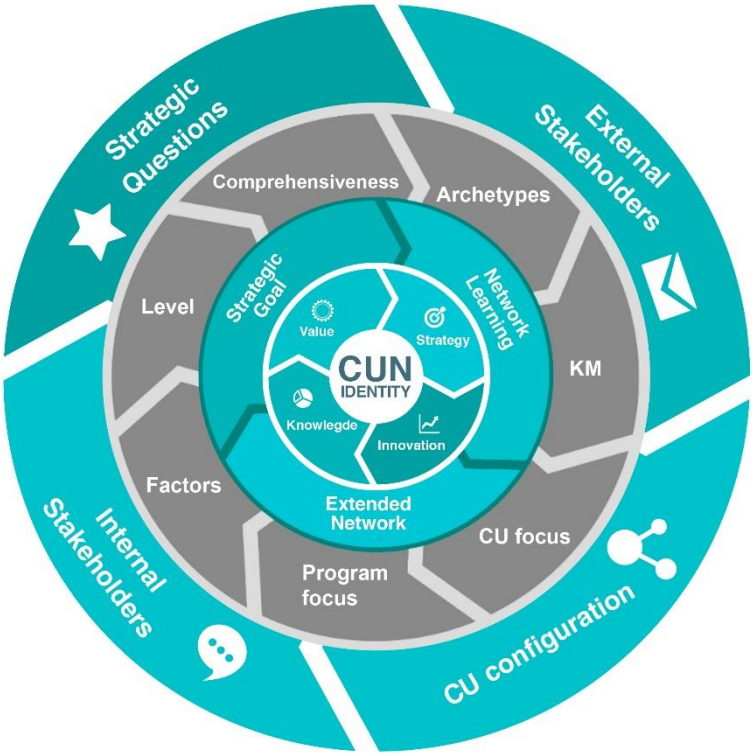


Figure 2. Guidelines of the Corporate University in Network model (CUN)
Source: Freire et al. (2016).

Figure 2 presents the guidelines for the construction of the CUN identity, an initial model made of several rings in a topological structure, showing which levels must be examined, understood and overcome, so that the CUN identity may emerge.

Analyzing from inside out, the first level directs the reader to the CUN strategic questions definition, for the internal and external stakeholder identification served by the CUN, and the definition of the CUN

configuration (which is driven by the second level). The second level defines the fundamental guidelines described, as the comprehensiveness of the programs and knowledge management. The third level induces that the CUN model must extend beyond its internal collaborators, promoting network learning, without losing sight of the strategic focus of the organization to which the CUN is bound. The fourth level guides that the CUN be configured in such a way as to create value for the organization, promoting the creation, sharing, and application of knowledge and innovation, and it must be aligned to the organization strategy. The fifth level determines the composition of the CUN identity, that is, it places the identity as a center of the strategic plan, turning it into a shared goal of the organization.

In order to meet the CUN identity, it is also observed that a Corporate University must be configured as follows:

- as a collective learning environment oriented to the organization and stakeholders demands that make up its ecosystem;
- with principles of knowledge management and focus on the human capital, social and relational development, through qualification, training, corporate education and network learning;
- for all the different people interested in the success of the organizational strategy, whether external or internal, operational, managerial or strategic;
- with high level of confidence, cooperation and connectivity between the organization, the traditional society, the corporate university, and the institutes of science and technology, creating value and social capital;
- offering content aligned to the organizational strategy, which may be of operational, administrative or generalist level;
- with the perspective of obtaining some university credits and a diploma in traditional university;
- with the vision of promoting the co-creation and co-production of value for all stakeholders.

Moreover, assuming the formation of network memory and knowledge engineering among its structuring elements, the CUN model implementation must comply with the following assumptions:

- retain knowledge through the establishment of knowledge bases, and interaction and knowledge sharing channels;
- eliminate geographic barriers in the access to information and expertise, inside and outside the organization;
- increase the productivity of employees and stakeholders by the ease in finding content and expertise;
- provide greater agility in communication between the areas and units, and between the different stakeholders that make up the organizational ecosystem;
- implement efficient means to organize and distribute information in the network;
- form a computerized database with expertise and knowledge produced by stakeholders in the processes that permeate the organizational activities;
- align the application of Information and Communication Technologies in accordance with the needs of the knowledge management processes at all levels of interaction between the stakeholders that form the CUN.

Thus, the present study intends to identify the steps to be followed to model the CUN (table 1), given that Freire et al (2016), even offering clues on how to implement the model; do not make explicit the implementation process to be configured.

3. Proposition Implementation Process of the Corporate University in Network (CUN)

The coordinated actions of the implementation process of the CUN must consider the factors for implementation described by Abel and Li (2012), listed in table 2. In this way, it can be considered that the implementation process of the CUN should achieve the following goals:

- align the execution of the CUN implementation with the organizational strategy, through a partnership with the corporate HR to evaluate the performance;
- develop skills in line executives and employees of the operation through work-based programs, skills and competencies, to support the needs of business;
- evaluates performance and impact learning, by the return on investment, and learning transference;
- build partnerships with academic universities for exchange of lecturers and certification;
- manage and support learning through online technologies and comprehensive management systems.

Therefore, in order to constitute the CUN as a dynamic and intelligent environment, on the amplest corporate education settings, the implementation process must begin from the stakeholders' recognition of its ecosystem, forming a network with different degrees and connectivity, having as objective collective learning. The strategic foundations of the implementation process of the CUN aim to promote, when respected, the collective learning of essential knowledge to the success of the organizational strategy.
Given these considerations, the implementation process of the CUN is elaborated based on the fundamental model guidelines (Freire et al. 2016): Level of Involved Activities; Strategic Focus of the Program; Strategic Focus of the CU; CU's Archetypes; CU's Factors; Scope of the Content Offered; Knowledge Management.
These guidelines must be considered as objectives of implementation. This way, the interrelationship of thirteen steps must be coordinated to make possible the implementation of the Corporate University adhered to the CUN Model (Figure 3).

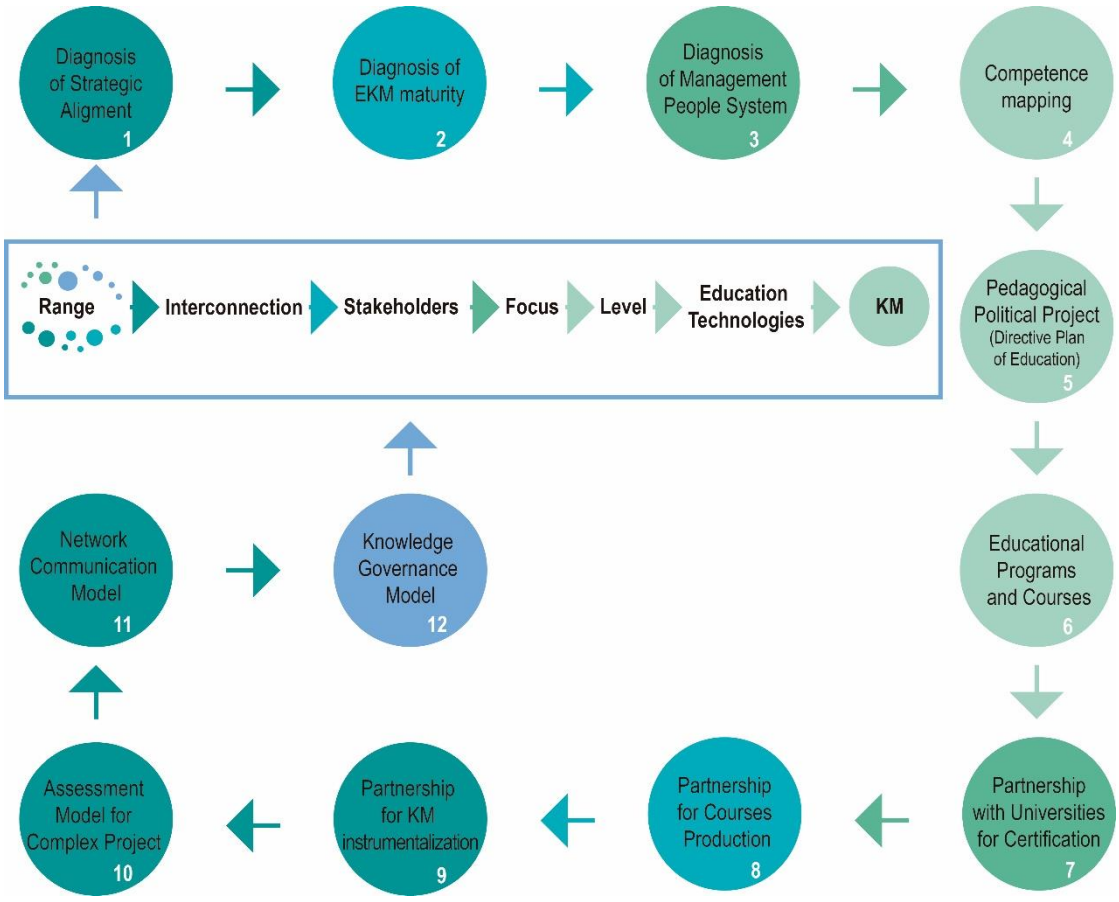


Figure 3. Process of implementation of CUN
Source: Elaborated by the authors.

The first step must be the definition of the CUN strategy aligned to the organizational strategy. Mission, vision and strategic goals of the CUN must be elaborated to fulfill the mission, vision and goals of the organization.

The second step is the diagnosis of the organization's knowledge management to identify the degree of maturity, especially regarding people, technology, innovation, learning and knowledge management. That diagnosis is extremely important to the analysis of different organizational dimensions that, somehow, influence and determine the results of the processes of information and knowledge management; such as leadership, organizational and knowledge processes, people management, and individual behaviors for collaboration and sharing, the existence and use of interactive technologies, learning and innovation, and, lastly, the results of information management itself, in case it is used by the organization or the network.

The third step is the system of strategic people management diagnostic, to identify which subsystems are being managed or not. For the CUN implementation is of utmost importance to identify the way the company manages the selection and movement of people, and their allocation in positions, as well as rewards and people development attracts and maintain them, as well as monitoring the performance of the whole system.

During the fourth stage, individual and organizational skills are mapped to identify the gaps to be developed by the CUN. From the identification of those gaps, the learning trails are defined and the path structuring

begins in order to train each of the participating groups and those interested ones in the ecosystem success in the light of the practices, techniques and tools of knowledge management.

The fifth stage for implementation of the CUN refers to the development of the Pedagogical Political Project, which must consider the results of previous actions (strategies, knowledge management maturity, and individual and organizational skills). Soon after, it is possible to draw up the instructions relating to educational programs and their respective courses. The Pedagogical Political Project (PPP) must be as a guiding reference for the implementation, management, execution and evaluation of a CUN. As its name suggests, it is a project because it presents a proposal for action to be performed for a determining time. It is political when considering the university as a space where conscious, responsible, and critic individuals are trained, who will act individually and collectively to promote changes in the ecosystem. It is pedagogical, since it defines and organizes the activities, programs and courses required for the teaching and learning processes. The PPP details goals, guidelines and actions of the educational process to be developed in the CUN to meet the needs, goals and expectations of individual employees, internal and external participants of the social and productive arrangements, its beneficiaries, and the organization itself; that is, of all its stakeholders. It expresses the organizational culture at the same time that contributes to transform it. It has an overall planning function of its educational action and reveals the ways of thinking and acting of the actors participating in the continuing education process. Thus, the role of the PPP is to define the CUN identity as manager of competence, knowledge and teaching and learning processes of the network participants and its beneficiaries.

In this manner, at the end of this stage of the implementation process, it is prepared a document that records beyond the principles and strategic foundations for the implementation itself; it suggests tactical and operational guidelines for the management and implementation of the CUN. This document is configured in a planning and evaluation tool that all the CUN members of the management and educational teams must consult in every decision-making about the educational process. In the sixth stage, under PPP guidelines, the Educational Programs must be established and the amount and the contents of the courses that comprise it should be set.

The CUN must be structured in Educational Programs and for those Learning Trails, covering the different possibilities of ways of building knowledge, contributing for the learning to take place in accordance with the strategic objectives of the organization and the students. The program must promote the training and qualification of stakeholders for effective and continuous development of human, relational and social capital.

The application of the CUN model guidelines determines that its educational programs are flexible and dynamic, to meet the Organization's strategic alignment, the individual expectations, of the group and the network, allowing greater flexibility in updating and incorporating innovations and adaptations to the changes.

Therefore, the trainings and qualifications offered by university to conduct this educational proposal must be aligned with educational programs, which, in turn, are composed of courses and events to be chosen by the students (Figure 4).

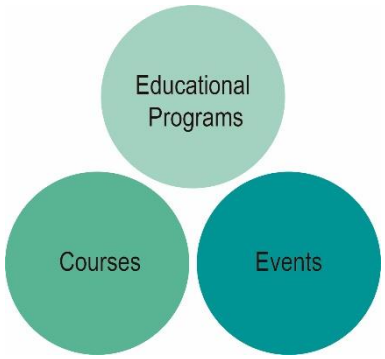


Figure 4 - Educational programs.
Source: Elaborated by the authors.

Although the CUN has as orientation the development of a critical and independent view of the individual in the sense of his / her self-construction, this responsibility can't be attributed only to the student, considering the importance of maintaining the alignment between individual and organizational skills for the effectiveness of the System. Thus, it is up to the CUN to provide the necessary directions and learning opportunities, namely the so-called Knowledge Tracks within educational programs. In this way, each program must address a theme aligned with the strategic planning of the organization. Each educational program may be composed of one or more learning tracks that together form a mosaic of operational, tactical and strategic interrelated contents. These contents must be distributed between courses and / or events with a specific workload,

Still, depending on the educational context of the target audience or purpose of the program, the organization can develop courses to instruct the repetition and practice (qualification); create knowledge for understanding the phenomenon studied (capacitation) or develop gradually and orderly formal education (training).

For these programs and courses to be defined, in this stage six, meetings of the collaborative working groups between the CUN team and the teams of other organizational sectors (courses applicants) and different identified stakeholders must be held. As one of the best knowledge management practices, these Collaborative Groups aim to create trust and cooperation so that it is possible to raise the real needs and expectations regarding training, qualification and network formation for collective development. The results of Competency Mapping are recovered for the modeling of the way to follow as well as the resulting directions of KM and strategic people management diagnostics. With the information and knowledge raised, the collaborative group, in its interdisciplinary vision, follows to the information and knowledge treatment and its prioritization. Finally, it is given the definition of courses that meet the trails of knowledge of educational programs offered in that period.

During program and course elaborations, the collaborative group must also set some criteria that will guide the next steps of the implementation process of the CUN, described in Figure 5.

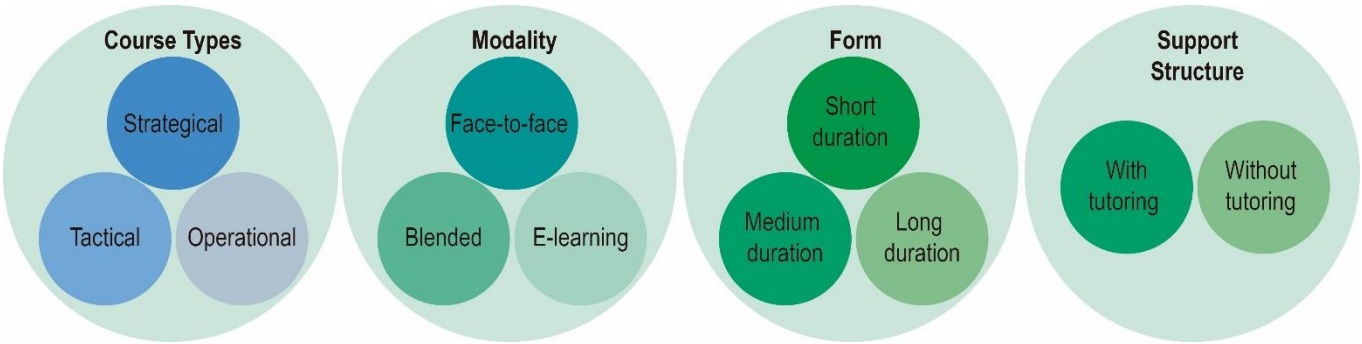


Figure 5. Course Structure.
Source: Elaborated by the authors.

According to the audience to be achieved, courses can be developed from three types: strategic, tactical or operational. As to the modality of implementation, they can be taught face-to-face, blended, or distance courses using appropriate distance education platforms. In relation to the form, the courses must be short (between 10 to 25 hours), medium (from 26 to 50 hours) or long duration (up to 100 hours) and may or may not count on support from tutors. The courses with less than 10 hours are considered events.

The Educational Program formed by these courses must follow the legal guidelines of the regulatory organization for academic universities to certify them. In Brazil, the organization is the Ministry of Education. So, for the Ministry of Education to certify the educational program of the CUN as a *latu sensu* specialization, for example, it must offer at least 360 hours of study, in addition to other requirements as to the modality of evaluations. It must be noted that certification of courses (isolated), programs, or tracks can be effective in this partnership network according to the established cooperation.

In the implementation process of the CUN, from the seventh to the ninth steps, it is important to notice the preparation of reference terms for the academic partnerships negotiation with universities and producing courses companies and of KM instrumentation. The CUN must draw up the reference terms of these services, whether they are carried out internally or by third parties, the hirings and partnerships meet the interest of maintaining the CUN as an innovative knowledge disseminator, to promote the motivation of all those involved in the quest for continuous learning. If the organization does not have an area of innovative technologies of education, for example, it is better to seek partnerships and external hires. If the area of information technology has not advanced for the development of intelligent knowledge systems, based on ontologies and taxonomies constantly updated, it is preferable the achievement of a partnership or hiring of external service providers. Regarding the partnership with academic universities, it is worth doing it to support the Pedagogic Political Project development for teacher training, content producers, mentors and/or tutors of the Organization, as well as for the certification of programs and courses. In addition, it must be considered the participation of external teachers in the CUN Collaborative Working Groups.

In the step 8, regarding the second partnership to be made, once validated the PPP and the syllabus of each course, it is necessary the hiring of service providers to produce high-level technology courses, whether in the classroom or distance courses. This step of course development involves two phases: preparation of teaching materials and course development.

In the first phase of elaboration of didactic materials that will be used in the courses, if it is a face-to-face course, the briefing and the programmatic content created in step 6 must follow for the teacher hired to the course preparation as proposed. If the course is distance, these documents must be referred to a content producer teacher for raw content preparation of the course. In the sequence, the course production service provider must draw up an Instructional Project (visual; technology; content) based on the raw content, aligned to the PPP of the CUN.

The second phase of course development: for face-to-face courses, must be chosen and prepared at least transport and accommodation for the professor, the lease of the place, the instructional support materials, assistive technologies to the course such as a projector and the virtual environment of document sharing. For distance courses, must be configured the virtual learning environment, the prototype of the course, its script, the instructional support materials, as well as the selection and training of the mentoring and monitoring team, as well as the form and language of service and troubleshooting.

In parallel, there is the step 9 of the CUN implementation process, in which it must be structured the creation and/or implementation of KM. Partnerships get started with internal area of the IT and the companies specialized in exploitation of KM. The term of reference to this partnership must provide the elaboration of the Strategy Map of Organizational Knowledge that embraces alternative analysis activities for knowledge mappings; definition of scope for strategy implementation, and the application of the method chosen. Still, the partnership must provide the elaboration of a Data Integration and Interoperability Model, defining the structure of the catalogue of information units, from the cataloguing of internal and external sources of information and strategic definition to compose the document base. At the end of this step, it is set up the scope of the taxonomy of the essential processes to the CUN, and it is initiated the development and implementation of the knowledge system. The systems and Skills Observatory, and the CUN Secretary must be the first ones to be drawn up to provide intelligent support for the CUN's management.

In sequence, for the proper implementation of the CUN, it is provided the modeling of three processes: the Evaluation Model (step 10); Network Communication Model (step 11) and the Governance Model of Organizational Knowledge (step 12).

About evaluation model of the CUN (step 10), it should be noted that there are several possible models, because the choice must be based on the cultural characteristics of the organization, as well as in the structure and purpose of the course to be taught. However, as every step of implementation process, the evaluation model must comply with the guidelines of the CUN. It must be designed so that the diversity in the environment is understood; "It is necessary to understand that the evaluation cannot be an instrument of measure to assess the performance of students, but a resource of observation and self-observation to understand what factors deprive or disinhibit the growth of each student" (Covatti, Trentin & Fischer, 2011, pp. 3168). Thus, the evaluation model of the CUN must consider the formative and inclusive evaluation epistemologies.

The formative assessment does not care about the amount of "knowledge" (product) to be purchased by the student, but with the quality of this knowledge gained during the construction process. Formative assessment eliminates the concern to build learning with intent for conceptualization and diploma. It understands that individual learning needs to be built gradually to get the truly domain of a subject and its

application, transforming the acquired knowledge in competence. Hoffman (2005, pp. 20), in his turn, clarifies that "the essence of the formative design is in the teacher's involvement with students and awareness about their commitment to their progress in terms of learning – on the importance and nature of pedagogical intervention". To Freitas, Costa and Miranda (2014, pp. 87) "the formative evaluation is conducted throughout the process, it is continuous, and it gives parameters to the teacher to check whether the objectives were achieved, and they may interfere in what may be compromising the learning". Even when the course is distance and the evaluation and monitoring are handled through non-human tutoring; it is possible to create evaluations to be carried out during the course so that the student can be guided on the way.

Added to the formative assessment model, it should be incorporate the principles of inclusive assessment, so that the differences in expectations and interests of all the stakeholders' clusters and social organizational ecosystem can be observed. It is important to remember that, even with much effort, the organization does not know in depth the difficulties and deficiencies for learning of its employees. Neither it will be able to have dominion over the more distant stakeholders. Santos (2003, pp. 4) points out that "an educational institution with inclusive orientation is one who cares about the modification of the structure, the operation and educational response that should be given to all individual differences, including those associated with any disability – in any educational institution, of any educational level."

The CUN understands that everyone is different and therefore assumes the importance of practicing inclusive assessment, in which the teaching must be collective and must consider all the environmental variations in which individuals are included. Concluding about the evaluation, Santos (2003) states that the individual must be co-participant of the teaching learning process and be a co-agent on building their knowledge, leaving aside the traditional assessment model, in which the student is compared with the others within predetermined labels. The author points out that, in inclusive assessment "are offered various opportunities and different forms of the student to show how they are doing throughout the educational process" (Santos, 2003, pp. 8). That is, in the CUN model must be predict an individual self-assessment focused on the process of construction and application of knowledge by the student, and not comparative to the others.

About the network communication model (step 11), it must consider the strategic objective of inclusion and integration of multiple actors in the ecosystem. Thus, it must privilege interactive, integrative and inclusive medias. For the effective implementation of the CUN model, it is necessary a communication model that recognizes and integrates the stakeholders to the educational process, not only as production collaborates, but especially as part of a learning network. It is known that the effective inclusion depends on the use of information and communication technologies (ICT), as these are crucial for an inclusive system consolidation, "for its inexhaustible possibilities of building features that facilitate access to information, curricular content and knowledge in general, by the whole diversity of people" (Giroto, Poker and Omote, 2012, pp. 7).

The CUN is directly dependent on the mechanisms, tools and applications that facilitate the effective approach of all stakeholders of the organizational ecosystem for the learning network formation. So, when defining the CUN educational programs and courses, dynamic collaboration and sharing spaces that include,

in addition to employees, suppliers and customers must be considered. In addition, academic universities, and participants of the productive and social arrangements of the organizational ecosystem must be recognized (Freire et al., 2016). Furthermore, the communication model must predict the use of inclusive, integrative and interactive technologies as strategic enabling mediation of dialogue between the corporate university and its stakeholders (Freire et al.).

We reach the Step 12, in which the governance model of organizational knowledge must be elaborated. It is worth to point out, initially, that Grandori (1997) coined the expression "knowledge governance" at the end of the 1990s. In the early 2000s, studies of Bart Nooteboom, from Rotterdam School of Management at Erasmus University arise contextualizing the importance of governance of knowledge created in inter-organizational relationships (Nooteboom, 2000). In 2007, researcher, Nicolai j. Foss, from the Center for Strategic Management and Globalization at the Copenhagen Business School, brings the idea of Knowledge Governance Approach (KGA) (Foss, 2007). The author defines Knowledge Governance (KG) as an emerging interdisciplinary approach, running through the fields of knowledge management, organization studies, strategies and human resource management.

In any of the governance dimensions, whether global, public, corporate or of knowledge, scientific literature has identified the term governance is treated as being the governance of systems of authority, leadership and formal incentives; internal communication and with stakeholders; of culture characteristics for transparency and control, psychological contracts for trust and sharing; and the social construction of meaning, focusing on respect for collective and economic, social and environmental sustainability of the organization or country. To draw this KG model is important to rethink corporate governance in the light of knowledge management.

As points Nooteboom (2000) with KG it is possible to win three organizational challenges: to achieve a balance between dependence and power; create powers to keep active the absorptive capacity of knowledge between the internal and external collaborators; keep the focus on achieving the best of each participant's ability. With these challenges achieved, it is easy, according to Nooteboom (2000), to motivate internal and external participants, for the co-creation and co-production of a new essential knowledge to the success of the organization, because it leads them to "take the interests of others into the heart" (pp. 76-77), corroborating with CUN's goals.

The CUN understands KG as a new approach to organizational learning that includes control and supervision, leadership, resources, processes and procedures that subsidize and promote the creation, sharing, handling, transfer, storage and knowledge dissemination of competitive value. Whether it be individual, group, organizational, inter-organizational or network, fostering an environment of socialization of experiences where good practices and learned lessons become the basis of new effective applications. The KG model is based on the intention of the organization to achieve a balance between dependence and power; in the creation of skills to keep the absorptive capacity of knowledge between the stakeholders, in order to carry out the improvement of its capacity for the collective good. Therefore, this is the 12th step of the CUN implementation process, that is, to develop the organization's KG model aligned to the results of the previous steps.

Finally, in the 13th step (Figure 6), the monitoring of adherence of all seven stages of the CUN guidelines

is started, which are: the increased range; the promotion of interconnection; the identification of stakeholders; the expansion of focus; the determination of the level; the use of education technology, and the center for learning and memory. In detail, these are basic guidelines of the CUN.

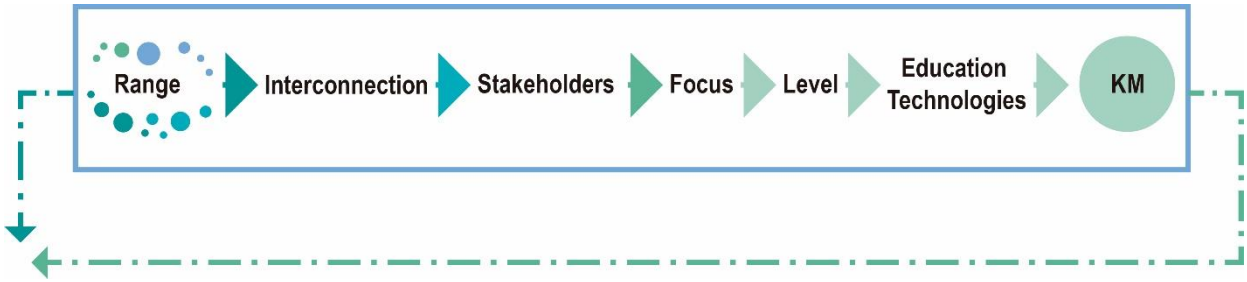


Figure 6. 13th Step of implementation process of the CUN.
Source: Elaborated by the authors.

In short, on this 13th stage, the following conditions that keep the university aligned to CUN guidelines must be analyzed, evaluated and implemented to keep the university aligned to UCR guidelines:

- Range: wide range of training, formation and qualification for collective learning including the stakeholders of the productive and social arrangements of the organizational Ecosystem and its beneficiaries.
- Interconnection: use of collaborative technologies and other tools for the promotion of integration, inclusion and interactivity of the different actors of the training – students, instructors, teachers and tutors.
- Recognition of the Stakeholders of the productive and social arrangements: recognition of the expectations and learning needs of the different stakeholders of the productive and social arrangements for the elaboration of programs that meet them. In other words, the training must propose programs that involve a wide range of internal and external network participants, recognizing the centrality of social capital development and inter-organizational relationships, in addition to human capital.
- Focus: coordinate distribution of courses and events, with a focus on task for individual efficiency improvement; on delivery, to align organizational goals with individual skills; and in the development of human capital, aimed to promoting co-creation and co-production for strategy implementation.
- Level: Programs may offer only a series of free courses, or in partnerships with academic universities, which may be recognized as university credits or rights to a diploma (undergraduate or graduate).
- Technology: Use of educational technologies for boosting and optimization of the network learning process, of knowledge creation and innovation based on relationships and interactions between the stakeholders productive and social arrangements of the organizational ecosystem, through a new generation of collaborative technologies of work and learning. Basic technologies for face-to-face mode, advancing to teaching learning virtual environments until the massive e-learning technologies.
- Knowledge management: Critical knowledge management for the strategic alignment of the operation, management and organizational strategy and network, mainly regarding the network learning, organizational memory, and knowledge retention. To prevent loss of knowledge and promote the construction of organizational memory, the content producer selection of the CUN courses, both internally

and externally, must prioritize the servers in retirement phase, so that the interested parties may retain knowledge and make it available.

If it is a strategy of organization, the CUN may be managed as a self-sustainable business unit. To reach the 13th step of the CUN, the organization has the data needed for the preparation of a university business plan, to monetize some of the educational programs, courses and events offered to external stakeholders. For the preparation of a business plan it is necessary to describe the organizational and business strategy; the expectations and interests of customers, partners, and suppliers; production process, communication and offering; description of products and services. All this knowledge has been developed at the end of the 13 stages of the implementation process of the CUN described in this article.

4. Conclusion

After analysing the different models of training, development and education offered by the scientific literature; after describing the main guidelines of the contemporary model of Corporate University - CU; after identifying the stages of evolution for the CUN model; after understanding the construction of Intellectual Capital by the Logic of Learning; after identifying the strategic fundamentals that a corporate university must develop to become a CUN, it was possible to understand the seven guidelines that must be managed for the evolution among the six stages of the CUN: Training Department, E-learning Platform, Corporate Education, Corporate University, Stakeholder University, and Corporate University in Network (Table 1), as well as to map out the steps that must be followed for the implementation of the most contemporary model, the Corporate University in Network model.

Thirteen steps were proposed for the corporate university implementation that adhering to the CUN model: I) the strategy definition of the CUN aligned with organizational strategy; II) knowledge management diagnostic of the organization; III) diagnosis of the strategic people management system; IV) mapping of individual and organizational skills to identify gaps to be developed by the CUN; V) development of the Pedagogical Political Project; VI) elaboration of educational programs, and definition of the number and contents of the courses from which it's made; VII) elaboration of terms of reference for the negotiation of partnerships with academic universities, and certification; VIII) partnerships with companies producing courses; IX) partnerships for the instrumentalization of KM; X) definition of the Complex Project Evaluation model; XI) Network Communication Model; XII) Governance of Organizational Knowledge Model; XIII) monitoring the adherence of all stages covered to the seven guidelines of the CUN.

The results of this research advance on the existing scientific knowledge, since Freire et al. (2016), the CUN model authors, did not design the model implementation process.

Therefore, following previous research, in this current work, it was possible to model the implementation process of the CUN, respecting each of the identity model guidelines (Freire et al., 2016) taking into consideration the need to attend the different expectations and stakeholder interests in the organizational ecosystem. This action answered the research purpose, which was to model the processes of implementation of the Corporate University in Network (CUN).

Also, have been defined practices, techniques and knowledge management tools to promote collaboration

and sharing of information and knowledge between the internal and external stakeholders, as the Collaborative Groups, and knowledge engineering tools to skills management. The concepts of two new terms dealt by the academy were also introduced. The first one is the concept of Corporate University in Network (CUN) as being an "intelligent environment for continuing education, not necessarily physical, which manages and institutionalizes a learning culture among all beneficiaries and participants, internal and external, of the productive and social arrangements of the organizational ecosystem. It has as a goal the co-creation and co-production of development strategy".

The second one is the concept of Knowledge Governance (which corresponds to the 12th step of the implementation model) as being "a new approach to the organizational learning that includes control and supervision, leadership, resources, processes and procedures that subsidize and promote the creation, sharing, handling, transfer, storage and dissemination of knowledge of competitive value, whether individual, group, organizational, inter-organizational or network, favoring an environment of socialization of experiences where good practices and learned lessons become the basis of new effective applications."

With the implementation model of the CUN here proposed, it will be possible to enable organizations to manage the difficulties in managing cultural, behavioral and structural changes, and the strategic alignment of technologies, partnerships and the evaluation of results, creating the path to the effective implementation of a contemporary model of corporate university.

We propose the continuation of this study from theoretical empirical research deepen each of the 13 stages of the implementation process of the CUN.

5. References

A. L. Abel, and J. LI. Exploring the Corporate University Phenomenon: development and implementation of a comprehensive survey. Human Resource Development Quartely, 23(1). Springcs, Wiley Periodic, Inc., 2012.

D. I. D. P. Albuquerque, D. J. G. Perez, M. C. S. Del-Masso, and E. T. M. Schlünzen. Elementos norteadores para orientação na Educação a Distância. Inovação e Formação - InFor, 1(1), 2015, pp. 129-143.

M. Allen (Ed.). The Corporate University Handbook e Designing, Managing and Growing a Successful Program. Amacom, New York, 2002.

A. J. Alves-Mazzotti. Relevância e aplicabilidade da pesquisa em educação. Cadernos de Pesquisa. São Paulo: Fundação Carlos Chagas/Cortez (113), 2001, pp. 39-50.

G. A. C. Antonelli, G. B. C. Cappiello, and G. A. C. Pedrini. The Corporate University in the European utility industries. Utilities Policy, 25, 2013, pp. 33 – 41.

A.C. Barros Junior. Sujeito e empresa capitalista contemporânea num impasse: entre o laço social neurótico e o perverso. Dissertação (Mestrado), São Paulo, 2009, 185 p.

N. Bobbio. Os intelectuais e o poder: dúvidas e opções dos homens de cultura na sociedade contemporânea. São Paulo: Editora da Universidade Estadual Paulista, 1997.

E. B. Campos, and P. O. Pablos. The intelectual capital statement: new challenges for managers. In: JOIA, L. A. (Ed.). Strategies for information technology and intelectual capital: challenges and opportunities. Idea Group Inc, Hersey, P. A, 2007, pp. 91-110.
J. A. Carvalho, M. P. Carvalho, M. A. M. Barreto, and F. A. Alves. Andragogia: considerações sobre a aprendizagem do adulto. Rempec - Ensino, Saúde e Ambiente, v.(1), 2010, pp. 78-90.
R.A. Cavalcanti. Andragogia: a aprendizagem nos adultos. Rev. De Clínica Cirúrgica da Paraíba, n.6, ano 4, 1999. Retrieved from http://pt.slideshare.net/Vicentana/andragogia-a-aprendizagem-nos-adultos.
M. M.Crossan, H. W. Lane, and R. E. White. An organizational learning framework: from intuition to institution. Academy of Management Review, 24(3), 1999, pp. 522-537.
F. Covatti, V. B. Trentin, and J. Fischer. Concepções e Práticas Avaliativas: Inclusão Escolar e Diversidade. In: X Congresso Nacional De Educação - Educere, E I Seminário Internacional De Representações Sociais, Subjetividade E Educação-Sirsse, com a temática: 'Formação para Mudanças, o Contexto da Educação: Políticas, Representações Sociais e Práticas', Curitiba. Editora Universitária Champagnat, 2011, pp. 3165-3178.
A. L. Fischer, F. C. C. Moraes, and W. A. C. Amorim (Org). Educação Corporativa: fundamentos, evolução e implantação de projetos. São Paulo: Atlas, 2011.
N. J. Foss. The Emerging Knowledge Governance Approach: challenges and characteristics. Organization, 14, 2007, pp. 29–52.
P. S. Freire. Engenharia da Integração do Capital Intelectual nas Organizações Intensivas em Conhecimento Participantes de Fusões e Aquisições, 2012, 354 p. Tese (Doutorado). Programa de Pós-Graduação em Engenharia e Gestão do Conhecimento. Universidade Federal de Santa Catarina. Florianópolis.
P.S. Freire, and F.J. Spanhol. O conhecimento organizacional: produto ou processo? Perspectivas em Gestão & Conhecimento, João Pessoa, v. 4(1), 2014, pp. 3-21.
P. S. Freire, K. C. B. T. Tosta, E. A. Helou Filho, and G. G. D. Silva. Memória organizacional e seu papel na gestão do conhecimento. Revista de Ciências da Administração – RCA, 14(33), 2012.
P. S. Freire, G. A. Dandolini, J. A. De Souza, A. C. Trierweiller, S. M. Da Silva, D. Sell, R. C. Dos S. Pacheco, J. L. Todesco, and A. V. SteIL. Universidade Corporativa em Rede: considerações iniciais para um novo modelo de educação corporativa. Espacios, 37(5), 2016.
S. L. Freitas, M. G. N Costa, and F. A. Miranda. Meta: Avaliação. Revista Cesgranrio. Rio de Janeiro, v. 6 (16), 2014, pp. 85-98. Retrieved from http://revistas.cesgranrio.org.br/index.php/metaavaliacao/article/viewFile/217/pdf.
C. R. M. Giroto, R. B. Poker, and S. Omote (Org.). As Tecnologias nas Práticas Pedagógicas Inclusivas. Marília: Oficina Universitária: São Paulo: Cultura Acadêmica Editora, 2012, 238 p.
A. Grandori. Governance Structures, Coordination Mechanisms and Cognitive Models. Journal of Management and Governance, 1, 1997, pp. 29-42.
G. Hamel, and C. K. Prahalad. The core competence of the corporation. Harvard Business Review, 1990, pp. 3–15. Retrieved from http://www.profrandes.com.br/wp-content/uploads/2013/03/Core-Competenceof-the-Corporation.pdf

J. Hoffmann. O jogo do contrário em avaliação. Porto Alegre: Mediação, 2005.
M. S. Knowles. Do aluno adulto. Uma espécie negligenciada. 4ª ed. Houston: Gulf Publishing, 1990.
A. R. Luria. O cérebro humano e a atividade consciente. In: L. S Vigotskii, A. R. Luria, and A. N. Leontiev (Org). Linguagem, Desenvolvimento e Aprendizagem. São Paulo: Ícone Editora da Universidade de São Paulo, 1988.
A. Margherita, and G. Secundo. The Emergence of the Stakeholder University, em Romano, Aldo. Open Business Innovation Leadership The Emergence of the Stakeholder University. Londres: Palgrave Macmillan, 30(2), 2009, pp. 170-206.
K. J. Meier, and A. Hicklin. Employee turnover and organizational performance: Testing a hypothesis from classical public administration. Journal of Public Administration Research and Theory, 18, 2007, pp. 573-590.
J. L. Morrison, and J. C. Meister. Corporate Universities: An Interview with Jeanne Meister. The Technology Source Archives at the University of North Carolina. vision july-august, 2000. Retrieved from http://technologysource.org/article/corporate_universities/.
A. T. Nicolai, and J. M. Dautwiz. Fuzziness in action: what consequences has the linguistic ambiguity of the core competence concept for organizational usage? British Journal of Management, 21(4), 2010, pp. 874-888.
B. Nooteboom. Learning by Interaction: Absorptive Capacity, Cognitive Distance and Governance. Journal of Management and Governance, 4(1), 2000, pp. 69-92.
A. Oliveira, and L. Pombo. Estratégias de ensino mediadas pelas tecnologias no modelo EduLab. Rev. Indagatio Didactica, 8(1), 2016, pp. 1-20. Retrieved from http://revistas.ua.pt/index.php/ID/article/view/3913/3597
R. Pacheco, D. Sell, A. Steil, and F. Ceci. A Revista Brasileira de Ciências Ambientais no contexto do Sistema Brasileiro de CT&I. Revista Brasileira Ciências Ambientais. 26, 2012, pp. 75-100.
M. Q. Patton. Paradigms and pragmatism. In: Fetterman, D. M. (Ed.) Qualitative approaches to evaluation in education: the silent scientifique revolution analysis. New York: Praeger, 1988.
J. J. Phillips. Corporate Universities. HRD Trends Worldwide, 1999, pp. 73-97.
R. Putnam. Tuning in tuning out: the strange disappearance of social capital in America. The 1995 Ithiel de Sola Pool Lecture. Political Science and Politics, 1995, pp. 664-683.
M. Rademakers. Corporate Universities: driving force of knowledge innovation. Journal of Workplace Learning, 17, 2005, pp. 130-136.
D. R. M. Ramos. Universidades Corporativas: possibilidades e dificuldades de sua implantação - estudo de casos. Dissertação (Mestrado). Escola Brasileira de Administração Pública e de Empresas. Fundação Getulio Vargas, 2001, 135 p.
A. Renaud-Coulon. Corporate Universities: a Lever of Corporate responsibility. Global CCU Publishing, Paris, 2008.
M. V. Rodriguez Y Rodriguez. Fatores críticos para a implantação de uma Universidade Corporativa. 10º Convirh – Congresso Virtual de RH, 2016. Retrieved

from http://www.rh.com.br/Portal/Desenvolvimento/Artigo/3174/fatores-criticos-para-a-implantacao-de-uma-Universidade-corporativa.html#

M. P. Santos. O Papel do Ensino Superior na Proposta de uma Educação Inclusiva. Revista Movimento – Revista da Faculdade de Educação da UFF, n. 7, may 2003, pp. 78-91.

G. G Serra. Pesquisa em arquitetura e urbanismo: guia prático para o trabalho de pesquisadores em pós-graduação. São Paulo: EdUSP, 2006.

D. J. Teece. Managing Intellectual Capital. Oxford University Press, Oxford, 2000.

D. J. Teece. Dynamic capabilities & strategic management. Oxford: Oxford University Press, 2009.

L. S. Vygotsky. A formação social da mente. 7. ed. São Paulo: Martins Fontes, 2007.

K. Xie, and F. Ke. The role of students' motivation in peermoderated asynchronous online discussions. British Journal of Educational Technology, 6(42), 2011, pp. 916-930.

J.P. Walsh, and G.R. Ungson. Organizational memory. Academy of Management Review, 16(1), 1991, pp. 57-90.

A Scenario-Based Methodology for Cloud Computing Security Risk Assessment

Prof. Hany Ammar, Ishraga Mohamed Ahmed Khogali

Abstract

Cloud computing has been one of the major emerging technologies in recent years. However, for cloud computing, the risk assessment become more complex since there are several issues that likely emerged [1]. In this paper we survey the existing work on assessing security risks in cloud computing applications. Existing work does not address the dynamic nature of cloud applications and there is need for methods that calculate the security risk factor dynamically. In this paper we use the National Institute of Standards and Technology (NIST) Risk Management Framework and present a dynamic scenario-based methodology for risk assessment. The methodology is based using Bayesian networks to estimate likelihood of cloud application security failure which enable us to compute the probability distribution of failures over variables of interest given the evidence. We illustrate the methodology using two case studies and highlight the significant risk factors. We also show the effect of using security controls in reducing the risk factors.

1. Introduction

Cloud computing is a new technology that provide real promise to business with real advantages in term of cost and computational power. Cloud computing depends on complex architectures that allow providers to deliver different services in different models such as software-as-a-service (SaaS), which allows cloud customers to process and use licensed software on the cloud providers' resources only. The cloud services can also be provided as platform-as-a-service (PaaS) which lets the consumers to rent only a platform that gives more control to the consumer to configure it as needed. The last model is infrastructure-as-a-service (IaaS), which provides the consumers with a complete infrastructure where they deploy different machines and storage resources[1].

However, it's important to consider security and data protection when it comes to widespread cloud adoption [2] because cloud computing raises severe security concerns that existing in traditional system as well as issues that appear to be specific to that domain. Although most of these concerns are not new, already exist in traditional IT environment, they need more consideration because of the dynamic nature of cloud computing platform. The National Institute of Standards and Technology (NIST) defines the IT risk as "the net mission impact considering (1) the probability that a particular threat-source will exercise (accidentally trigger or intentionally exploit) particular information system vulnerability and (2) the resulting impact if this should occur" [1].

Security risk assessment is aim at examining possible threats, vulnerabilities, the likelihood and impact of them [3] to define appropriate controls for reducing or eliminating the risks [4].

However, Cloud computing encompasses new technologies such as virtualization and there are both new risks to be determined and old risks to be re-evaluated and mitigated [5]. Moreover, cloud-computing environment is dynamic that make the traditional assessments developed for conventional IT environments do not readily fit it. Therefore, there are need to dynamic risk assessment method where frequent updates of risk evaluation information are used to evaluate risk exposure, as close as possible to real-time [6].
Hence, the introduction of cloud specific security risk assessment methodology that fit the dynamic nature of the cloud has significant importance and scope. Recently, several studies have been conducted to improve traditional security risk assessment techniques and present new paradigms for analyzing and evaluating security risks in cloud environment. However, it is still challenge and a growing area of research to find security risk assessment method for cloud environment [3].

1.1. Bayesian Networks

IN recent years, Bayesian Networks (BNs) have become increasingly recognized as a potentially powerful solution to complex risk assessment problems [7]. BNs have been widely used to represent full probability models in a compact and intuitive way. In the BN framework, the independence structure in a joint distribution is characterized by a directed acyclic graph, with nodes representing random variables and directed arcs representing causal or influential relationships between variables [7]. If the variables are discrete, then the conditional probability distributions (CPDs) CPDs can be represented as node probability tables (NPTs), which list the probability that the child node takes on each of its different values for each combination of values of its parents[7]. BNs offer the advantage of being able to reason in the presence of uncertainty, prior assumptions, and incomplete data [8].
Further, they are able to learn from evidence in order to update their prior beliefs. Similarly, BN models do not just predict a single value for a variable; they predict its probability distribution. By taking the marginal distributions of variables of interest, we get a ready-made means of providing quantitative risk assessment [8].

The remainder of this paper is organized as follows: In Section 2, we will present the related work. In Section 3, we will present our security risk assessment method for cloud environment. In Section 4, we will present motivating examples (Ecommerce application and hybrid Live VM migration scenario) to explain our method more.

2. Related Work

As we will see in this section there are several work towards risk assessment in cloud computing environment have been presented in the literature.
In [9] Daniele et al.(2009) proposed to estimate the level of risk based on the likelihood of an incident scenario, mapped against the estimated negative impact. The likelihood of an incident scenario is given by a threat exploiting vulnerability with a given likelihood. The likelihood of each incident scenario and the business impact was determined in consultation with the expert group contributing to this report, drawing on their collective experience. In cases where it was judged not possible to provide a well founded

estimation of the likelihood of an occurrence, the value is N/A. In many cases the estimate of likelihood depends heavily on the cloud model or architecture under consideration. However, there method is not quantitive and the estimation of risk levels is based on ISO/IEC 27005. One of the most important recommendations of their report is a set of assurance criteria designed to assess the risk of adopting cloud services. A fully quantitative risk assessment framework would further improve this methodology [12].

In [10] Amit Sangroya et al. (2010) present approach that can be primarily used by the perspective cloud users before putting their confidential data into a cloud. It is easily adaptable for automation of risk analysis. However, they define variables that can be used where there are some past statistics about the service provider [10]. The most obvious finding to emerge from this study is that, there is a need of better trust management framework and there is a lack of structured analysis approaches that can be used for risk analysis in cloud computing environments.

Xuan Zhang et al. (2010) in [11] present information risk management framework that provides better understanding for critical areas of focus in cloud computing environment, to identifying a threat and identifying vulnerability. It is covering all the cloud service models and cloud deployment models. Cloud providers can apply this framework to their organizations to do risk mitigation [11]. However, the risk assessment in this paper is mainly qualitative and not quantitative.

Prasad Saripalli et al. (2010) in [12] present a Quantitative risk and impact assessment framework (QUIRC), to assess the security risks associated with cloud computing platforms. The advantages of the QUIRC methodology are as follows. A quantitative approach gives vendors, customers and regulation agencies the ability to comparatively assess the relative robustness of different cloud vendor offerings and appr oaches in a defensible manner. It also can be helpful in alleviating the considerable FUD (Fear, Uncertainty and Doubt) associated with cloud platform security issues and assure that they are dealing with these issues in an effective way [12]. However, the limitations of the approach include the large amount of input information on meticulous collection of input data and probabilities of events, which requires collective industry SME inputs [12]. Moreover, this framework does not cover risks during all the stages of the lifecycle of the service when it exists on the cloud [13].

Burton S. Kaliski et al. (2010) in [14] introduced risk assessment as a service. Risk assessment as a service is a new paradigm for measuring risk as an autonomic method that follows the on-demand, automated, multi-tenant architecture of the cloud – a way to get a continuous "risk score" of the cloud environment with respect to a given tenant, a specific application, or more generally, for use by new tenants and applications [14]. They proposed a cloud-based *assessment as a service* paradigm as a promising alternative. However, they did not implement such a service but rather offer a general paradigm to be followed [14]. As well as they do not suggest method to calculate risk score.

Afnan Ullah et al. (2012) in [15] propose a methodology for performing security risk assessment for cloud computing architectures presenting some of the initial results. They consider the deployment and operation stages in the cloud lifecycle. Deployment stage where the initial placement of services on cloud providers, and the service operation stage where cloud resources and data managed by the cloud provider to fulfill the Service Level Objectives. However, at the operation stage, along with the calculated security risk for this

stage, the risk assessment tool will be interacting with the monitoring database and additional tools like a network and historical database to monitor if certain threats are becoming live [15].This work considers the three security requirement for information systems (Confidentiality, Integrity and Availability), but they do not consider other security requirements that are unique to cloud platforms such as (multi-party trust considerations, mutual auditability and Usability). Their future work include testing this system on a cloud platform with monitoring agents installed which will log certain threats when they occur. This will then be extended to determine threats which may be eventually occur based on the data being collected and difficult to determine directly from the events [15].

In [16] Saadia et al.(2015) proposed a new risk assessment method in which the measure of an IT risk can be determined as a product of threat, vulnerability and asset values. Where the asset value of each cloud actor is the average of the weight of confidentiality, availability and integrity ; the vulnerabilities value for each cloud actor specified basing on the absence or ineffectiveness of controls; threat value is calculated as product of probability of occurrence and the impact where each threats is mapped to indicative number of vulnerabilities and assets. However, the risk value will be depend on the actor and their corresponding assets, their security objectives and their corresponding vulnerabilities. To improve the architecture and consolidate the security risk assessment for cloud computing multi-agent systems can be used. [16].

In [17] Shareeful et al. (2017) presents a risk management framework that enables users to identify risks, based on the relative importance of the migration goals for specific migration scenarios and analyzed the risks with a semi-quantitative approach. They use the analytic hierarchy process (AHP) where each goal is compared with the other goals based on its importance level within the organizational context for the cloud migration. The net risk calculation depends on the associated risk factor values. Each risk factor value is estimated through the product of its probability and impact of overall risk. However, they use subjective judgment depending on individual perception for defining probability and impact values. The risk value is obtained by averaging the risk factors' values. Finally, the net risk level is the sum product of risk level and relative importance of affected migration goal. However, if the number of goals were to increase, the net risk level estimation would be more complex[17]. They are currently working on defining a guideline for risk management activities along with a checklist so that the framework could provide better hands-on support to potential cloud users. They are also planning to develop migration goals and a risk taxonomy and integrate it with the guidelines.

In [3], Fatimah M. Alturkistani et al. present a classification of cloud-based security risk assessment methods and tools. They suggests to have a collaborative security risk assessment method where the assessment is conducted in collaboration between customers and providers. They argue that this will add great assistance to both service providers and consumers alike.

In table 1 we summarize those related work with the technique suggested in them ,their problems and the model or tool proposed in it. However, [14] is just a paradigm to be followed. [9] is semi-quantitative. [10] need past statistics about the service provider. [11] does not cover risks during all the stages of the lifecycle of the service when it exists on the cloud. [15] do not consider other security requirements that are unique to cloud platforms. [16] the risk value will be depend on the actor.[17] use subjective judgment depending

on individual perception for defining probability and impact values. Moreover, none of them are dynamic to fit the dynamic nature of the cloud computing environment.

Table 1: Summary of the related works.

Lit. Ref	Context of Research	Technique Used	Problems	Model/ Tool/ Proposed
9	Security risk assessment method for cloud computing	Likelihood of an incident scenario, mapped against the estimated negative impact.	-Semi-quantitative [4]. -The estimation of risk levels is based on ISO/IEC 27005.	-Framework include additional standards. -Set of assurance criteria designed to assess the risk of adopting cloud services. - A fully quantitative risk assessment framework [12].
10	Risk analysis approach that can be primarily used by the perspective cloud users.	Build a trust matrix to analyze the data risk.	The variables have been defined in this method can be used where there are some past statistics about the service provider. A lack of structured analysis approaches that can be used for risk analysis in cloud computing environments.	Better trust management framework.
11	Information risk management framework	The Risk assessment step have four major processes (Likelihood Determination, Impact Analysis, Risk Determination according to Risk Scale, and Control Recommendations).	Risk assessment in this paper is not quantitative.	-

12	Quantitative risk and impact assessment framework (QUIRC)	Security risk under each Security Objective category would be average over the cumulative, weighted sum of n threats that map to that SO category and assign a weight for each of the SO categories. Then, Net Security Risk (R) to the application integrated over the SO is a weighted average.	This framework requires the careful collection of input data for Probabilities of events. Moreover, it does not cover risks during all the stages of the cloud lifecycle [13].	-
14	Risk assessment as a service	It is a paradigm to be followed.	No implementation as well as there are no method suggested to calculate risk score.	The dynamic assessment service
15	Methodology for performing security risk assessment for cloud computing architectures.	A number of stages have identified for performing a complete risk assessment (High level analysis of the system, Identifying the assets involved, Identify the threats in each cloud deployment scenario, High-level analysis of each threat, Risk Evaluation using evaluation matrix, and Risk Treatment).	They consider the three security requirement for information systems but they do not consider other security requirements that unique to cloud platforms.	Testing this system on a cloud platform with monitoring agents installed which will log certain threats when they occur.
16	Comprehensive and shared risk assessment method for cloud computing	Risk determined as a product of threat, vulnerability and asset values.	The risk value will be depend on the actor and their corresponding assets, their security objectives and their corresponding vulnerabilities.	-Use Multi-agent systems to improve the architecture and consolidate the security risk assessment for cloud computing.

17	A risk management framework for cloud migration decision support	Identify risks based on the relative importance of the migration goals for specific migration scenarios and analyzed the risks with a semi-quantitative approach.	-They use subjective judgment depending on individual perception for defining probability and impact values.	- Guideline for risk management activities along with a checklist. - Develop migration goals and a risk taxonomy and integrate it with the guidelines.

3. Proposed Method for Security Risk Assessment for Cloud Computing

Our dynamic method for risk assessment is depend on the National Institute of Standards and Technology (NIST) Special Publication (SP) 800- 30 which is a comprehensive framework that defines a set of risk assessment activities in nine steps [18] which explained in figure 1 .In addition, we will use a Bayesian network in likelihood determination step (step5). Therefore we will go through the following steps:

STEP 1: SYSTEM CHARACTERIZATION

In this step, the boundaries of the IT system are identified, along with the resources and the information that constitute the system. Therefore, output from this step will be a good picture of the system environment, and delineation of system boundary [18].

STEP 2: THREAT IDENTIFICATION

The goal of this step is to identify the potential threat-sources and compile a threat statement listing potential threat-sources that are applicable to the IT system being evaluated. Therefore, output from this step will be a threat statement containing a list of threat-sources that could exploit system vulnerabilities [18].

STEP 3: VULNERABILITY IDENTIFICATION

The goal of this step is to develop a list of system vulnerabilities (flaws or weaknesses) that could be exploited by the potential threat-sources. Therefore, output from this step will be a list of the system vulnerabilities (observations) that could be exercised by the potential threat-sources [18].

STEP 4: CONTROL ANALYSIS

The goal of this step is to analyze the controls that have been implemented, or are planned for implementation, by the organization to minimize or eliminate the likelihood (or probability) of a threat's exercising a system vulnerability [18]. Therefore, output from this step: List of current or planned controls used for the IT system to mitigate the likelihood of a vulnerability's being exercised and reduce the impact of such an adverse event [18].

STEP 5: LIKELIHOOD DETERMINATION

To derive an overall likelihood rating that indicates the probability that a potential vulnerability may be exercised within the construct of the associated threat environment. Therefore, output from this step will be Likelihood rating [18].

In this step, we will use Bayesian network model since it is enable to compute the posterior probability distribution of some variables of interest (unknown parameters and unobserved data) conditioned on some other variables that have been observed. Our methodology for developing scenario based Bayesian network as follows:

5.1 Identifying the important system interaction event.

5.2 Establishing the links between them.

5.3 Assigning states and probabilities to each event state (i.e. The conditional probabilities for the states of each child node are specified for all combinations of states of their parent nodes). The estimation of probabilities associated with each state can be elicited from experts, learned from data or a combination of these [19].

5.4 Testing diagnostic to find probabilities for intended state.

5.5 Measure the probabilities when set evidence base on given information.

To conducting these steps, we will use Genie tool.

STEP 6: IMPACT ANALYSIS

To determine the adverse impact resulting from a successful threat exercise of a vulnerability. Therefore, output from this step will be magnitude of impact [18] .

In this step we will depend on current FMECA severity categories for U.S. Federal Aviation Administration (FAA), NASA and European Space Agency space applications .

Table 2: FMECA Severity Categories [20].

Category	Description	Criteria
I	Catastrophic	Could result in death, permanent total disability, loss exceeding $1M, or irreversible severe environmental damage that violates law or regulation.
II	Critical	Could result in permanent partial disability, injuries or occupational illness that may result in hospitalization of at least three personnel, loss exceeding $200K but less than $1M, or reversible environmental damage causing a violation of law or regulation.
III	Marginal	Could result in injury or occupational illness resulting in one or more lost work day(s), loss exceeding $10K but less than $200K, or mitigatible environmental damage without violation of law or regulation where restoration activities can be accomplished.
IV	Negligible	Could result in injury or illness not resulting in a lost work day, loss exceeding $2K but less than $10K, or minimal environmental damage not violating law or regulation.

STEP 7: RISK DETERMINATION

The purpose of this step is to assess the level of risk to the IT system.The final determination of mission risk is derived by multiplying the ratings assigned for threat likelihood (e.g., probability) and threat impact [18]. Therefore, risk define as:

Risk = Probability x Impact

Therefore, the decision maker can predict the risk, where the risk of each node is calculated and the node with maximum risk value have to given more attention and high priority to add control for it.

STEP 8: CONTROL RECOMMENDATIONS

The goal of the recommended controls is to reduce the level of risk to the IT system and its data to an acceptable level . Therefore, output from this step is recommendation of control(s) and alternative solutions

to mitigate risk [18] .

STEP 9: RESULTS DOCUMENTATION

Once the risk assessment has been completed (threat-sources and vulnerabilities identified, risks assessed, and recommended controls provided), the results should be documented in an official report or briefing . Therefore, output from this step is risk assessment report that describes the threats and vulnerabilities, measures the risk [18].

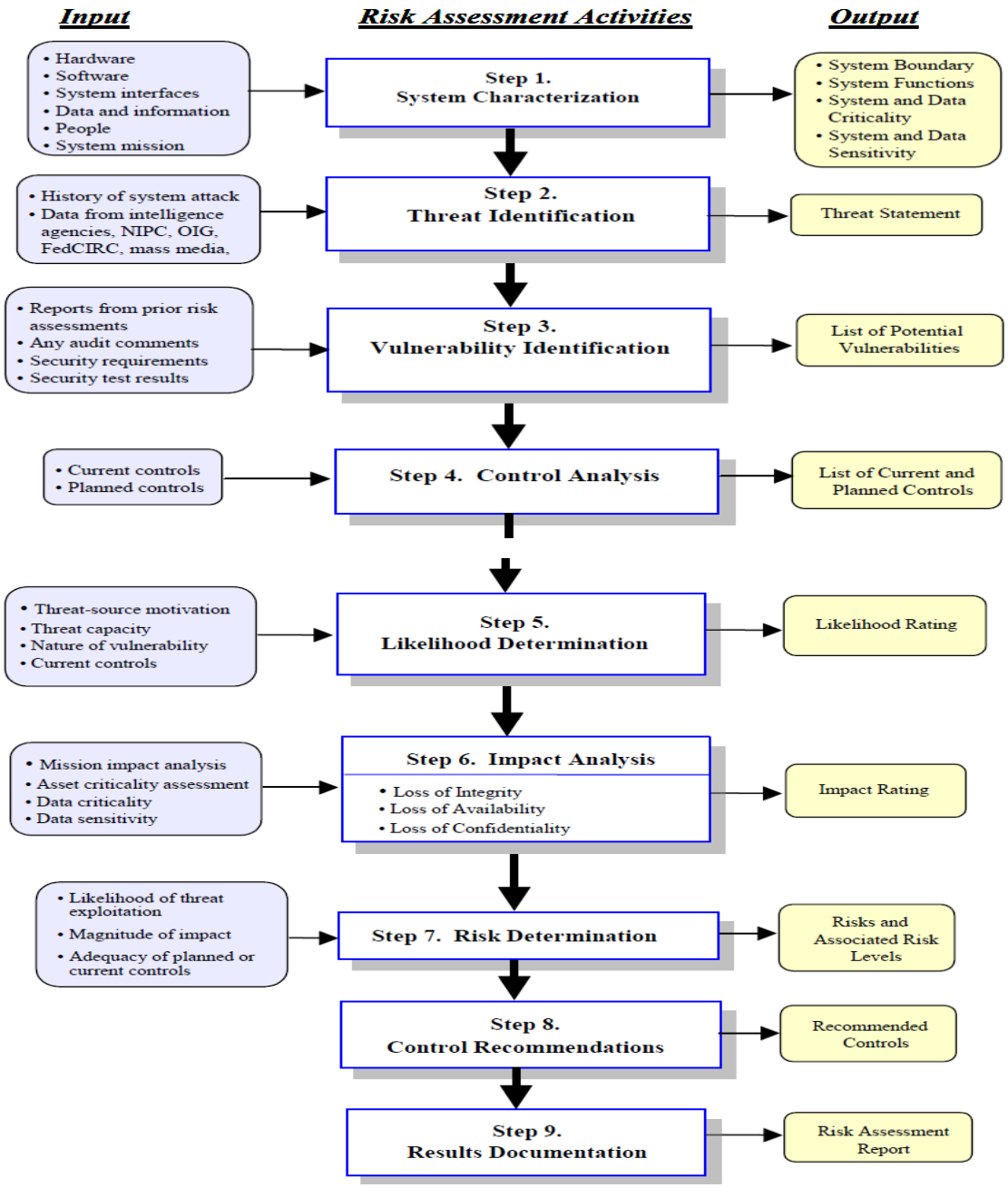


Figure 1: NIST Risk Assessment Methodology Flowchart [18]

4. Motivating Examples (case studies)

Our method will be based on specific scenario so we will explain every step on our method using two case

studies in the following two subsections.

4.1. First Motivating Example (Ecommerce application):

Ecommerce on Cloud Computing is the specific application making good use of the cloud technology application in the business field, taking effective use of resources and reduce costs [21].For some e-commerce companies, entrusting the work to the third party contains some elements of risks. Going too much, the risks may be greater than the benefits for the business. Therefore, our first case study will be security risk assessment in buy book scenario for e-commerce in cloud computing environment. In the following we will explain our method using the buy book scenario for e-commerce application in cloud computing environment :

STEP 1: SYSTEM CHARACTERIZATION

We begin by explaining the buy book scenario for e-commerce in cloud computing environment using a sequence diagram in figure 2 to give good picture of the system.

STEP 2: THREAT IDENTIFICATION

We explained the potential threat for each event in the buy book scenario in figure 2.

STEP 3: VULNERABILITY IDENTIFICATION

The common cloud computing security vulnerabilities is:

- Insecure Coding

Injection Flaws, Cross-site Scripting (XSS), Cross-site Request Forgery (CSRF) , Buffer Overflows , Weak Authentication and/or Session Credentials .

- Security Misconfigurations [23]
- Unauthorized access to management interface.
- Internet protocol vulnerabilities.
- Data recovery vulnerability.
- Metering and billing evasion [24].

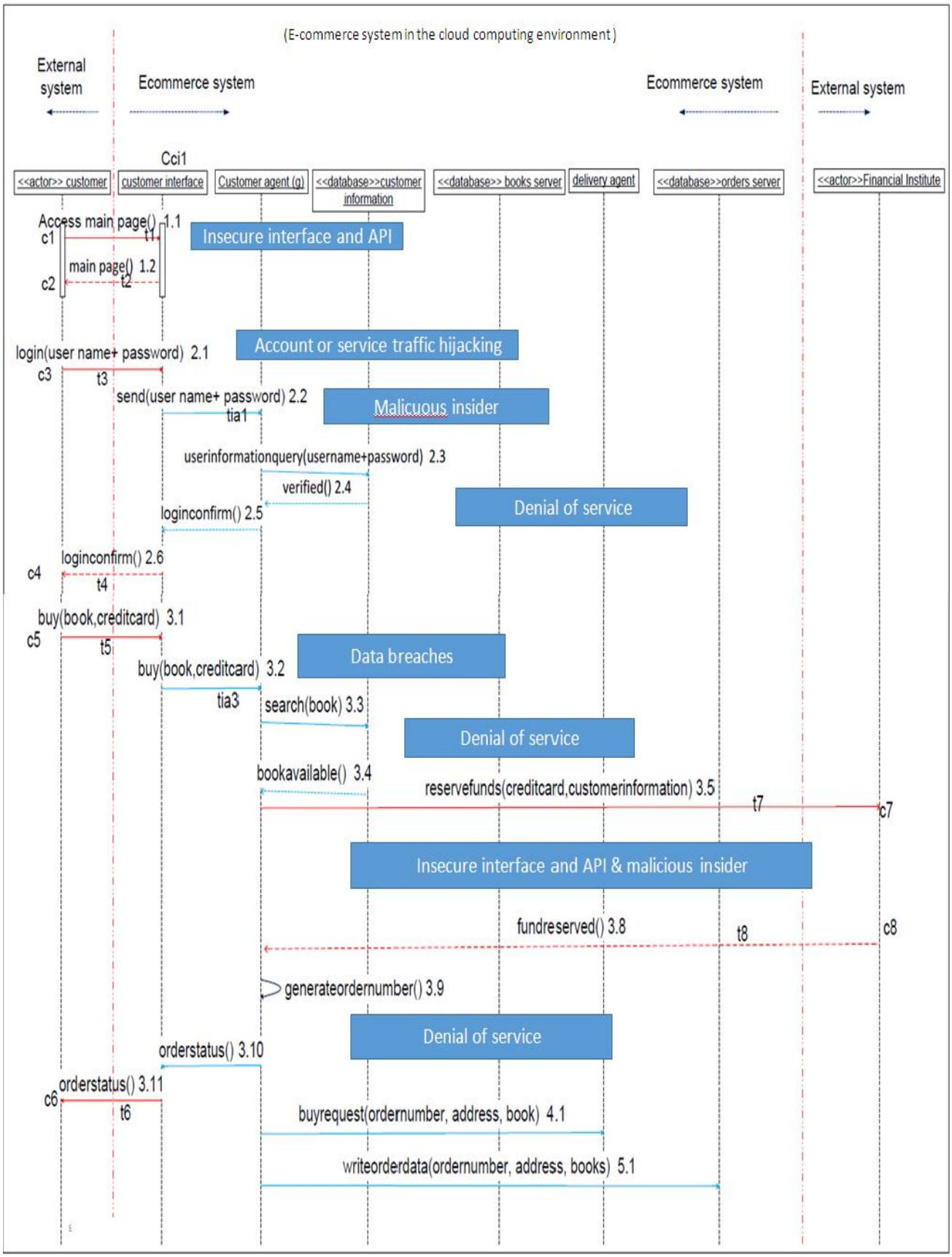


Figure.2. Sequence diagram of the buy book scenario [22]

STEP 4: CONTROL ANALYSIS

The detail to be asked to analyze control used for securing the system in the cloud computing environment include the following:

- The physical security and mechanical robustness of the datacenters
- Controls used to commission and decommission equipment within the datacenter, including hardware security controls such as hardware encryption devices
- Network operations and security features, including firewalls, protection against distributed denial of service (DDoS) attacks, integrity, file/log management, and antivirus protection.
- Basic IT controls and policies governing personnel, access, notification of administrator intervention, levels of access, and logging of access events [25].

STEP 5: LIKELIHOOD DETERMINATION

In this step, we will use Bayesian network model so we developed Bayesian network for the buy book scenario for e-commerce in cloud computing environment with states for each node which explained in figure 3 with some probabilities tables contain probability that we assume for each state.

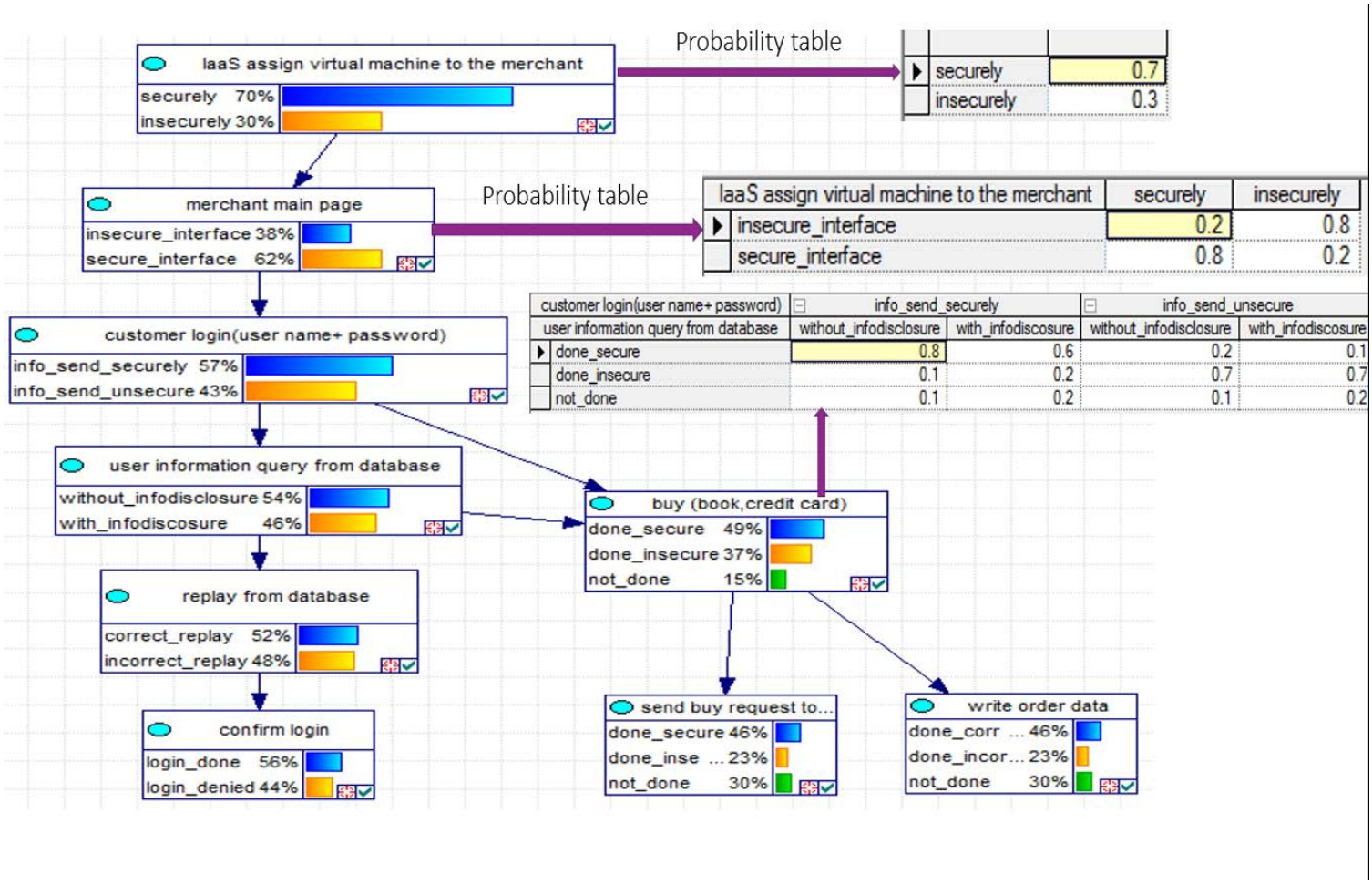


Figure. 3. Bayesian network for the buy book scenario.

In figure 4, we explain the diagnostic analysis for the Bayesian network for the buy book scenario by

selecting some state of the event and see their probability.

Ranked Targets	Probability
replay from database:incorrect_replay	0.483
user information query from database:with_infodiscosure	0.457
confirm login:login_denied	0.438
customer login(user name+ password):info_send_unsecure	0.428
merchant main page:insecure_interface	0.380
buy (book,credit card) :done_insecure	0.368
send buy request to delivery agent:not_done	0.305
write order data:not_done	0.305
IaaS assign virtual machine to the merchant:insecurely	0.300
send buy request to delivery agent:done_insecure	0.233
write order data:done_incorrectly	0.233
buy (book,credit card) :not_done	0.146

Figure 4: Testing diagnostic result for buy book scenario.

When set evidence base on given information we will notice the change in the probabilities for each state of the events. For example, for the buy book scenario in the customer login event if the evidence set to customer info sent insecurely, it will lead to change in the probability of states of all nodes as explained in figure 5.

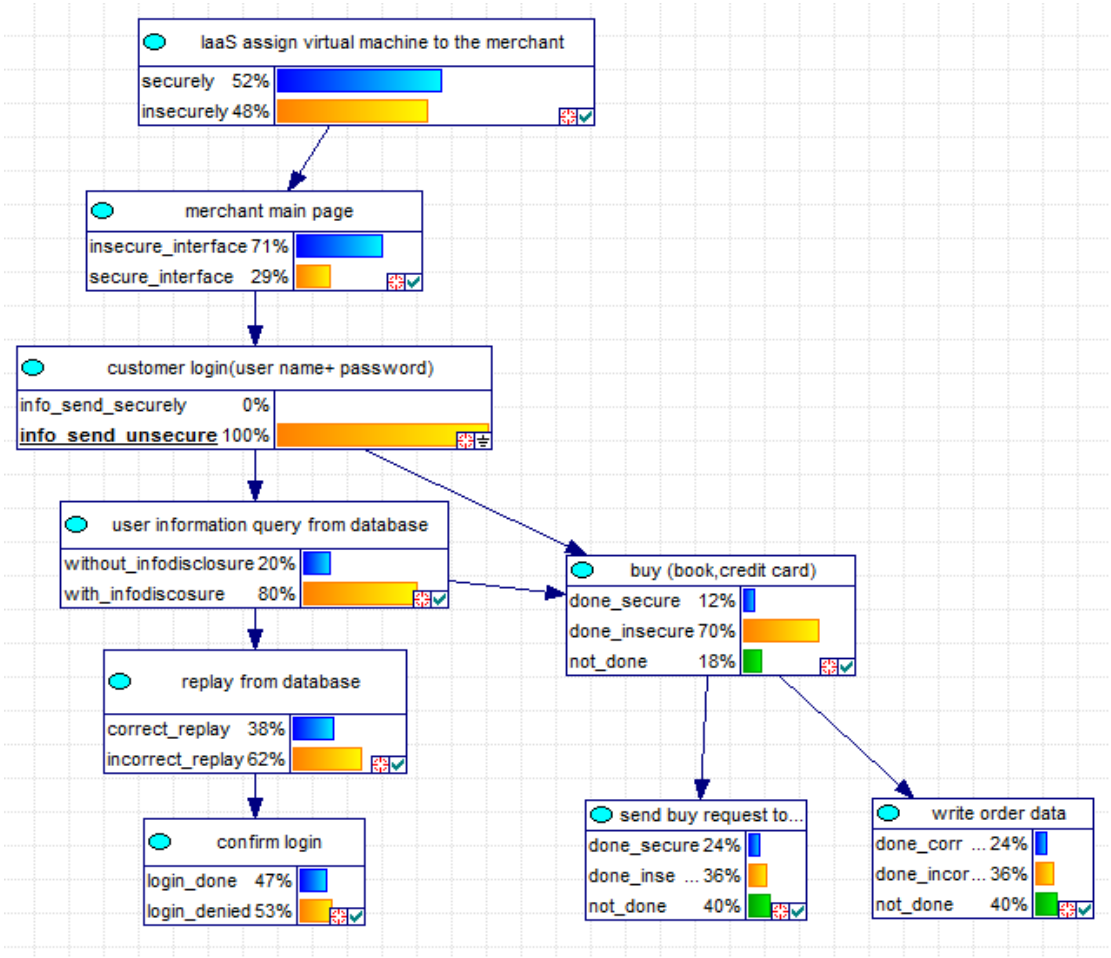
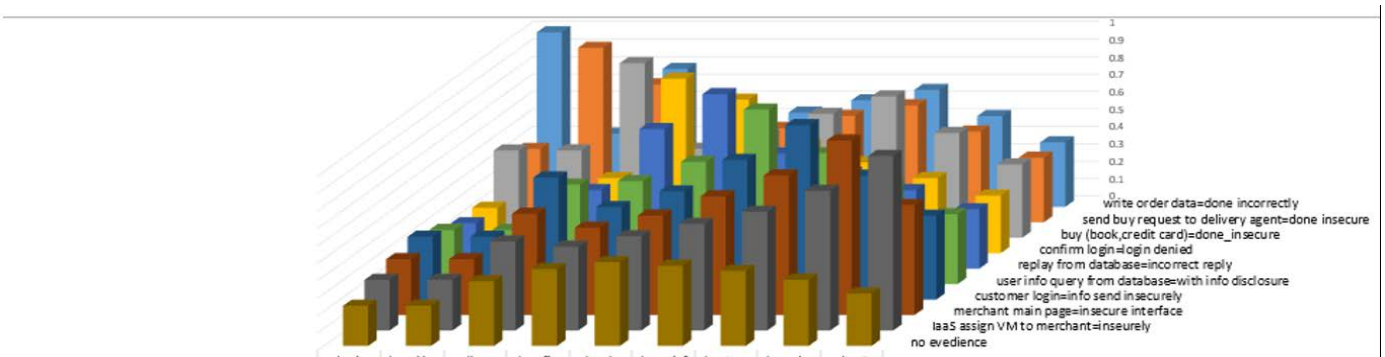


Figure. 5. Bayesian network when customer info send unsecure for the buy book scenario.

By this way we can see if we change the probability of insecurity for any event the related changes in the posterior probabilities for each events after setting evidence.

In figure 6 at the first row we explain the probability for the all events to be unsecure without setting for any evidence then we see each time if we set the evidence for one of the event to be done unsecure and observing the related changes in the posterior probabilities for other events. Therefore, at the second row we see if we set the evidence for the IaaS assign VM to merchant event to insecurely. Then the third row explain if we set evidence for the merchant main page to insecure interface and so on.



	p(write order data):done incorrectly	p(send buy request to delivery agent):done insecure	p(buy (book,credit card)):done insecure	p(confirm login):login denied	p(replay from database): incorrect reply	p(user info query from database): withinfo disclosure	p(customer login):info send unsecurely	p(merchant main page):insecure interface	p(IaaS assign VM to merchant) :inseurely
no evedience	0.23	0.23	0.37	0.44	0.48	0.46	0.43	0.38	0.3
IaaS assign VM to merchant=inseurely	0.29	0.29	0.51	0.48	0.54	0.61	0.68	0.8	1
merchant main page=insecure interface	0.32	0.32	0.58	0.5	0.57	0.68	0.8	1	0.63
customer login=info send insecurely	0.36	0.36	0.7	0.53	0.62	0.8	1	0.71	0.48
user info query from database=with info disclosure	0.31	0.31	0.57	0.59	0.7	1	0.75	0.57	0.4
replay from database=incorrect reply	0.26	0.26	0.45	0.8	1	0.66	0.55	0.45	0.34
confirm login=login denied	0.26	0.26	0.43	1	0.88	0.62	0.52	0.43	0.33
buy (book,credit card)=done_insecure	0.5	0.5	1	0.51	0.59	0.71	0.81	0.6	0.42
send buy request to delivery agent=done insecure	0.42	1	0.79	0.48	0.54	0.61	0.67	0.52	0.37
write order data=done incorrectly	1	0.42	0.79	0.48	0.54	0.61	0.67	0.52	0.37

Figure 6: The probability of insecurity for each event with the related changes in the posterior probabilities for each event after setting evidence.

STEP 6: IMPACT ANALYSIS

For the buy book scenario we determine the impact resulting from a successful threat in the following table that explain each event with it is severity (Impact).

Table 3. The impact resulting from a successful threat for each event in the buy book scenario.

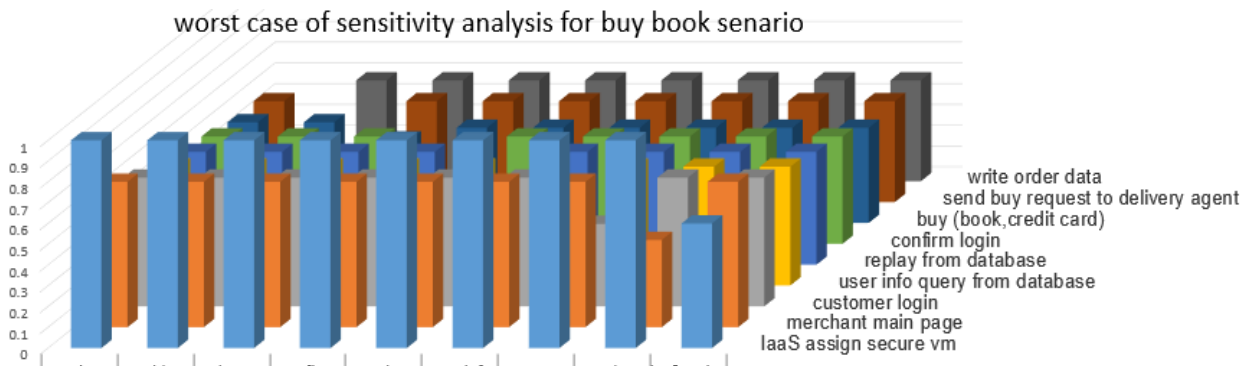
Event	Threat	Effect on system	Severity
IaaS assign VM to merchant	Insecure VM assigned to merchant	Deal with infected VM	Catastrophic
Access main page	Insecure main page accessed	Deal with another website (hacker web site)	Critical
Login :send (user name +password) to customer agent	Insecure sending	User name and password disclosed	Critical

user information query from database	Information disclosure	User name and password disclosed	Critical
replay from database	database don't work correctly or denial of service attack is done and reply not done correctly	Service denied	Significant
confirm login	denial of service attack is done and confirmation not done	Service denied	Significant
buy (book , credit card)	Insecure sending	credit card disclosed	Catastrophic
send buy request to delivery agent	Insecure sending	Buy request updated	Critical
write order data	Inconsistent database	System inconsistent	Critical

Risk Scale: Catastrophic (.95); Critical (.75); Marginal (.5)

If the severity of events not known we can use value for severity from sensitivity analysis results which enable us to see the impact of each event on the other events.

We explain in figure 7, the worst case of sensitivity analysis result for the Bayesian network, which we constructed for buy book scenario.As we can see from the figure , the first event IaaS assign VM to merchant affecting on all event by 100% percent so it have to given more priority to add control methods for it to be more secure. Then, the merchant main page security affecting on all event after it by .7 so it have to given the second level of priorty. Then, the customer login effect on all event after it by .62 so it have to give the third level of priority and so on.



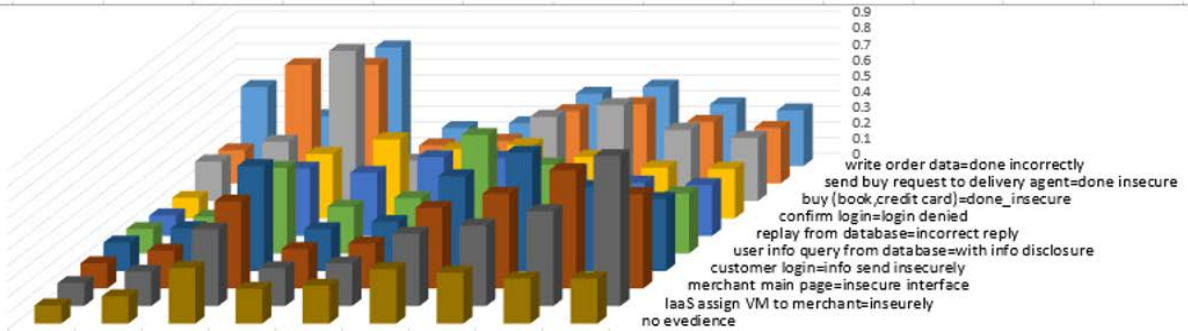
	write order data	send buy request to delivery agent	buy (book,credit card)	confirm login	replay from database	user info query from database	customer login	merchant main page	IaaS assign VM to merchant
IaaS assign secure vm	1	1	1	1	1	1	1	1	0.6
merchant main page	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.42	0.7
customer login	0.62	0.62	0.62	0.62	0.62	0.62	0.397	0.62	0.62
user info query from database	0.572	0.572	0.572	0.572	0.572	0.229	0.572	0.572	0.572
replay from database	0.543	0.543	0.543	0.543	0.38	0.543	0.543	0.543	0.543
confirm login	0.517	0.517	0.517	0	0.517	0.517	0.517	0.517	0.517
buy (book,credit card)	0.485	0.485	0.402	0.458	0.458	0.458	0.458	0.458	0.458
send buy request to delivery agent	0.486	0	0.486	0.486	0.486	0.486	0.486	0.486	0.486
write order data	0	0.486	0.486	0.486	0.486	0.486	0.486	0.486	0.486

Figure. 7. Bayesian network sensitivity analysis results for the buy book scenario

STEP 7: RISK DETERMINATION

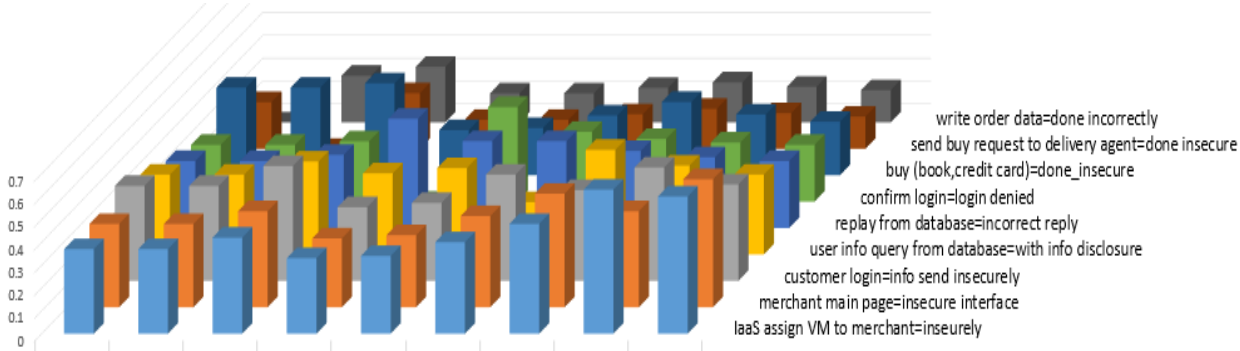
For the buy book scenario the result after we calculating the value of risk by multiplying the ratings assigned for event likelihood (e.g., probability) and its impact to assess the of risk of every event on the other event is explained in figure 8.

As we can see from figure 8 at the first row we explain the probability for the all events to be insecure without setting for any evidence. Then we see each time if we set the evidence for one of the event to be done insecure and observing the related changes in the posterior probabilities for other events. Therefore, at the second row we see if we set the evidence for the IaaS assign VM to merchant event to be done insecurely. As we notice the most event affected is the event that merchant main page to be insecure interface by .6 percent and so on. In addition we can see the prior probabilities for other events if we set the evidence. For example, if we set evidence the buy book event done insecurely this mean in the customer login event info was sent insecurely by .6 percent and so on.



	write order data:done incorrectly	send buy request to delivery agent:done insecure	buy (book,credit card)):done insecure	confirm login:login denied	replay from database: incorrect reply	user info query from database: withinfo disclosure	customer login:info send unsecurely	merchant main page:insecure interface:	IaaS assign VM to merchant inseurely
no evedience	0.115	0.1725	0.3515	0.22	0.24	0.345	0.3225	0.285	0.285
IaaS assign VM to merchant=inseurely	0.145	0.2175	0.4845	0.24	0.27	0.4575	0.51	0.6	0.95
merchant main page=insecure interface	0.16	0.24	0.551	0.25	0.285	0.51	0.6	0.75	0.5985
customer login=info send insecurely	0.18	0.27	0.665	0.265	0.31	0.6	0.75	0.5325	0.456
user info query from database=with info disclosure	0.155	0.2325	0.5415	0.295	0.35	0.75	0.5625	0.4275	0.38
replay from database=incorrect reply	0.13	0.195	0.4275	0.4	0.5	0.495	0.4125	0.3375	0.323
confirm login=login denied	0.13	0.195	0.4085	0.5	0.44	0.465	0.39	0.3225	0.3135
buy (book,credit card)=done_insecure	0.25	0.375	0.85	0.255	0.295	0.5325	0.6075	0.45	0.399
send buy request to delivery agent=done insecure	0.21	0.75	0.7505	0.24	0.27	0.4575	0.5025	0.39	0.3515
write order data=done incorrectly	0.5	0.315	0.7505	0.24	0.27	0.4575	0.5025	0.39	0.3515

Figure 8: The risk of each event with the related change after setting evidence based on probability of insecurity and severity we specified for each event.



	write order data=done incorrectly	send buy request to delivery agent=done insecure	buy (book,credit card)=done_insecure	confirm login=login denied	replay from database=incorrect reply	user info query from database=with info disclosure	customer login=info send insecurely	merchant main page=insecure interface	IaaS assign VM to merchant=inseurely
IaaS assign VM to merchant=inseurely	0.37	0.37	0.42	0.33	0.34	0.4	0.48	0.63	0.6
merchant main page=insecure interface	0.364	0.364	0.42	0.301	0.315	0.399	0.497	0.42	0.56
customer login=info send insecurely	0.4154	0.4154	0.5022	0.3224	0.341	0.465	0.397	0.496	0.4216
user info query from database=with info disclosure	0.34892	0.34892	0.40612	0.35464	0.37752	0.229	0.4576	0.38896	0.34892
replay from database=incorrect reply	0.29322	0.29322	0.32037	0.47784	0.38	0.3801	0.33666	0.30951	0.29322
confirm login=login denied	0.24816	0.24816	0.26367	0	0.4136	0.30503	0.27401	0.2585	0.24816
buy (book,credit card)=done_insecure	0.38315	0.38315	0.402	0.19694	0.2061	0.26106	0.3206	0.26564	0.23358
send buy request to delivery agent=done insecure	0.20412	0	0.243	0.12636	0.12636	0.15066	0.17496	0.15552	0.14094
write order data=done incorrectly	0	0.20412	0.243	0.12636	0.12636	0.15066	0.17496	0.15552	0.14094

Figure 9: Risk value based on likelihood and sensitivity analysis results

In figure 9, we explain the result after we calculating the value of risk by multiplying the ratings assigned for event likelihood (e.g., probability) and its impact from sensitivity result which explained in figure 6. We can see the significant risk will be if the IaaS assign VM to merchant insecurely the risk of the merchant

main page be insecure will be.63.

STEP 8: CONTROL RECOMMENDATIONS

The best practices around security controls and processes for cloud computing are:

1. PHYSICAL SECURITY

- Fortifying physical data centers
- Multiple control layers
- Access authentication and 7×24 monitoring

2. NETWORK SECURITY

- Production environment completely separate
- Firewall and network zone segregation
- Two-factor authentication remote access
- Host based intrusion detection

3. APPLICATION SECURITY

- HTTPS for all incoming/outgoing data transfer
- Data encryption for credit card payment information
- Secure application design, development and testing
- Application firewall for an extra layer of perimeter protection

4. VULNERABILITY MANAGEMENT

- Internal and external network scans
- Security application scans
- Web application penetration testing
- Keep critical patches up-to-date [26]

STEP 9: RESULTS DOCUMENTATION

From figure 7 we can see the risk value for every event in the buy book scenario without evidence and the risk value for each event if there is information or evidence that is specific event done insecurely . Therefore, the event with maximum risk value and the event effecting on it have to given more attention and high priority to add control for it.

If we consider threshold for significant risk from .6 we can see the following significant risk:

- If the IaaS assign VM to merchant insecurely the risk of:
  - The merchant main page be insecure will be.6
- If the merchant main page be insecure interface the risk of :
  - Customer login(info send insecurely) will be.6
- If the customer login info send insecurely the risk of:
  - User info query from database with info disclosure will be .6

If we consider for the buy book scenario the result of the risk calculated depending on sensitivity result, which explained in figure 8, we can see the significant risk will be if the IaaS assign VM to merchant insecurely the risk of the merchant main page be insecure will be.68.

4.2. Second Example (Hybrid Live VM Migration):

Live migration of virtual machines exposes the contents of the VM state files to the network. An attacker can do the following actions:

a) Access data illegally during migration

b) Transfer a VM to an untrusted host

c)Create and migrate several VM causing disruptions or DoS

This can be possible because VM migration transfer the data over network channels that are often insecure, such as the Internet [27].

Therefore, our second case study will be security risk assessment for Hybrid Live VM Migration scenario in cloud computing environment. In the following we will explain our method on it:

STEP 1: SYSTEM CHARACTERIZATION

The sequence diagram that we use to explain hybrid Live VM migration to give good picture of the system is shown in figure 10.

STEP 2: THREAT IDENTIFICATION

We explained the potential threat for each event in figure 10.

STEP 3: VULNERABILITY IDENTIFICATION

The most vulnerabilities that is inherent in cloud computing due to using virtual machine and migration of it are:

-The co-location of virtual machines due to multi-tenant environment where an attacker's virtual machine tries to reside in the same server of the victim's virtual machine with purposes of misuse .

- An attacker who creates a valid account can create VM image containing malicious code such as a Trojan horse. If another customer uses this image, the virtual machine that he creates will be infected .

- The contents of virtual machines such as the kernel, applications, and data being used by these applications can be compromised during live migration [27].

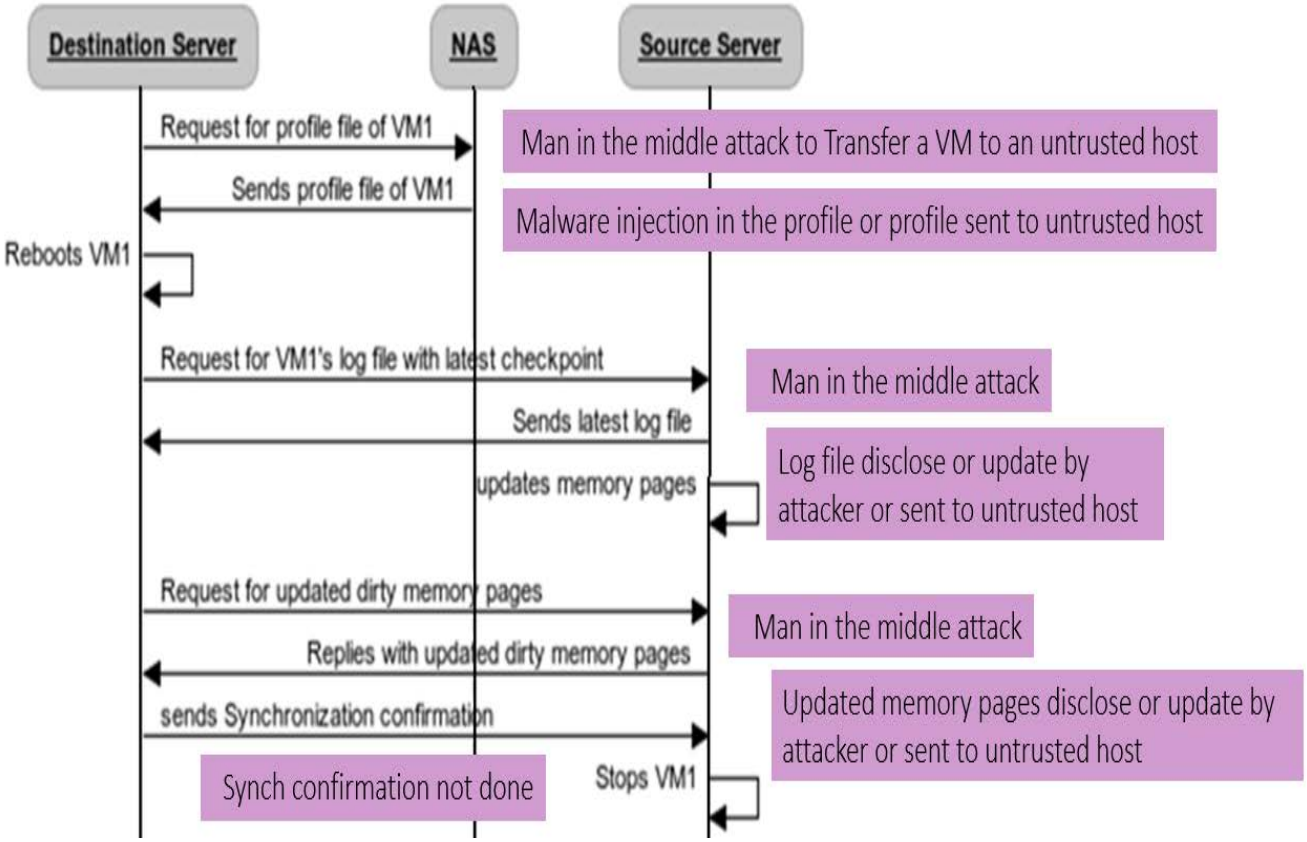


Figure.10. Sequence diagram of the hybrid Live VM migration scenario [28]

STEP 4: CONTROL ANALYSIS

The analysis include security control to be applied before migration, during migration process, and after migration. The detail to be asked to analyze control include the following:

• Are the source and destination physical hosts trusted.

• Are an authorized access to management interface; authenticated and authorized management capabilities (VM creation, deletion, migration etc) are in place.

• Is the migration data remains confidential and unmodified during the transmission.

• Control used for protection against network attacks, intrusions and malicious codes.

• The presence of mechanisms to detect and report suspicious activities.

• Protection against vulnerabilities in the migration software [29].

STEP 5: LIKELIHOOD DETERMINATION

In figure 11, we explain the Bayesian network we developed for the hybrid Live VM Migration in cloud computing environment with states for each node and their probability that we assume.

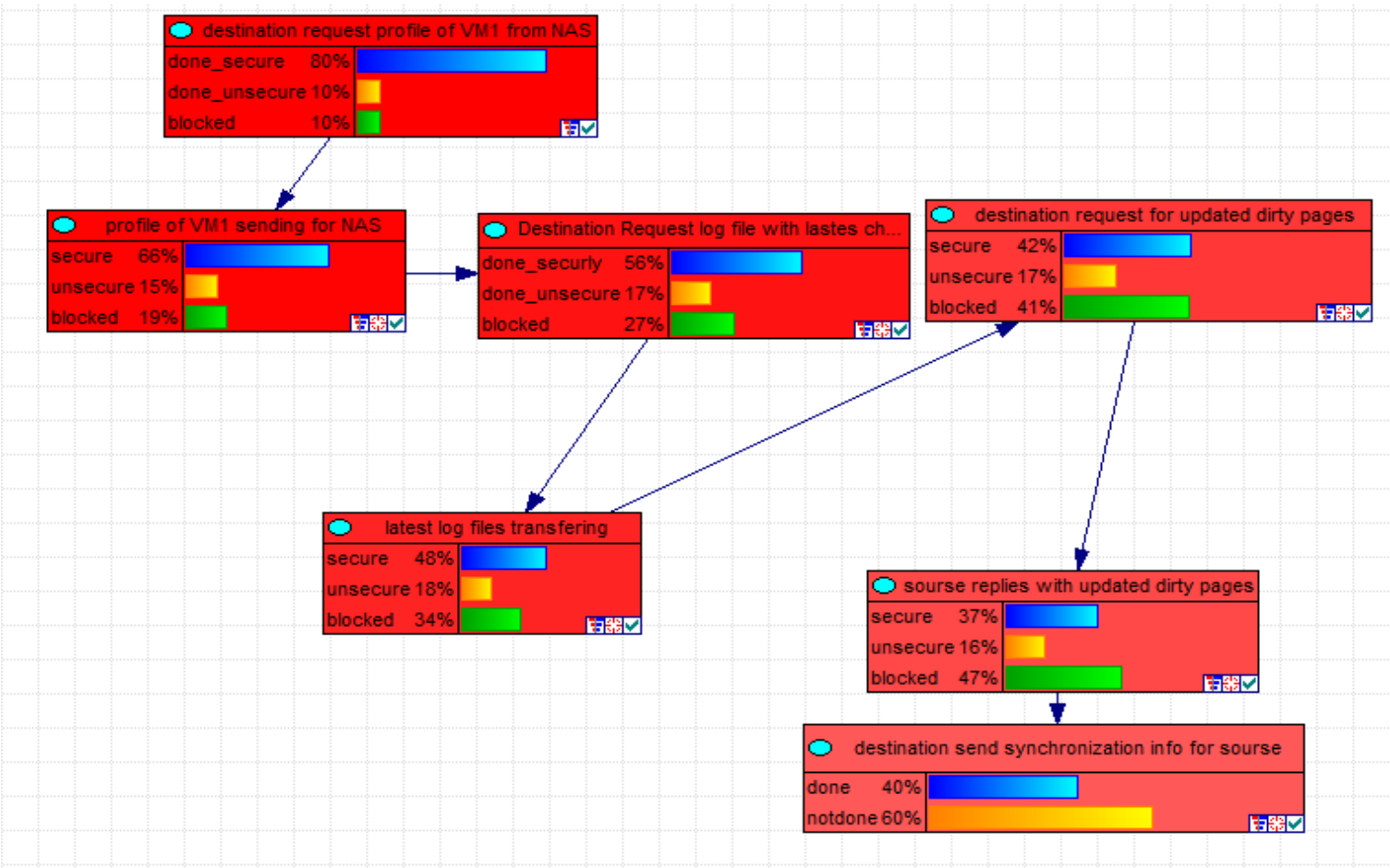


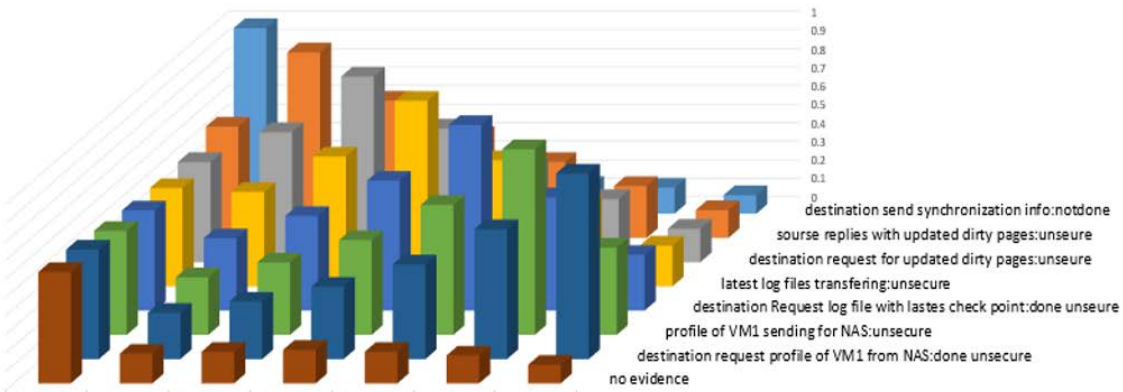
Figure. 11. Bayesian network for the hybrid Live VM Migration scenario.

In figure 12, we explain the diagnostic analyses for the Bayesian network for the hybrid Live VM migration by selecting some state of the event and see their probability.

Ranked Targets	Probability
destination send synchronization info for sourse :notdone	0.603
sourse replies with updated dirty pages:blocked	0.469
destination request for updated dirty pages:blocked	0.410
latest log files transfering :blocked	0.344
Destination Request log file with lastes check point from source:blo...	0.271
profile of VM1 sending for NAS:blocked	0.190
latest log files transfering :unsecure	0.175
Destination Request log file with lastes check point from source:don...	0.171
destination request for updated dirty pages:unsecure	0.171
sourse replies with updated dirty pages:unsecure	0.162
profile of VM1 sending for NAS:unsecure	0.150
destination request profile of VM1 from NAS:blocked	0.100
destination request profile of VM1 from NAS:done_unsecure	0.100

Figure 12: Testing diagnostic result for the hybrid Live VM migration scenario.

Then from figure 13, we can see the probability of insecurity for each event with the related changes in the posterior probabilities for each events after setting evidence for the hybrid Live VM migration scenario.



	destination send synchronization info for sourse :not done	sourse replies with updated dirty pages:unsecure	destination request for updated dirty pages:unseure	latest log files transfering :unsecure	destination Request log file with lastes check point from source:done unsecure	profile of VM1 sending for NAS:unsecure	destination request profile of VM1 from NAS:done unsecure
no evidence	0.6	0.16	0.17	0.18	0.17	0.15	0.1
destination request profile of VM1 from NAS:done unsecure	0.59	0.25	0.31	0.39	0.51	0.7	1
profile of VM1 sending for NAS:unsecure	0.56	0.31	0.39	0.51	0.7	1	0.47
destination Request log file with lastes check point:done unseure	0.54	0.39	0.51	0.7	1	0.61	0.3
latest log files transfering:unsecure	0.53	0.51	0.7	1	0.68	0.44	0.22
destination request for updated dirty pages:unseure	0.54	0.7	1	0.72	0.51	0.34	0.18
sourse replies with updated dirty pages:unseure	0.6	1	0.74	0.55	0.41	0.28	0.15
destination send synchronization info:notdone	1	0.16	0.15	0.15	0.15	0.14	0.1

Figure 13: The probability of insecurity for each event with the related changes in the posterior probabilities for event after setting evidence for the hybrid Live VM migration scenario.

From figure 13, we can see the following significant likelihood:

- Without evidence the destination send synchronization info for source :not done probability is .6
- If the destination request profile of VM1 from NAS: done unsecure the probability that:
  - The profile of VM1 sending for NAS: unsecure will increase to .7
- If the profile of VM1 sending for NAS: unsecure the probability that:
  - The destination request log file with lasts check point from source: done unsecure will increase to .7
- If the destination request log file with lasts check point from source: done unsecure the probability that:
  - The latest log files transferring :unsecure will increase to .7
- If the latest log files transferring :unsecure the probability that:
  - The destination request for updated dirty pages: unsecure will be .7
- If the destination request for updated dirty pages: unsecure probability that:
  - The source replies with updated dirty pages: unsecure will be .7
- If the source replies with updated dirty pages: unsecure probability that:
  - The destination send synchronization info for source :not done will be .6

STEP 6: IMPACT ANALYSIS

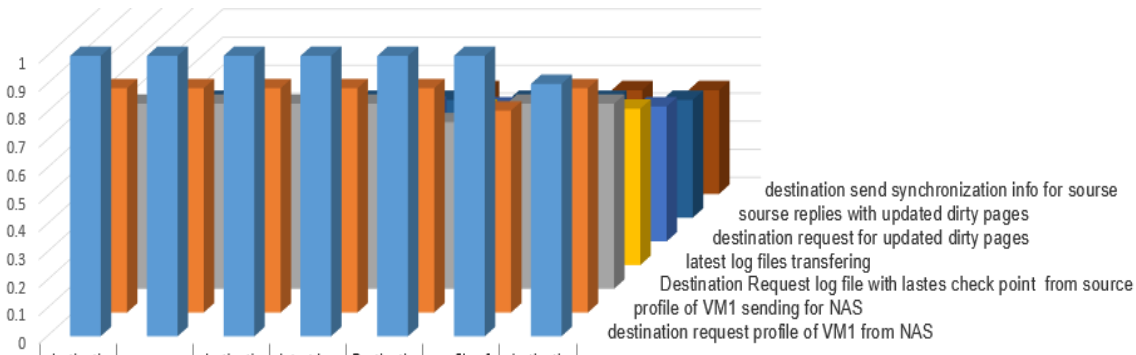
In Table 4. We explain the impact resulting from a successful threat for each event in the hybrid Live VM migration scenario.

Table 4. The impact resulting from a successful threat for each event in the hybrid Live VM migration scenario.

Event	Effect on system Severity
destination request profile of VM1 from NAS	Critical
profile of VM1 sending for NAS	catastrophic
Destination Request log file with lasts check point from source	critical
latest log files transferring	catastrophic
destination request for updated dirty pages	critical
source replies with updated dirty pages	catastrophic
destination send synchronization info for source	marginal

On the other hand, we can conduct sensitivity analysis for constructed Bayesian network using that will enable us to see the impact of every event on the others.

In figure 14, we explain the worst case of sensitivity analysis result for hybrid live VM migration for the Bayesian network, which we constructed.



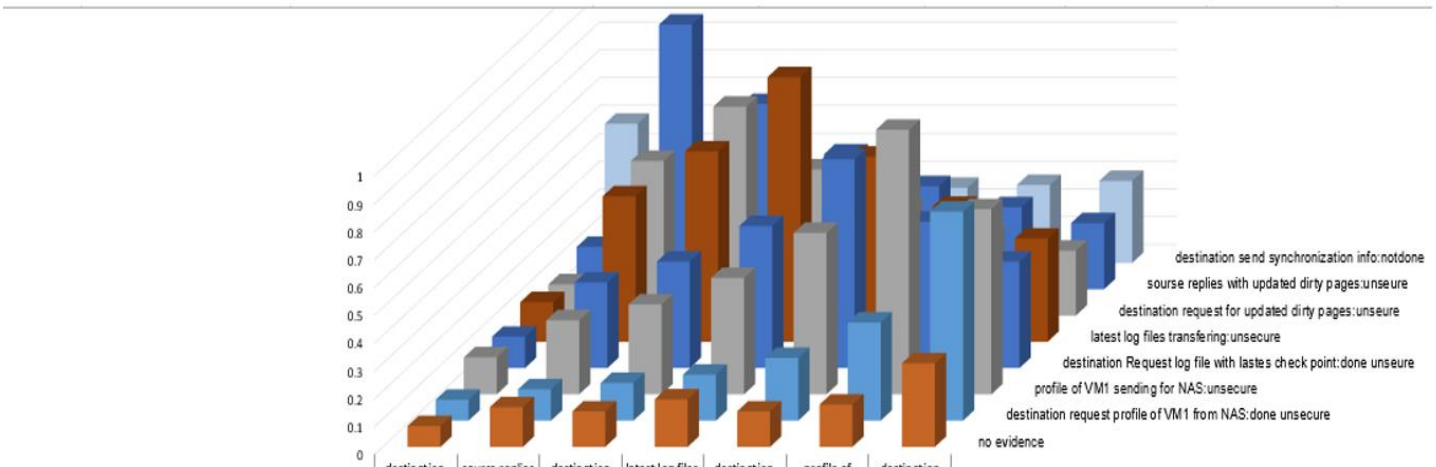
	destination send synchronization info	sourse replies with updated dirty pages	destination request for updated dirty pages	latest log files transfering	Destination Request log file with lastes check point	profile of VM1 sending for NAS	destination request profile of VM1 from NAS
destination request profile of VM1 from NAS	1	1	1	1	1	1	0.9
profile of VM1 sending for NAS	0.8	0.8	0.8	0.8	0.8	0.72	0.8
Destination Request log file with lastes check point from source	0.66	0.66	0.66	0.66	0.594	0.66	0.66
latest log files transfering	0.558	0.558	0.558	0.502	0.558	0.558	0.558
destination request for updated dirty pages	0.481	0.481	0.433	0.481	0.481	0.481	0.481
sourse replies with updated dirty pages	0.42	0.354	0.42	0.42	0.42	0.42	0.42
destination send synchronization info for sourse	0	0.37	0.37	0.37	0.37	0.37	0.37

Figure. 14. Bayesian network sensitivity analysis results for the hybrid Live VM migration scenario

As we can see from figure 14, the first event destination request profile of VM1 from NAS is more event affecting on all other event so it have to give more priority to add control methods for it to be more secure.

STEP 7: RISK DETERMINATION

From figure 15, we can see the risk of each event with the related change after setting evidence for the hybrid Live VM migration scenario.



	destination send synchronization info:notdone	sourse replies with updated dirty pages:unseure	destination request for updated dirty pages:unseure	latest log files transfering:unsecure	destination Request log file with lastes check point:done unseure	profile of VM1 sending for NAS:unsecure	destination request profile of VM1 from NAS:done unsecure
no evidence	0.075	0.1425	0.1275	0.171	0.1275	0.152	0.3
destination request profile of VM1 from NAS:done unsecure	0.075	0.1125	0.135	0.165	0.225	0.3525	0.75
profile of VM1 sending for NAS:unsecure	0.133	0.266	0.323	0.418	0.579	0.95	0.665
destination Request log file with lastes check point:done unseure	0.1125	0.3075	0.3825	0.51	0.75	0.525	0.3825
latest log files transfering:unsecure	0.1425	0.5225	0.684	0.95	0.665	0.4845	0.3705
destination request for updated dirty pages:unseure	0.1125	0.555	0.75	0.525	0.3825	0.2925	0.2325
sourse replies with updated dirty pages:unseure	0.152	0.95	0.665	0.4845	0.3705	0.2945	0.2375
destination send synchronization info:notdone	0.5	0.3	0.27	0.265	0.27	0.28	0.295

Figure 15: The risk of each event with the related change after setting evidence for the hybrid Live VM migration scenario

STEP 8: CONTROL RECOMMENDATIONS

Insecure VM Migration can be stopped by the following countermeasures:

- A Trusted Cloud Computing Platform (TCCP) that provide confidential execution of guest virtual machines. It provides secure VM launch and migration operations.
- PALM a secure migration system that provides VM live migration capabilities under the condition that a VMMprotected system is present and active.
- The connection between the source and the destination VMMs should be authenticated and encrypted during the migration process.
- Isolate VM migration traffic to prevent eavesdropping attacks [27].

STEP 8: RESULTS DOCUMENTATION

From figure 15, we can see the following significant risk:

- If the latest log files transferring :unsecure the risk that:
  - The destination request for updated dirty pages: unsecure will be .684

5. Effect of using security controls in reducing the risk factors

If we add security control to the system we have to reassess the security risk depending on the new value for state probabilities that we will change to see its effect in reducing the risk factors . For example, figure 16 illustrate the Bayesian network which we construct for buy book scenario if we change in some states probabilities for some events.

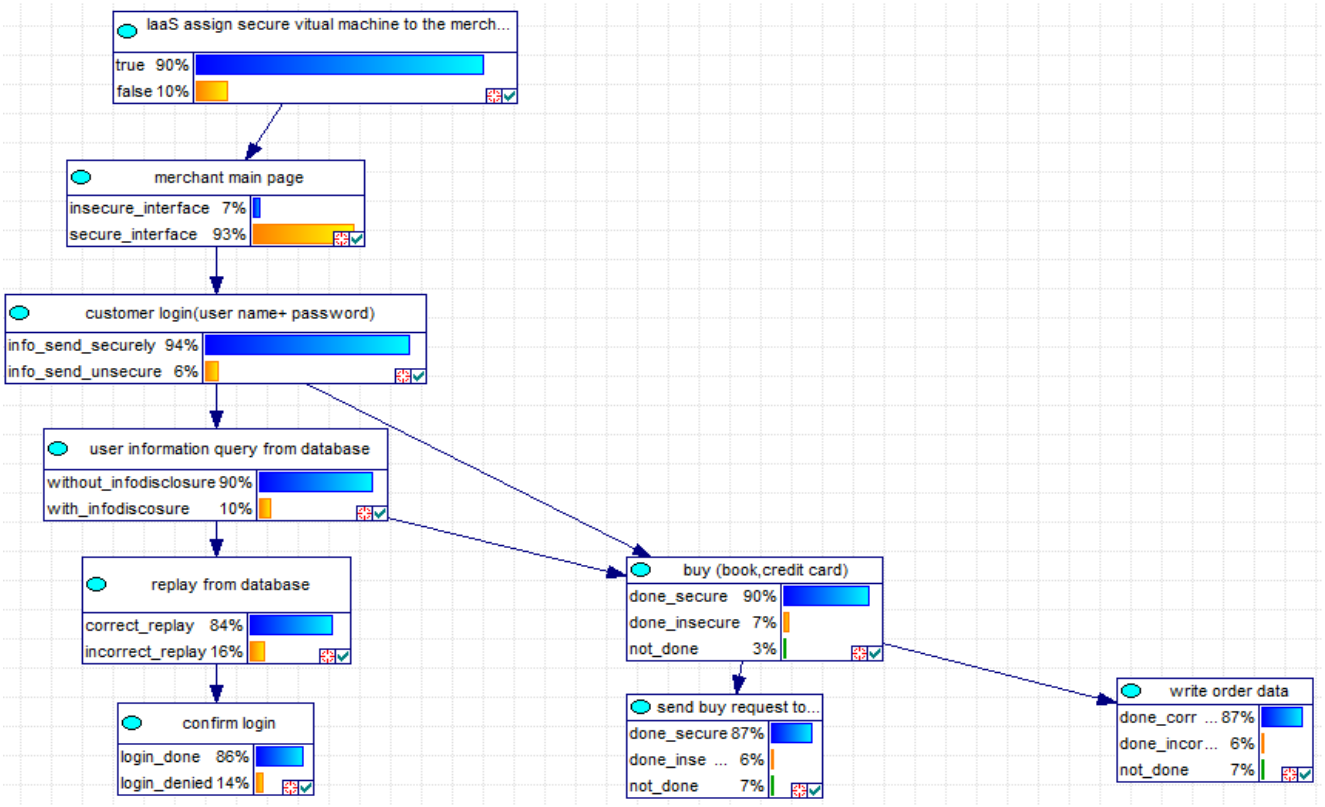


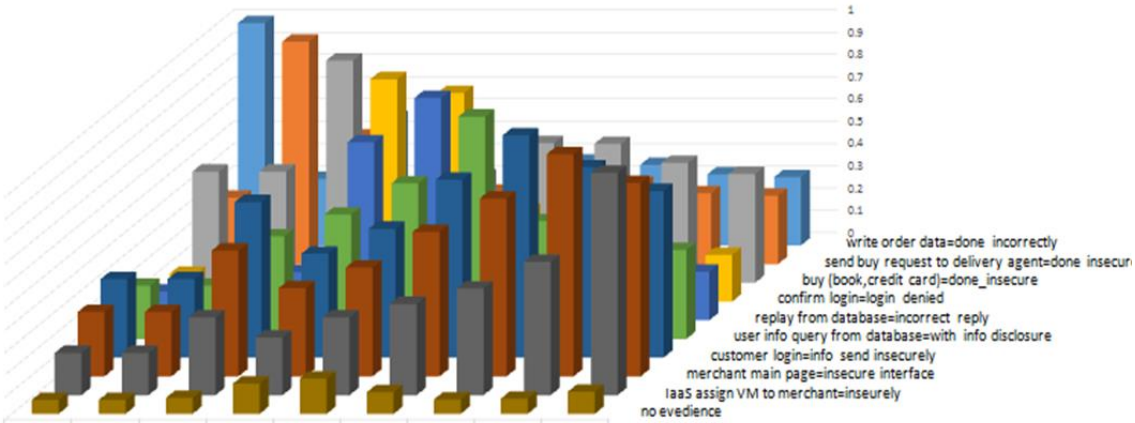
Figure 16: Bayesian network after change in some states probabilities for some events.

Based on the new probabilities the new testing diagnostic result for buy book scenario will be as explained in figure 17.

Ranked Targets	Probability
replay from database:incorrect_replay	0.159
confirm login:login_denied	0.136
IaaS assign secure vitual machine to the merchant:false	0.100
user information query from database:with_infodiscosure	0.098
buy (book,credit card) :done_insecure	0.072
send buy request to delivery agent:not_done	0.069
write order data:not_done	0.069
merchant main page:insecure_interface	0.069
customer login(user name+ password):info_send_unsecure	0.065
send buy request to delivery agent:done_insecure	0.063
write order data:done_incorrectly	0.063
buy (book,credit card) :not_done	0.030

Figure 17: Testing diagnostic result for buy book scenario after change in some states probabilities for some events.

In addition we explain in figure 18 the new value of the probability of insecurity for any event and the related changes in the posterior probabilities for each events after setting evidence.



	p(write order data):done incorrectly	p(send buy request to delivery agent):done insecure	p(buy (book,credit card)):done insecure	p(confirm login):login denied	p(replay from database):incorrect reply	p(user info query from database):withinfo disclosure	p(customer login):info send unsecurely	p(merchant main page):insecure interface	p(IaaS assign VM to merchant):inseurely
no evedience	0.063	0.063	0.072	0.136	0.159	0.098	0.065	0.069	0.1
IaaS assign VM to merchant=inseurely	0.19	0.19	0.35	0.26	0.35	0.41	0.48	0.6	1
merchant main page=insecure interface	0.29	0.29	0.566	0.397	0.49	0.65	0.8	1	0.87
customer login=info send insecurely	0.354	0.354	0.7	0.468	0.58	0.8	1	0.856	0.75
user info query from database=with info disclosure	0.24	0.24	0.462	0.56	0.7	1	0.53	0.46	0.4
replay from database=incorrect reply	0.129	0.129	0.217	0.8	1	0.433	0.235	0.213	0.219
confirm login=login denied	0.124	0.124	0.206	1	0.938	0.408	0.223	0.202	0.21
buy (book,credit card)=done_insecure	0.5	0.5	1	0.387	0.478	0.629	0.625	0.54	0.489
send buy request to delivery agent=done insecure	0.299	1	0.573	0.267	0.326	0.376	0.362	0.319	0.307
write order data=done incorrectly	1	0.299	0.573	0.267	0.326	0.376	0.362	0.319	0.307

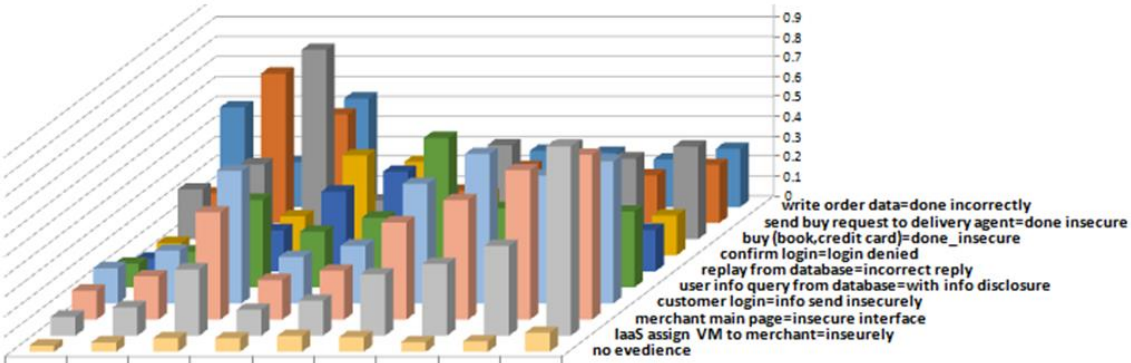
Figure 18: The probability of insecurity for each event with the related changes in the posterior probabilities for each event after setting evidence.

Based on this new value of the probability the result after we calculating the value of risk by multiplying the event probability and its impact in figure 19.

As we can from this figure the significant risk will be:

- If the merchant main page be insecure interface the risk of :
  - Customer login(info send insecurely) will be.6
- If the customer login info send insecurely the risk of:
  - User info query from database with info disclosure will be .6

Therefore we can see the effect of adding security controls in reducing the risk factors.



	write order data:done incorrectly	send buy request to delivery agent:done insecure	buy (book,credit card)):done insecure	confirm login:login denied	replay from database:incorrect reply	user info query from database:with info disclosure	customer login:info send insecurely	merchant main page:insecure interface	IaaS assign VM to merchant:inseurely
no evedience	0.0315	0.04725	0.0684	0.068	0.0795	0.0735	0.04875	0.05175	0.095
IaaS assign VM to merchant=inseurely	0.095	0.1425	0.3325	0.13	0.175	0.3075	0.36	0.45	0.95
merchant main page=insecure interface	0.145	0.2175	0.5377	0.1985	0.245	0.4875	0.6	0.75	0.8265
customer login=info send insecurely	0.177	0.2655	0.665	0.234	0.29	0.6	0.75	0.642	0.7125
user info query from database=with info disclosure	0.12	0.18	0.4389	0.28	0.35	0.75	0.3975	0.345	0.38
replay from database=incorrect reply	0.0645	0.09675	0.20615	0.4	0.5	0.32475	0.17625	0.15975	0.20805
confirm login=login denied	0.062	0.093	0.1957	0.5	0.469	0.306	0.16725	0.1515	0.1995
buy (book,credit card)=done_insecure	0.25	0.375	0.95	0.1935	0.239	0.47175	0.46875	0.405	0.46455
send buy request to delivery agent=done insecure	0.1495	0.75	0.54435	0.1335	0.163	0.282	0.2715	0.23925	0.29165
write order data=done incorrectly	0.5	0.22425	0.54435	0.1335	0.163	0.282	0.2715	0.23925	0.29165

Figure 19: The risk of each event with the related change after setting evidence based on probability of insecurity and severity we specified for each event.

6. Conclusion:

Despite the fact that cloud computing offers many cost benefits for their cloud consumers, number of security risk are emerging in association with cloud usage that need to be assessed.

However, Risk assessment is a complex undertaking, usually based on uncertain information while managing uncertainties is a tedious task and the nature of occurrence of threats and vulnerabilities change rapidly.

This paper presents method for security risk assessment in cloud computing that will enable the cloud provider to assess the risk based on existing scenario, and prioritizing security risks. It is using Bayesian network that allows entering evidence so probabilities in the network are updated when new information is available. Depending on the assessment results the cloud provider can establishing controls so that the risk can be reduced to an acceptable level. For illustration of the method, we explained it is in two scenario. However, our method need to have initial probabilities for events occurrence depending on existing control and threat analysis.

7. References:

1. Almathami, Mohammed, "SLA-based risk analysis in cloud computing environments" ,Thesis. Rochester Institute of Technology, 2012.

2. http://blogs.datadirect.com/2013/07/banking-security-cloud.html
3. Fatimah M. Alturkistani, Ahmed Z. Emam, "A Review of Security Risk Assessment Methods in Cloud Computing", New Perspectives in Information Systems and Technologies, Volume 1 , Springer International Publishing, 2014.
4. Drissi S., Houmani H. and Medromi H., Survey: Risk Assessment for Cloud Computing, University Hassan II Aïn Chock. ENSEM Casablanca, Morocco, (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 4, No. 12, 2013.
5. J. Oriol Fit´o, Mario Mac´ıas and Jordi Guitart, Toward Business-driven Risk Management for Cloud Computing, Barcelona Supercomputing Center and Technical University of Catalonia, 978-1-4244-8909-1/$26.00 _c 2010 IEEE.
6. David Lopez,Oscar Pastor, Luis Javier Garcia Villalba," Data model extension for security event notification with dynamic risk assessment purpose",Science China Information Sciences, Volume 56, Issue 11, pp 1-9, November 2013.
7. Norman E. Fenton, Member, IEEE Computer Society, Martin Neil, And Jose Galan Caballero, "Using Ranked Nodes To Model Qualitative Judgments In Bayesian Networks",Ieee Transactions On Knowledge And Data Engineering, Vol. 19, No. 10, October 2007.
8. Peter Hearty, Norman Fenton, David Marquez, and Martin Neil, Predicting Project Velocity in XP Using a Learning Dynamic Bayesian Network Model, Ieee Transactions On Software Engineering, Vol. 35, No. 1, January/February 2009.
9. Daniele Catteddu and Giles Hogben," cloud computing :Benefits, risks and recommendations for information security", The European Network and Information Security Agency (ENISA),2009.
10. Amit Sangroya, Saurabh Kumar, Jaideep Dhok, Vasudeva Varma, "Towards analyzing data security risks in cloud computing environments", International Conference on Information Systems, Technology, and Management (ICISTM 2010).
11. Xuan Zhang, Nattapong Wuwong, Hao Li ,Xuejie Zhang, "Information security risk management framework for the cloud computing environments",10th IEEE International Conference on Computer and Information Technology (CIT 2010), China.
12. P. Saripalli and B. Walters, "QUIRC: A quantitative impact and risk assessment framework for cloud security", In the Proceedings of the IEEE 3rd International Conference on Cloud Computing, pp. 280-288, 2010.
13. Jaydip Sen, "Security and privacy issues in cloud computing", Innovation Labs, Tata Consultancy Services Ltd., Kolkata, INDIA
14. Burton S. Kaliski Jr. and Wayne Pauley “Toward risk assessment as a service in cloud environments,” EMC Corporation, Hopkinton, MA, USA 2010.
15. Afnan Ullah, Khan, Manuel Oriol, Mariam Kiran, Ming Jiang, Karim Djemame , "Security risks and their management in cloud computing", 4th International Conference on Cloud Computing Technology and Science ,UK,University of York, Switzerland ,Barcelona, Spain, 2012 IEEE.

16. Saadia Drissi1, Siham Benhadou1, Hicham Medromi1,"A New Shared and Comprehensive Tool of Cloud Computing Security Risk Assessment", National High School of Electricity and Mechanics, ENSE, 2015.
17. Shareeful Islam ,Stefan Fenz , Edgar Weippl and Haralambos Mouratidis, "A Risk Management Framework for Cloud Migration Decision Support"
, J. Risk Financial Manag. 2017, 10, 10; doi:10.3390/jrfm10020010.
18. Gary Stoneburner, Alice Goguen, and Alexis Feringa ,"Risk Management Guide for Information Technology Systems: Recommendations of the National Institute of Standards and Technology", NIST Special Publication 800-30, July 2002.
19. Marit E. Kragt,"A beginners guide to Bayesian network modelling for integrated catchment management", Landscape Logic Technical Report No. 9, July 2009.
20. Symantec Security Response,"Assessing the Severity of Threats, Events, Vulnerabilities", February 2006.
21. Shen Juncai and Qian Shao," Based on Cloud Computing E-commerce Models and Its Security", International Journal of e-Education, e-Business, e-Management and e-Learning, Vol. 1, No. 2, June, 2011.
22. Fadi HajSaid, Yousef Hassouneh and Hany Ammar," Security Risk Assessment of Software Architecture", ICCTA 2011, 15-17 October 2011, Alexandria, Egypt.
23. Adam Goslin, Chief Operations Officer, PCI Compliance Updates, E-Commerce / Cloud Security.
24. Bernd Grobauer, Tobias Walloschek and Elmar St ker, " Understanding Cloud Computing Vulnerabilities", Aug 15, 2011.
25. Microsoft Corporation," Microsoft Dynamics CRM Online security and compliance planning guide" ,September 2013.
26. Pritesh Parekh and Joe Andrews ,"Keeping Your Cloud Secure – a CIO's Favorite".
27. Keiko Hashizume, "A Reference Architecture For Cloud Computing And Its Security Applications ",Florida Atlantic University , 2013
28. Kumar Narander and Saxena Swati ,"An Efficient Live VM Migration Technique in Clustered Datacenters", Research Journal of Recent Sciences ISSN 2277-2502 Vol. 3(IVC-2014), INDIA , 2014
29. Mahdi Aiash, Glenford Mapp, Orhan Gemikonakli, "Secure Live Virtual Machines Migration: Issues and Solutions",Advanced Information Networking and Applications Workshops (WAINA), 2014.
30. CSA, The Notorious Nine: Cloud Computing Top Threats in 2013, Top Threats Working Group, CSA, 2013.
Available:https://cloudsecurityalliance.org/download/the-notorious-nine-cloudcomputing-top-threats-in-2013

Strategic Management Practices and Performance of Public Health Institutions in Mandera County, Kenya

[1*]Ibrahim Ahmed Issack and [2]Stephen M. A. Muathe
[1&2]Department of Business Administration,
School of Business,
Kenyatta University

Abstract

The general objective of this study was to look at strategic management practices on performance of public health institutions in Mandera County. The general objective of this study was to investigate the effect of strategic management practices on performance of public health institutions in Mandera County. Specifically the study sought to examine the influence of environmental analysis on performance of public health institutions, to establish the effect of strategy formulation on performance of public health institutions, to determine the impact of strategy implementation on performance of public health institutions and to find out the effect of strategy evaluation on performance of public health institutions in Mandera County. This study adopted a mixed research design method. Mandera County has a total of Fifty (50) public health institution. The study therefore target one hospital administrators from each of the five (5) Sub-county Hospitals, Two (2) staff from Mandera Referral Hospital (Director of Medical Service and Administrator), nineteen (19) Health Administrators from each Health Centres and twenty five (25) nursing officer in charge of dispensaries thus totaling to Fifty one (51) respondents. The findings revealed that environmental analysis, strategy formulation, strategy implementation, strategy evaluation and performance of public health institutions in Mandera County are positively and significantly related. Correlation analysis showed that environmental analysis, strategy formulation, strategy implementation and strategy evalaution are significantly and positively related to performance of public health institutions in Mandera County. Based on the findings the study concluded that environmental analysis, strategy formulation, strategy implementation, strategy evaluation affects performance of public health institutions. The study recommends that public health institutions formulates strategies that can enable them to define their corporate mission, specifying achievable objectives, develop strategies and setting policy guidelines.

Key words: *Strategic management practice*, *environmental analysis, strategy formulation, and strategy implementation.*

1.0 Introduction

Strategic management practice as an effective tool in strengthening the performance of health care has become a subject of interest. Strategic management has been touted as one of the effective management

tools in strengthening organization performance through effective decision making and systematic strategic formulation and implementation. Although, strategic management was more prevalent in the private sector since the concept was first developed, the interest of using strategic management in the public sector has increased over the last decade (Smith, 1994). Since 1980's there have been a series of reforms taking shape in the public sector resulting from increased awareness on the importance of quality in the public sector.

Barnely and Hesterly (2008) suggested that a good strategy is one that actually generates a competitive advantage that differentiate an organization with its competitors by giving it sustainable edge that is valuable, rare and not easy to imitate. Strategy should therefore be unique in order to create a competitive advantage. Porter (1998) in competitive advantage of nations aptly states that at the heart of positioning is competitive advantage. Thompson and Strickland (2003) defined strategy as consisting of moves and approaches devised by management to produce successful organizational performance while Wheelen and Hunger (2008) stated that a strategy is a plan that provides direction on how the organization will achieve its mission and objectives.

Proper strategic management practices enable the organization to avoid a mismatch with the environment, it provides a link between an organization and its environment and must be consistent with the goals, values, the external environment, resources, organizational structures and systems (Ansoff & McDonnell, 1990). According to Hussey (1991) strategy is the heart of strategic management because it helps the organization to formulate and implement various tasks to remain competitive in a turbulent environment. An organizational strategy define its unique image, provides its purpose and direction to its activities and to the people within and outside the organization (Grant, 1998).

Mintzberg (1998) distinguishes between intended, realized and emergent strategy by defining intended strategy as deliberate strategy that is planned and conceived by the management, emergent strategy is the strategy that becomes apparent through passage of time while realized strategy is that observed and is influenced by both the intended and emergent strategy. Mintzberg goes on to state that in practice strategic decisions that are key ingredient of strategic management can be made by a powerful individual, mostly the founder with growth as the dominant goal at the inception of the organization. Strategic management is not linear in practice since firms must be ready for upsets and surprises any time requiring more flexibility. Mintzberg (as cited in Abbot, 2010) advocates for planning i.e. hard data for informing the intellect but it is the soft data i.e. intuition and experience that generates wisdom.

The business environment in which firms operates is dynamic and turbulent with constant and fast paced changes that often render yester-years strategies irrelevant. Top management and decision makers of firms must constantly think strategically about the future of their organizations. The environmental turbulence necessitate an equal need for rapid recognition of appropriate strengths, opportunities to be exploited, threats to be countered and weakness to be overcome (Pearce & Robinson, 2000). Strategic planning calls for the determination of the basic long term goals and objectives of an enterprise and the adoption of courses of action and allocation of resources necessary to carry out the goals. Planning is a conscious systematic process during which decisions are made about mission, values, goals, strategies, priorities and activities that an organization, and by extension industry players will pursue if they are to survive and remain relevant in the future, amidst a constantly volatile environment. Strategic planning therefore is not a matter of

coming up with a detailed plan or program but it is a unifying theme that gives coherence and direction to actions and decisions (Grant, 1998).

The use of strategic management practices enables firms to define their strategies which provide a central purpose and direction to its activities to people who work in the firm and often to the outside world. Strategic planning and implementation enable firms to adapt under conditions of external pressure caused by changes in environment. Firms can and often do create their environment besides reacting to it. Strategic planning and management helps firms develop competitive strategies (Johnson & Scholes, 2002). In developing strategy, firms carry out an analysis of their environment, their industry and competitors and gauge how they can outperform their competitors. Strategic planning also helps firms focus their efforts and resources on their key success factors and cultivate a culture of being proactive. By implementing strategic plans, firms are able to respond to the turbulent environment in an appropriate manner, to ensure their continued survival and profitability hence providing the shareholders with value for money invested (Porter, 1998).

Abraham and Leavy (2007) argued that the success of theories, concepts and tools in the practice of strategic management is exhibited in careful analysis of industry and competitive conditions, behavior and how managers tackle the task of crafting and executing strategies as opposed to using high powered quantitative techniques. As the pace of change accelerates, Pearce and Robinson (2007) observed that the nature of strategy planning work has shifted from emphasizing analysis and forecasting to communication, co-ordination, and control.

Researchers have associated business strategies with performance, distinguishing between strategies associated with high and low performance (Chell*et al.*, 1991). Strategies which result in high performance are identified with activities that generally lead to success in the industry; that is key success factors. These activities are associated with initiatives in industry. Researchers have identified such initiatives to include emphasis on product quality, product and service innovations, development of new operating technologies, and discovery of new markets. Activities associated with high performing strategies also include emphasis on customer service and support, extensive advertising, and use of external finance (Covin, 1991).

Strategic management practices contribute to performance by generating relevant information, creating a better understanding of the environment and reducing uncertainty. (Porter (2004) states that organizational performance is determined by the ability of the firm to find its unique position and strategic management practice is the tool to enable the firm acquire that strategic position. Ofunya (2013) examined the relationship of strategic management practices and firm performance in Post bank in Kenya. The study revealed that the strategies adopted by Post bank so as to cope with the competitive environment included vigorous pursuit of cost reductions, providing outstanding customer service, improving operational efficiency, among other.

Firm`s performance need to be able to measure prescribed indicators of effectiveness, efficiency, and environmental responsibility such as, cycle time, productivity, waste reduction, and regulatory compliance. Performance metrics relating to how a particular request is handled, or the act of performing; of doing something successfully; using knowledge as distinguished from merely possessing it is an important aspect

for organizations. It should be the outcome of all of the organization's operations and strategies (Venkatraman & Ramanujam, 1986).

Performance of public health institutions has not had consensus among scholars. Provan (1985) has outlined performance in hospitals in terms of bed occupancy, costs, mortality rate, payroll ratios, accreditation, growth, resource acquisition. He however concedes that these measures lack generalizability. Bloom *et al*., (2009) state that management in hospitals is poorly alike with that of manufacturing firms. What is more, public hospitals have worse practices than private ones. In the public hospitals, hospital administrators must make decisions that foster the highest standards of patient care and achieve financial performance, as measured by more traditional metrics such as return on equity, return on assets, occupancy rates. Hence, strategic decisions made by hospital administrators have considerable consequences.

Healthcare institutions pose unique problems for management since organizational decision makers must consider elements such as patient access to services, reliability and quality of care. These elements distinguish hospitals from other types of consumer organizations since failures in these areas, even on a small scale, could result in the loss of life. Furthermore, hospitals are further distinguished by diverse training, experiences, and responsibilities; inherently present issues about how to work together (Ashmos, Huonker & McDaniel, 1998).

Mandera County is located in the North Eastern part of Kenya.It borders Ethiopia to the North, Republic of Somalia to the East, and Wajir County to the South and South West. Mandera County has the highest mortality rate in the world recording 3,795 deaths per 100,000 live births, more than seven times higher than the national average of 488 deaths per 100,000 live births. This is attributed to poor health infrastructure, unskilled and inadequate workforce and cultural practices that discourages deliveries at the hospitals. Mandera County hospitals lack infrastructure to qualify it to operate as a referral hospital. Causes of increasing maternal deaths in the county as per the report are poor health seeking behaviour by the locals, cultural values and practices that do not allow women to be attended to by male health workers and long distances traveled en route the referral hospital (Manderacounty, 2016).

For any well-being of a nation, public health institutions must be on the fore front to ensure that citizens receive the best health care. This can best be achieved through strategic management practices which ensure that performance of these institutions is top notch. Strategic management practices are expected to translate into improved service delivery, efficiency and effectiveness in any organizational context. Management practices are interconnected in such ways that they enable efficient functioning of organizations. Management is a wide field with specific disciplines of organizational endeavor and practices varying across firms and industries. Management practices cut across organizational functionality in any discipline. There is inadequate research that has focused specifically on management practices that can sustain efficiency and effectiveness in African organizations (Bagire & Namada, 2015).

While strategic management is widely practiced by firms and other profit oriented organizations in this country, its adoption by public sector particularly in health care service delivery at operational level is less understood. Strategic planning practices in Kenya are still insubstantial and unknown in the sense that there is an absence of documented proof of its practice (Ghosal, 2005). This study is undertaken to fill this

knowledge gap. It is imperative to study on how strategic management practices are being adopted by government agencies as a tool of enhancing performance.

Various studies have been carried out in this area of study for example Mutuma (2011) studied the challenges facing the implementation of hospital management information systems in hospitals in Nairobi whereas Chepkurui (2011) studied the human capital planning practices in faith base hospitals in Kenya. Studies in private hospitals were carried out by Gichane (2011) who studied the adoption of social marketing concept by private hospitals in Kenya and Mbugua (2010) studied the competitive strategies adopted by private hospitals in Kenya. Some studies have also been conducted in public hospitals; Ongayo (2005) covered human resource issues, Mutugi (2008) determined the challenges of strategy implementation.

On the other hand Obaga (2009) explored performance contracting Kamuri (2010) studied the challenges facing the implementation of outsourcing strategy at the KNH. While the above studies were able to look at strategy implementation and performance they did not specifically look at strategic management practices and performance of public health institutions in Mandera County, Kenya. With this is mind there is a knowledge gap that the current study seeks to fill. This study addressed: strategic management practices and performance of public health institutions in Mandera County.

The study fills this gap by reviewing the process of formulating the strategic management practices in this area and this trend shows that the countyis lagging behind in providing health care. Therefore research investigated the types of strategic management practices on the performance of public health institutions in Mandera County by bringing in strategies of improving service delivery in the public health care sector in the county.

This study was guided by the following objectives. Each of the independent variable is stated and linked to the dependent variable.

i. To examine the influence of environmental analysis on performance of public health institutions in Mandera County.
ii. To establish the effect of strategy formulation on performance of public health institutions in Mandera County.
iii. To determine the impact of strategy implementation on performance of public health institutions in Mandera County.
iv. To find out the effect of strategy evaluation on performance of public health institutions in Mandera County.

2.0 Literature Review

2.1 Theoretical Literature Review

The current study was guided by two theories covering management of strategic change: these are resource-based theory or view and configurational theory.

2.1.1 Resource-Based Theory or View (RBV)

This theory was developed by Birge Wenefeldt in 1984. It is a method of analyzing and identifying a firm`s strategic advantages based on examining its distinct combination of assets, skills, capabilities and intangibles as an organization. The RBV`s underlying premise is that a firm differ in fundamental ways because each firm possess a unique bundle of resources-tangible and intangible assets and organizational capabilities to make use of those assets. Each firm develops competencies from these resources, and when developed especially well, these become the source of the firm`s competitive advantage; (Pearce & Robinson, 2007). In the context of this theory, it is evident that the resources that a firm has will play a big role in the strategic implementation process. This is because no matter how good the strategies are, without the necessary resources to enable the implementation, they remain in the planning phase.

The resource-based approach sees firms with superior systems and structures being profitable not because they engage in strategic investments that may deter entry and raise prices above long run costs, but because they have markedly lower costs, or offer markedly higher quality or product performance. This approach focuses on the rents accruing to the owners of scarce firm-specific resources rather than the economic profits from product market positioning. Competitive advantage lies 'upstream' of product markets and rests on the firm's idiosyncratic and difficult-to imitate resources.'

2.2 Empirical Literature Review

Dorling, Scott and Deakins (2006) examined the relationship between industry environment and organizational performance using Porter's (1980) five-force model of competition. Their findings supported the notion that as the power of five forces increases, this tends to limit the ability of firms to boost profitability. In examining the relationship between a firm's resources and strategy, Benedetto and Song (2003) argued that different types of strategy should be related to different sets of firm resources. Certain sets of firm resources will be relatively more important depending on the type of strategy adopted. Camelo-Ordaz, Martin-Alcazar and Valle-Cabrera (2003) found that Prospectors tend to value the resources that enable innovation. Analyzers, however, tend to possess resources that strengthen both efficiency and market/product development. Defenders tend to focus their resource strategy on specification and efficiency. They concluded, therefore, that it is important that the type of strategy a firm employs should be linked to its bundle of resources. Defenders compete with physical assets as their core resources (Sidhu, Volberda & Commandeur, 2004). They invest in physical assets and associated fixed costs to raise barriers to entry and to deter new competitors. Prospectors and Analyzers do not look on physical resources as their core resources, but they do invest highly in such resources, in penetrating new product and market domains.

Taiwo and Idunnu (2010) examined the impact of strategic planning on organizational performance and survival. The study evaluated the planning-performance relationship in organization and the extent to which strategic planning affected performance of First Bank of Nigeria. The findings indicated that planning enhances better organizational performance, which in the long term impacts its survival. Bakar et al, (2011) studied the practice of strategic management in construction companies in Malaysia. The findings of the research showed that most of the firms practicing strategic management had a clear objective, a winning strategy to achieve the objective and a sound mission statement to guide the organization towards success.

According to Mintzberg and Quins (2004), 90% of well-formulated strategies fail at implementation stage and only 10% of formulated strategies are successfully implemented. The successful implementation of strategy is fully dependent on involvement of all the stakeholders in an organization. Communicating progress of implementing the strategy to the stakeholders will assist them in determining whether corrective action is required. Njagi and Kombo (2014) examined the effect of strategy implementation on performance of commercial banks in Kenya. Results revealed that there was a strong relationship between strategy implementation and organizational performance.

Ondera (2013) examined strategic management practices in Mbagathi District Hospital, Nairobi, Kenya. The study revealed that, the hospital formulates implements and evaluates the work plan by involving all staff working at the hospital and that the management allocated funds based on the work plan to facilitate the process of strategy implementation. They further argued that strategy evaluation should involve setting control processes to continuously review, evaluate and provide feedback concerning the implemented strategies to determine if the desired results arebeing attained such that corrective measures may be taken if needed.

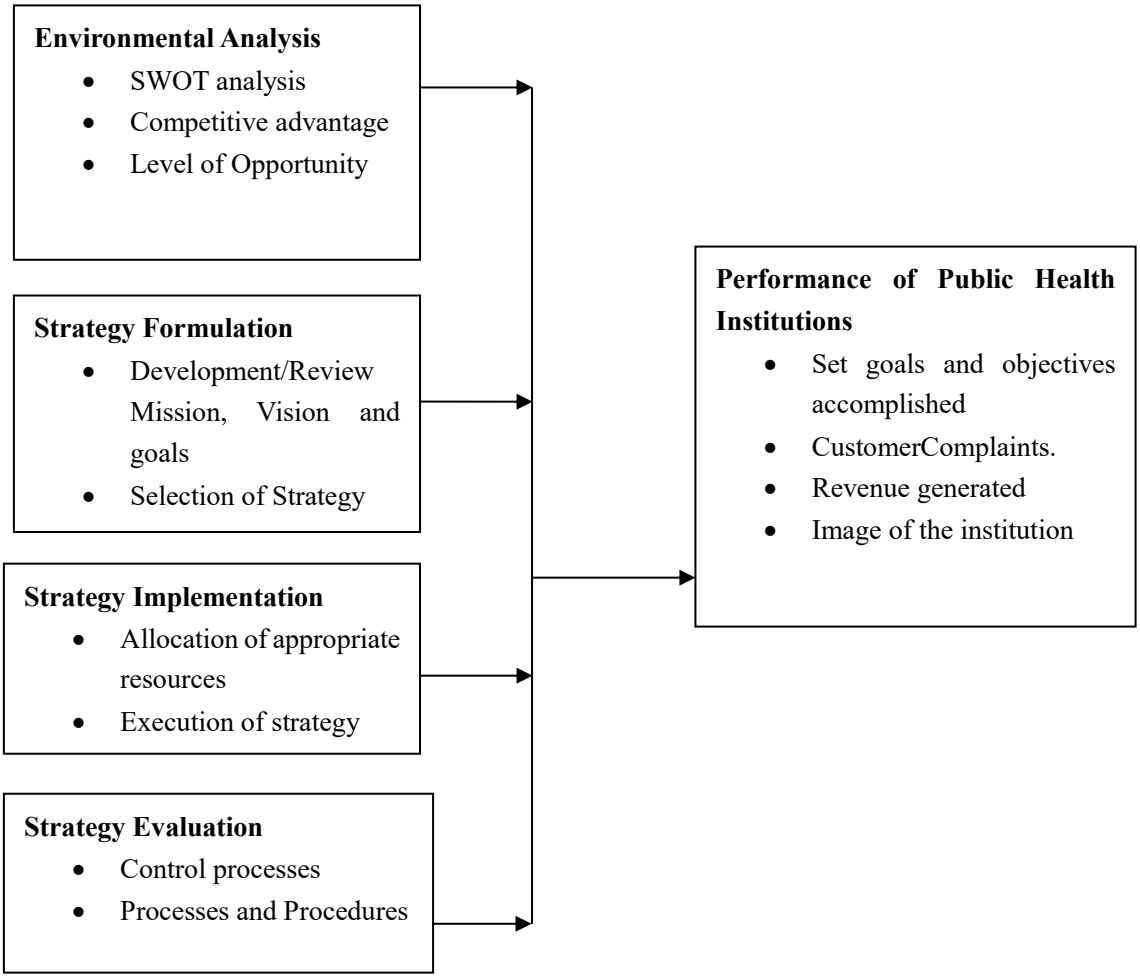


Figure 1 Conceptual Framework

3.0 RESEARCH METHODOLOGY

This study adopted a descriptive survey. The study therefore targetedone hospital administrators from five (5) sub-county hospitals, Two (2) staff from Mandera Referral Hospital (Director of medical services and hospital administrator), 19 health administrators from health centers and 25 nursing in charges from dispensaries thus totaling to Fifty one (51) respondents. A census technique was used to select the sample.Primary data were derived from questionnaires distributed to hospital administrators, nursing incharges and Director medical services. Pilot and validity tests were also conducted. Data analysis was done using SPSS version 22 and presented inferential statistics comprised of correlation and regression analysis resulted in a prediction equation that describes the relationship between the independent variables and dependent variables. The regression equation is presented as.

$Y=\beta_0+ \beta_1X_1+ \beta_2X_2+ \beta_3X_3+ \beta_4X_4+ e$

Where:

Y = Performance of public health institutions in Mandera County

$\{\beta i; i=_{1,2,3,4,5}\}$ = The coefficients for the various independent variables

X1 = Environmental analysis

X2 = Strategy formulation

X3 = Strategy implementation

X4 = Strategy evaluation

e is the error term

$Y= \beta_0 + \beta_{ij} X_{1j} + \beta_{ij} X_{2j} + \beta_{ij} X_{3j}+ \beta_{ij} X_{4j} +Є$

Where

Y -dependent variable- performance of public health institutions

β_0 -is the constant (y intercept)

X_{ij} is a set of - independent variables *i* for company *j* these variables include environmental analysis (X_1), strategy formulation (X_2), strategy implementation (X_3), and strategy evaluation (X_4).

B_{ij} -regression coefficient *i* for variable *j*

Є -the stochastic error term

β0 is the intercept; and reflects the constant of the equation.

β1 is the sensitive coefficient of each independent variable (i=1,2,3,4,5).

ε is the error term.

4.0: RESEARCH FINDINGS AND DISCUSSION

4.1 Correlation matrix

The study sought to establish the association among the study variables. The results are presented in Table 1.

Table 1: Correlation matrix

		Environmental analysis	Strategy formulation	Strategy implementation	Strategy evaluation	performance
Environmental analysis	Pearson Correlation	1.000	.523**	.397**	.292*	.551**
	Sig. (2-tailed)		0.000	0.004	0.040	0.000
Strategy formulation	Pearson Correlation	.523**	1.000	.670**	.368**	.646**
	Sig. (2-tailed)	0.000		0.000	0.009	0.000
Strategy implementation	Pearson Correlation	.397**	.670**	1.000	.612**	.614**
	Sig. (2-tailed)	0.004	0.000		0.000	0.000
Strategy evaluation	Pearson Correlation	.292*	.368**	.612**	1.000	.568**
	Sig. (2-tailed)	0.040	0.009	0.000		0.000
Performance of public health institution	Pearson Correlation	.551**	.646**	.614**	.568**	1.000
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

(Source: Survey data, 2017)

The results in Table 1 indicated that environmental analysis and performance of public health institutions are significantly and positively related (r= .551, p=0.000). Further, correlation results showed that strategy formulation, strategy implementation and strategy evaluation are positively related with performance of public health institutions. Results indicated that strategy formulation (r= .664, p=0.000), strategy implementation (.614, p=0.000) and strategy evaluation (r= .568, p=0.000) are significantly and positively related to performance of public health institutions in Mandera County. Conducting audit of environmental analysis, strategy formulation, strategy implementation and strategy evaluation increases the performance of public health institutions.

4.2 Model summary

The results presented in table 2 present the fitness of model used of the regression model in explaining the study phenomena. Environmental analysis, strategy formulation, strategy implementation and strategy

evaluation were found to be satisfactory variables in explaining performance of public health institutions. This is supported by coefficient of determination of 59.0%.

Table 2: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.768[a]	.590	.554	.40408

(Source: Survey data, 2017)

This means that environmental analysis, strategy formulation, strategy implementation and strategy evaluation explains 59.0% of the variations in the dependent variable which is performance of public health institutions in Mandera County. This results further means that the model applied to link the relationship of the variables was satisfactory.

4.3Analysis of Variance

Table 3 provides the results on the analysis of the variance (ANOVA). This was to establish whether there was any significant difference among the variables means. Independent variables were explored to determine whether their existed any significance difference with the dependent variable (performance of public health institutions).

Table 3: Analysis of Variance

Indicator	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	10.585	4	2.646	16.207	.000b
Residual	7.348	45	.163		
Total	17.933	**49**			

(Source: Survey data, 2017)

The results indicate that the overall model was statistically significant. Further, the results imply that the independent variables are good predictors of performance of public health institutions. This was supported by an F statistic of 16.207 and the reported p value (0.000) which was less than the conventional 0.05 significance level. Therefore, the result findings from the ANOVA showed that there exist a significant difference between the independent variables and the dependent variable.

4.4 Regression Coefficients

Regression of coefficients results in table 4 shows that environmental analysisand performance of public health institutions are positively and significantly related (r=.220, p=0.036). the results are in agreement with Hodgetts and Kuratko (2001) that opportunities for businesses are hidden in the external environments of the businesses and that companies need to prepare plans to cope with changes as they face dynamically changing environments especially such changes may be unpredictable and may occur suddenly. The results also agree with Ann, Zailani and Wahid (2006) that environmental munificence facilitates the ability to exploit the resources, acquiring resources, as well as identifying opportunities to create competitive advantage. The table further indicates that strategy formulation and performance of public health institutions are positively and significantly related (r=.251, p=0.020). The results agree with Taiwo and

Idunnu (2010) that strategic formulation enhances better organizational performance. It was further established that strategy implementation and performance of public health institutions are positively and significantly related (r=0.283, p=0.003). the results agree with Burgelman, Grove and Meza (2006) that strategy implementation are geared towards improving organizational performance. Organizational performance comprises the actual output or results of an organization as measured against its intended outputs or goals and objectives. Strategy formulation and performance of public health institutions was also positively and significantly related (r=0.299, p=0.014). The results concur with Kvarnerud and Maspers (2007) that strategy evaluation is needed to serve as tool of providing information on how performance compares to the peers and other standards.

Table 4: Regressions of coefficients

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	.296	.367		.807	.424
Environmental analysis	.220	.102	.244	2.159	.036
Strategy formulation	.251	.104	.336	2.404	.020
Strategy implementation	.284	.125	.302	2.272	.003
Strategy evaluation	.299	.117	.311	2.553	.014

(Source: Survey data, 2017)

Thus, the optimal model for the study is;

Performance of performance of public health institutions in Mandera County= .296+ .220*Environmental analysis*+ .251*Strategy formulation*+ .284*Strategy implementation*+.299*Strategy evaluation*

This overall model shows that environmental analysis auditing will increase performance of public health institutions by 0.220 units; strategy formulation will increase performance of public health institutions by 0.251 units while strategy implementation will increase performance of public health institutions by 0.284 units. Strategy evaluation will also increase the performance of public health institutions by 0.299 units. Finally, the positive constant (0.296) represents other factors which can increase the performance of performance of public health institutionsbuthave not been included in the model.

5.0: POLICY IMPLICATION

The conclusions of this study was informed by the findings based on each study objective and also findings of other similar studies.

Based on the findings the study concluded that environmental analysis influences performance of public health institutions. Conducting environmental audit is a necessity for a sustainable growth of organizations. Based on the findings the study concluded that strategy formulation influences performance of public health institutions.Strategy formulation aids in the development of long-range plans for effective management of opportunities. It includes defining corporate mission, specifying achievable objectives, developing strategies and setting policy guidelines.

Based on the findings the study concluded that strategy implementation influences performance of public health institutions. The strategy implementation process determines whether an organization excels, survives or dies. A successful execution and implementation of strong and robust strategies will always give a firm a significant competitive edge.

Finally, based on the findings the study concluded that strategy evaluation influences performance of public health institutions. Strategy evaluation informs the managers about the reasons leading to a particular failure in meeting a certain objective and target.

The study recommends that public health institutions need to prepare plans to cope with changes as they face dynamically changing environments especially such changes may be unpredictable and may occur suddenly.

The study recommends that public health institutions formulates strategies that can enable them to define their corporate mission, specifying achievable objectives, develop strategies and setting policy guidelines. Effective strategy formulation is able to tell what the institution is providing to the society, objectives tell what is to be accomplished, strategies state how the mission and objectives will be achieved.

The study further recommends that public health institutions should put more weight on implementing set strategies. This is because in this stage, the success or failure of well-formulated strategies depends much on strategy implementation.

Finally, the study recommends continuous of strategy implementation from time to time in order to ensure a successful end. Strategy evaluation informs the managers about the reasons leading to a particular failure in meeting a certain objective and target.

REFERENCES

Ann, G. E., Zailani, S., & Wahid, N. A. (2006). A study on the impact of environmental management system (EMS) certification towards firms' performance in Malaysia. *Management of Environmental Quality: An International Journal, 17*(1), 73-93. http://dx.doi.org/10.1108/14777830610639459

Bakar, A.H.A., Tufail M. A., Yusof, M. N. &Virgiyanti, W. (2011).Implementationof Strategic Management Practices in the Malaysian Construction Industry.*Pak. J. Commer. Soc. Sci,* 5 (1), 140-154

Benedetto, C. A., & Song, M. (2003). The relationship between strategic type and firm capabilities in Chinese firms. *International Marketing Review*, *20*(5), 514-533.

Camelo-Ordaz, C., Martin-Alcazar, F., & Valle-Cabrera, R. (2003). Intangibleresources and strategic orientation of companies: an analysis in the Spanish context. *Journal of Business Research*, *56*(2), 95-103.

Dorling, K., Scott, J., & Deakins, E. (2006). Determinants of successful vendor managed inventory relationships in oligopoly industries. *International Journalof Physical Distribution & Logistics Management, 36*(3/4), 176-191.

Hodgetts, R. M., & Kuratko, D. F. (2001). *Effective Small Business Management*. Dryden, Fort Worth, TX.

Johnson, G. & Scholes, K. (2002).*Exploring Corporate Strategy*.Prentice Hall.

Mintzberg, H., Quinn, J. B., &Ghoshal. (2004). *The strategy process: Concepts,contexts,* cases, 2nd Ed., New York: Prentice-Hall.

Njagi, L. &Kombo, H. (2014).Effect of Strategy Implementation on Performance of Commercial Banks in Kenya.*European Journal of Business and Management*, 6(13) 62-67

Ofunya, F.A. (2013) Strategic management practices on Performance of Post banks in Kenya, *International Journal of Business Management and Administration,* 2(6), 122-141

Ondera, K. (2013). *Strategic Management Practices in Mbagathi District Hospital, Nairobi, Kenya*: Unpublished MBA thesis: University Of Nairobi

Pearce. J. A. & Robinson, J. B. (2007). Strategic Management: Formulation, Implementation Control, 10th edition

Porter, E.M. (2001) *Competitive Advantage*. The Free Press, London.

Taiwo, A. S. &Idunnu, F. O. (2010).Impact of Strategic Planning on Organizational Performance and Survival.*Research Journal of Business Management,* 4 (1): 73-82

Thompson, A. A., Strickland, A. J., & Gamble, J. E. (2005). *Crafting and Executing Strategy: The Quest for Competitive Advantage.* New York: McGraw-Hill Irwin.

Venkatraman, N. (1986). *Strategic orientation of business enterprises: The construct, dimensionality and measurement*. Cambridge, Mass: Sloan School of Management, Massachusetts Institute of Technology.

The follow-up of alumni as a strategic action in Brazilian universities

Claudia Prim Correa, Cibele Barsalini Martins, Areli Andreia dos Santos
UFSC - Federal University of Santa Catarina
Brazil

Abstract

In Brazilian universities, considered as complex organization because of its multiple objectives, high specialization and low degree of coordination, the follow-up of alumni presents itself as a strategic action. The purpose of following-up alumni consists in obtaining information that enables evaluating the impact of graduate programs on professional and academic practice of alumni, as well as enhance the qualification of regular students. Taking these aspects into consideration, in this theoretical work we discuss aspects related to Brazilian universities and the follow-up of alumni as a strategic action in this context.

Keywords: Brazilian universities. Alumni. Theory of Complexity.

INTRODUCTION

The social environment in which Brazilian universities are inserted are constantly changing, which may lead them to a scenario of constant challenges (Meyer Junior, Pascucci, & Mangolin, 2012; Moritz, Moritz, & Melo, 2011). Brazilian universities face many difficulties in the materialization of their strategies, which can be explained by the fact that these organizations are considered as complex organizations (Moritz, Moritz, Melo, & Silva, 2012). Organization structure and processes present a high level of complexity, besides having multiple goals that underpin strategic actions in these higher education institutions (Souza, 2009).

In this scenario, having a strategy is an indispensable tool that encourages and enables self-organization. It also helps to reduce levels of uncertainty when individuals who are part of this system are performing their tasks (Serva, 1992). Nevertheless, this assignment is not an easy task, especially when the complex nature of Brazilian universities is taken into consideration.

In this context, we present a theoretical work that intends to discuss aspects regarding Brazilian universities as complex organizations and the influence CAPES evaluation system has over graduate programs as well. Based on this influence, we will also present a strategic action that would help universities to improve themselves, which is the follow-up of alumni from graduate programs.

2 THE THEORY OF COMPLEXITY

Complexity tends to lead people to a certain resistance, because of the difficulty in explaining what is considered complex, since “complexity is unsimplifiable” (Morin, 2005, p. 273). Despite this difficulty,

comprehending complexity can be achieved by taking into consideration simple principles and also a set of other simple elements (Morin, 2005).

About the Theory of Complexity, Serva (1992) points out that, despite having its origins in academic fields not related to Applied Social Sciences, it enables the arise of an *organization logic* that intends to answer questions regarding the autonomy of the individual. To this author, the behavior of autonomous and responsible individuals, when aggregated, aims to promote a self-organization.

As Morin highlighted, the crucial aspect of autonomy is precisely the paradox in which a system is as autonomous as it is dependent of its external environment. In 1992, Serva had already discussed this:

> "The concept of autonomy comes from the idea of organization and system and is elaborated by a paradoxical logic, by which autonomy and dependence are not seen as excluding conditions, since the system depends in part on the environment; autonomy can never be absolute, the thought that intends to give account of the complex absorb them simultaneously, assuming the paradox." (Serva, 1992, p.29).

Furthermore, Agostinho (2003) argues that the main idea regarding the Theory of Complexity is the concept of interaction between autonomous individuals or between parts of this system in which these individuals participate. Morin (2005) defines this interaction as combined relations, actions and retroactions that are combined in a system. These elements combined in different ways and means results in complexity.

As a result of the interaction of these elements, phenomena are created. The main characteristics of these phenomena are their emergent qualities, which are the result of the interaction between these autonomous individuals. It is worth reminding that these interactions are based on simple principles and local rules, which influence reaches only the action context of a specific individual. On the other hand, they can also be permeated by regularities and oscillations (Agostinho, 2003; Serva, 1992).

Consequently, if acting in a single manner through interaction, autonomous and distinct elements can emerge from a chaotic situation and change to a state of order. As a result of a coherent pattern of interaction, these elements can develop a new aggregate and emerging identity (Agostinho, 2003).

Serva (1992) points out that acting in a coherent manner, which shows a capacity of self-organization, is the main characteristic of complexity itself. Therefore, the more complex a system is, bigger its capacity to operate in chaos. Naveira (1998) adds that it is more likely and acceptable to let a system organize itself naturally than to try to control it under unstable conditions.

According to Morin (2005), from the combination of these interactions, the idea of organization logic arises. Parallel to this, the organization provides a constructive coherence to interactions:

> "The organization creates order (creating its own systemic determinism), but also disorder: in one hand, systemic determinism can be flexible, to maintain their zones of randomness, of game, of liberties; on the other side, organizing work, as we have said, produces disorder (increase in of entropy). In organizations, the presence and permanent production of disorder (degradation, degeneration) are inseparable from the organization. The paradigm of organization is considered, in this sense, a reform of thought; henceforth, the explanation does not exclude disorder, there is no hiding the organization, but you should always frame the complexity of the relationship organization - disorder - order."(Morin, 2005, p. 267).

In addition to the analysis of these interactions, the Theory of Complexity also allows to understand innovation and renovation processes, through investigating changes. Agostinho (2003) clarifies that this theory points out that complex systems can adapt to the environment from the moment they acquire information and interact from and with it. In this context, adaptation means "changing the structure (or the strategy) based on previous experience from the system" (Agostinho, 2003, p. 06).

However, a complex system that is able to adapt overcomes the barrier of simple adaptation, once it now covers the concept of apprenticeship. This happens once this system is able to identify some patterns, interpret them as a pattern to be followed and also reproduce them in a real context, which is only possible because of the interaction between with the environment where the system is inserted (Agostinho, 2003). This apprenticeship is enable by the fact that these systems are made of individuals with some degree of liberty to put into action their abilities of learning and adaptation (Agostinho, 2003). As a matter of fact, it is possible to say that complex and adaptive systems are systems that can learn.

Agostinho (2003) points out that these complex and adaptive systems express a certain level of coherence regarding the changes they need to react to, but they also have leverage points, once small input changes can result in great and targeted changes. Additionally, small changes in a complex system can result in amplified consequences, as a consequence of changing behaviors from the elements of the system.

Complex and adaptive systems can be typified by four main concepts: autonomy, cooperation, aggregation and self-organization. Autonomy consists in the action of an individual based on its own judgement. Cooperation is the adjustment between individuals behavior to possible adaptations. Aggregation defines the limits of autonomous actions, authoritatively or as a result of the posture of the individuals who aggregate. Self-organization, in order to happen, it is necessary that the system perceives the flow of information, knowledge, material, reliability, among others. Based on that, the system can control these flows and direct them in a more adequate way. These concepts are related to one another as follows:

> "Autonomous individuals are capable of learning and adapting, and also cooperate adaptive advantages. Such behavior tends to be selected and reproduced, reaching the point where these co-operative individuals come together to form an aggregate that also becomes behave as an individual and so on. It is said that the the resulting system is self-organized, global performance whose performance is also evaluated by selection pressures present in the environment (external and internal)." (AGOSTINHO, 2003, p.08)

Universities are amid complex organizations (Moritz et al, 2012). Universities are specialized organizations, which have centers of power divided by areas of competence and are orientated to produce and to transmit knowledge (Borges & Araújo, 2001; Andriguetto Junior, Meyer Junior, Pascucci, & Santos, 2011).

2.1 Universities as complex organizations

Taking into consideration their certain singularities, but also their plurality of activities areas, universities are conceptualized as complex organizations. Amongst these singularities, it is possible to name: tasks that are executed by individuals with a high degree of professionalism; professionals who

demand autonomy and liberty of action; decentralized decisions, which allow unequal development between individuals; multiplicity of distinct conceptions; low level of tasks coordination; unclear and dispersed power and objectives, which difficult the achievement of something in common in the context of the organization (Borges & Araújo, 2001).

Teixeira (2015) corroborate the idea of universities as complex organizations, but from another perspective. To the author, these organizations, besides requiring a high level of specialization, they also require a strategic management based on constant decision making processes. The plurality of possibilities of action also characterize universities as complex organizations.

Universities are understood as organized anarchies by Andriguetto Junior et al (2011). Morin (2005) says that the autonomy of a system is directly related to the development of its complexity. From this perspective, it is possible to assume that it is precisely the complexity of universities that stimulate all the more this anarchy, once the individuals become more autonomous in a complex environment.

The Theory of Complexity can be applied to the context of universities, once distinct elements act uniquely in a scenario that looks like chaos. According to Andriguetto Junior et al (2011):

> "(..) the behavior of the agents is not driven by rules and regulations, by standardized models, delimitation areas of competence and attributions, or by hierarchical structures. University organizations tend to be more fluid, with articulations between different groups and centers of power." (Andriguetto Junior et al, 2011, p. 129)

This scenario is better understood if the idea of human autonomy is taken into account. Morin (2005) indicates that the notion of autonomy is a complex concept, once it is related to cultural and social conditions of an individual. This individual is exposed to a wide range of ideas, concepts and cultures that compose a spectrum of ideas from which he can choose autonomously. Consequently, when individuals with this autonomy are gathered in order to achieve organizational goals, they act with low degree of control, resulting in a chaotic scenario.

2.1.1 Strategy in universities

Even with this possibility of chaos, the universities may be able to take measures in order to reduce the uncertainty, keep their autonomy and cooperation and also self-organize themselves. In order to do so, the universities have to match their singularities to their strategy (Andriguetto Junior et al, 2011).

Due to their complexity, universities can have difficulties regarding their strategic plan:

> "In the seek to fulfill its multiple roles and to optimize the process of management, the university adopts models for formulating strategies, but most of the time, it uses the same concepts and instruments adopted by organizations of an entrepreneurial nature, without considering peculiarities, which can ultimately lead to failure." (Teixeira, 2015, p. 34)

According to Meyer Junior, Pascucci and Mangolin (2012), Brazilian universities make use of strategies based exclusively on rational paradigms, inspired and guided by business models. These models do not bring efficient results, because universities are based on a management process that takes into consideration aspects related to not only rationality, but also political and symbolic aspects. This

multiplicity of aspects that guide the management process of universities exists because of their multiple objectives (Meyer Junior et al, 2012).

Moreover, the university strategy is not a result of a centralized management process, but a result of a complex relation among the top management and its administrative units (Teixeira, 2015). In this aspect, the Theory of Complexity can be observed in universities in the following perspective:

> "As the same as that the Theory of Complexity says that it is no use in insisting on in controlling a complex system from above, it beckons with the possibility of learning ways to promote conditions that allow the emergence of better solutions." (Agostinho, 2003, p. 03)

The Theory of Complexity assumes that the hierarchical organization of a system cannot be imposed by the top management. On the other hand, the conditions that enable the self-organization of this system can be fostered by this top management. In the context of universities, it is possible to say, based on this perspective, that its top management can help its administrative units to organize themselves to achieve their own goals. Teixeira (2015) complements the idea by saying that these administrative units can develop their own management strategic processes, which can be detached from the main strategic process of the university.

From that, it is possible to notice another sign of the relation between the Theory of Complexity and universities. Various elements act in a seemingly chaotic way, based on local rules and principles that affect only some specific units. Eventually, these elements achieve a state of order, so they can execute their goals. This state of order is reached because these elements learn and adapt to their own reality (Agostinho, 2003). Therefore, these autonomous individuals – the administrative unities – compose a complex system that acts as a bigger and singular individual – the university.

Universities, as mentioned before, are formed by distinct elements that can be considered autonomous. In a way, in the course of their action, these elements cooperate among them, each and every one in their own scope of work. This way, they achieve their own small objectives in order to help the organization to achieve the bigger and main objective. This way, these small objectives congregate themselves and act as one, through the concepts of autonomy, congregation and aggregation of the individuals that self-organized themselves. According to Tôrres:

> "In all fields, and particularly in the educational and organizational areas, we must let the emergent and potential properties of the whole, of the parts and relationships between the parts and the whole speak up for themselves" (Tôrres, 2005, p. 06).

Andreguetto Junior et al (2011) affirm that individuals define their behavior based on their own choices of actions. Consequently, they self-organize themselves based on emergent patterns that will be reflected on the whole system. In this context, strategic management is an organizational attempt of realize a process of self-organization. As a result of this attempt, the organization intends to provide the necessary conditions so that emergent performance is aligned to the intended performance (Agostinho, 2003).

From the Theory of Complexity is expected not only the study of this organizational chaos, but also to provide the means to anticipate fluctuations of the environment. From this point, it is possible to give rise to a strategic planning, what Serva (1992) calls a sophisticated way of predict and establish some regularities, reducing the organization levels of uncertainty. Although, aligning the actions of individuals

with the organizational strategic planning can be considered as a challenge, especially in the context of Brazilian universities. As Borges and Araújo (2001) pointed out, strategic planning in complex organizations is not an easy task. For that, considering the type and nature of the organization is essential, since the characteristics of universities and its own processes certainly define institutional arrangements, with direct consequences to planning and executing strategy (Borges & Araújo, 2001).

Strategic management in universities can be ambiguous and conflicting, due to the diverging objectives and preferences, which are caused by the plurality of the organization itself. In order to reduce problems with strategic management, universities must take as a strategic objective is contributing to production, application and dissemination of knowledge. As a consequence, the social context in which universities are inserted will be benefited, and it is precisely this society that validate universities performance.

3 THE FOLLOW-UP OF ALUMNI

A specific strategy that must be extensively discussed is the follow-up of alumni, specifically in this case graduate alumni. Brazilian graduation consists in a system conducted by academic and scientific needs and intends to enable regular students to widen and deepen their own knowledge, leading them to a high standard of scientific and professional competence (Capes, 2017a). Besides that, academic research produced in graduation programs can contribute to the development of a nation (Teixeira, 2015).

The follow-up of alumni is understood as a possibility to evaluate the university impact in the professional practice of its alumni that graduated from a *stricto sensu* graduate program (Teixeira, 2015). Bearing that in mind, an higher education institution that uses the follow-up of alumni as a strategic action can have information regarding their impact in the social context where they act, as well as strengthen the education to be given to regular students.

> "Assuming that alumni from a graduate program have their practical actions affected by the experiences of the course and that the quality of the program is determined by their operating conditions, it is important to contextualize the program and to understand the contributions that the course has brought to the trajectory of students' personal, professional and academic lives." (Maccari & Teixeira, 2014, p. 102)

From the relation created between the alumni and the institution from where they graduated, it is possible to have a process of feedback e development of knowledge based on their experience. Furthermore, the alumni can also dispose of a space in which they can promote new researches, exchange of experience and do networking. Considering the perspective brought by Teixeira (2015) that considers strategy not only as a plan for the future, but also learning from past actions, it reinforces the importance of maintaining a relation with the alumni. Learning from their experience helps the university to prospect new opportunities.

As Dantas (2004) says:

> "From the educational perspective, the engagement of graduate students in research lines with possible consequences for national development, guided by professors committed to society, can stimulate new ideas and facilitate the emergence of new leaderships, academic and political; therefore it is important to follow the career of alumni. It teaches a better listening of community needs and the possibility of providing adequate responses, leading to popular satisfaction and

> socioeconomic growth. It can lead to a dynamic organizational learning environment and new research opportunities, refreshing lines of research and invigorating programs through healthy competition." (Dantas, 2004, p. 168).

Maccari and Teixeira (2014) consider alumni as the most valuable asset for a higher education institution, based on the contribution that alumni may provide for the society. This contribution, as the authors remembers, is the reflex of their own experience during their graduation course. In this sense, alumni are a part of the university inserted in society.

3.1 CAPES' influence in follow-up of alumni

Brazilian universities are led to perform the strategic action of following-up alumni once they are submitted to the influence and regimentation of the Coordination for the Improvement of Higher Education Personnel (CAPES), a Brazilian public agency that reports to the Ministry of Education (MEC). Among CAPES attributions, it is worth highlighting: evaluation and recognition of *stricto sensu* graduate programs, access and dissemination of scientific production, investment in human resources, promotion of international scientific cooperation and also induction and fostering of teacher training (Capes, 2017a).

CAPES is responsible for defining guidelines, strategies and objectives that work as a strategic plan for graduate programs to follow (Capes, 2017b). Moreover, CAPES is responsible for the promotion of the development of Brazilian graduation courses and for the promotion of research with a high level of scientific rigour, which will lead to the development of the country as a nation. It is possible to affirm that there is a positive relation between education and development and this is the reason that reinforce CAPES importance (Dantas, 2004; Mancebo, Vale, & Martins, 2015).

There are five aspects considered in CAPES evaluation of graduate programs, which are: proposal of the graduate program; academic staff; student body, theses and dissertations; intellectual production; and social insertion. Among these aspects, Teixeira (2015) indicates that social insertion is directly related to alumni, once it is necessary that graduate programs identify how these alumni affect society, based on their professional and academic activities after graduation.

This social impact can be verified based on intellectual production and its impact. As Versesi, Hogan, Chambouleyron & Martinez (2002) suggest:

> "(...) an institution is valued for the products it produces and for the functions it performs in society. From the university, it is expected that it will form well-prepared professionals and researchers with solid ethical and citizenship values and who generate knowledge - science, technology, humanities and arts - in order to solve relevant problems to humanity and society that are financing them.". (Vercesi et al, 2002, p.03)

Considering the presented perspectives, it is possible to reassure that the follow-up of alumni is a strategic action of high importance in the context of Brazilian universities. Its importance is based not only by the immediate benefits the graduate programs can have directly, but also from the perspective of CAPES evaluation system. According to Teixeira (2015):

> "Thus, an effective follow-up of the alumni is for the university a competitive advantage, both to improve the grade in the evaluating assessment system (CAPES) and to provide subsidies that allow the course to enhance the training of its students." (Teixeira, 2015, p. 19).

Nevertheless, there are many critics regarding CAPES evaluation system. It is clear that this evaluation system has a direct effect in graduate programs actions, in researchers and in higher education institutions in general. This happens because a good result in this evaluation system is directly related to allocation of financial resources, which are commonly used to stimulate new and future researches. In this sense, CAPES evaluation system makes a link between performance and success (Moritz et al, 2011; Mancebo, Vale, & Martins, 2015)

As a result, this influence is considered as an invasion of a business model in universities, which Alcadipani (2011) considers as a negative aspect. The urgent need of social impact, that is achieved by extensive intellectual production, tend to lead researches to be more concerned about quantity than quality. Based on this necessity attending CAPES evaluation system, specially regarding social impact, graduate programs are supposedly led to produce research in a Fordist mode of production (Alcadipani, 2011; Bertero, Alcadipani, Cabral, & Rossoni, 2013). Considering that universities are responsible for production and dissemination of knowledge, it becomes unacceptable for them to do their activities based on this business paradigm similar to the Fordism mode of production (Borges & Araújo, 2001).

Despite the critics regarding this evaluation system, it is not possible for graduate programs to act based on the criteria regulated by CAPES. This institution and its evaluation system are taken as a guideline by graduate programs. The pursuit for attending all the requirements is considered as an efficient main strategic guideline (Maccari, Almeida, Nishimura, & Rodrigues, 2009; Teixeira, 2015). It must be brought to light that CAPES is constantly working to improve this evaluation system, so that this agency can work as a driving force that leads Brazilian education to a level of excellency (Martins, Maccari, Stropoli, Almeida, & Riccio, 2012).

3.2 Difficulties related to follow-up of alumni

In order to achieve the benefits promoted from the strategic action of following-up alumni, some difficulties may be faced by graduate programs:

> "The importance of evaluating the impact on the social and economic development of graduate's products (especially the results of the research that guided the dissertation or thesis) is, however, inversely proportional to the technical difficulty of operationalization and the definition of adequate parameters, and also, valid and reliable indicators." (Dantas, 2004, p. 168)

Teixeira (2015) says that it is not clear what is exactly expected from graduate programs. In this sense, the follow-up of alumni can bring light to aspects related to their impact in labour market and the influence of their academic studies in their professional practice. With this feedback, graduate programs may be able to reflect upon their own organization and characteristics, which gives them an opportunity to a continuous improvement action.

However, this strategic action is not easily put into practice, because maintaining a relationship between the Brazilian universities and alumni is difficult. It is noticed that alumni, in general, do not want

to maintain a link with the university. This lack of interest is noticed on not updated basic information, such as contact details and address. Consequently, the university cannot contact these alumni and request for feedback or information regarding their professional and academic work (Teixeira, 2015).

Aside from that, graduate programs also face difficulties related to operationalization of data. Some parallel actions that are meant to fill this gap are not successful, such as the research in Plataforma Lattes Curriculum of alumni. Teixeira (2015) states that these informations are not updated as well, as another result of the lack of interest of alumni.

It seems likely that alumni does not know the importance of updating their Lattes Curriculum as well, since it is from this platform that graduate programs extract information regarding academic researches that alumni may do. There is an absence of culture regarding a possible approximation between alumni and Brazilian universities that can also be noticed by the fact that alumni are unlikely to answer questionnaires sent by graduate programs with the purpose of gathering information related to professional practice and feedback about the program (Paiva; 2006; Teixeira, 2015).

Additionally, besides the fact that Brazilian universities and graduate programs are concerned with CAPES evaluation system and with their own performance, it is also noticed a lack of interest by alumni in this aspect. Teixeira (2015) suggest that this is a consequence of alumni not knowing the real impact this evaluation system has in higher education institutions in general. Moreover, the author also says that alumni does not understand how the approximation between them and their institution can contribute to actions for improvement.

> "In practical terms, it is from the importance recognition of sharing the actions and the updated data the only way to record the effective contribution of the graduate program to the society that the students collaborate with the increase of the grade of the course, which directly impacts on his own professional appreciation, since the curriculum published in the Lattes Platform shows the note of the program in which the graduate obtained his degree." (TEIXEIRA, 2015, p. 25)

In an effort to relate the Theory of Complexity with this alumni context, this theory discusses about leverage points, in which small action can result in large and effects. In this sense, actions like a continuous request for alumni updated information by the graduate program is an operational task that would enable these programs to have important information regarding their alumni in a second phase. From the moment that the follow-up of alumni becomes a strategic action in the context of Brazilian universities, by designing and implementing data operationalization, a new opportunity for improvement arises in graduate programs. It is for the university to organize itself in a way that it can develop administrative systems that can organize and process alumni information, which will lead Brazilian universities to a new level of professionalism regarding follow-up of alumni (Teixeira, 2015).

This data operationalization must be defined in the scope of each university, regarding their unique characteristics and the complexity of the organizational system. Also, it is important to understand that alumni from different universities may have different social impact and, for that, different academic and professional needs (Ortigoza, Poltroniéri, & Machado, 2012).

Therefore, it is clear that not only data operationalization is needed to alumni follow-up, but also to the increase of alumni awareness regarding the importance of feedback to graduate programs.

4 CONCLUSIONS

Based on what had already been discussed in this paper, it is possible to conclude that Brazilian universities are complex organizations, for having specific singularities and also a plurality of objectives to achieve (Borges & Araújo, 2011). Despite the difficulties this type of organization may encounter, as a result of the feeling of constant chaos and complexity, conduct a strategic action that is compatible with these characteristics is indispensable for Brazilian universities.

The follow-up of alumni becomes a strategic action in Brazilian universities based considering the benefits this action can provide for graduate programs. Data that enable the analysis of the impact of graduate programs in alumni professional work, to potentiate regular students learning and facilitate networking are examples of these benefits that can derive from following-up of alumni.

It cannot be disregarded the influence that CAPES evaluation system has over Brazilian universities and graduate programs in general, but also related to the follow-up of alumni. This complex organization has an interest in this strategic action because, once the follow-up of alumni provide positive results, there is an increase on the possibility of the allocation of financial results. As a consequence, CAPES evaluation system tends to lead Brazilian universities in a search for excellence.

REFERENCES

Agostinho, M. C. E (2003). "Administração complexa": revendo as bases científicas da Administração. ERA Eletrônica, *2*(1), 1-18.

Alcadipani, R (2011). Academia e a fábrica de sardinhas. O&S, *18*(57), 345-348.

Andriguetto Junior, H.; Meyer Junior, V.; Pascucci, L.; Santos, A (2011). Estratégias Acadêmicas e suas manifestações – o discurso e a prática. Revista GUAL. Florianópolis, *4*(3), 126-152.

Bertero, C. O.; Alcadipani, R.; Cabral, S.; Rossoni, AA. F. L. (2013). Os desafios da produção de conhecimento em Administração no Brasil. EBAPE, *11*(1), 181-196.

Borges, D. F.; Araújo, M. A. D. (2001). Uma experiência de planejamento estratégico em universidade: o caso do Centro de Ciências Sociais Aplicadas na UFNR. RAP, *35*(4), 63-76.

CAPES (2017a). História e missão. Disponível em: <http://www.capes.gov.br/historia-e-missao> Acesso em 10 de ago. de 2016.

CAPES (2017b). Sobre a avaliação. Disponível em: <http://www.capes.gov.br/avaliacao/sobre-a-avaliacao> Acesso em 10 de ago. de 2016.

Dantas, F. (2004). Responsabilidade social e pós-graduação no Brasil: idéias para (avali)ação. RBPG, *1*(2), 106-172.

Maccari, E. A.; Almeida, M. I. R.; Nishimura, A. T.; Rodrigues, L. C. (2009). A gestão dos programas de Pós-graduação em Administração com base no sistema de avaliação da CAPES. Revista de Gestão USP, *16*(4), 1-16.

Maccari, E. A.; Teixeira, G. C. S. (2014). Estratégia e planejamento de projeto para acompanhamento de alunos egressos de programas de pós-graduação *stricto-sensu*. Rev. Adm. UFSM, *7*(1), 101-116.

Mancebo, D; Vale, A. A.; Martins, T. B. (2015). Política de expansão da educação superior no Brasil. Revista Brasileira de Educação, *20*(6), 31-50.

Martins, C. B.; Maccari, E. A.; Stropoli, J. E.; Almeida, M. I. R.; Riccio, E. L. (2012). A influência do sistema de avaliação nos programas de pós-graduação *stricto sensu* brasileiro. Revista GUAL, *5*(3), 155-178.

Meyer Junior, V.; Pascucci, L.; Mangolin, L. (2012). Gestão estratégica: um exame de práticas em universidades privadas. RAP, *46*(1), 49-70.

Morin, E. (2005). Ciência com consciência. Rio de Janeiro: Bertrand, Brasil, 8ª edição.

Moritz, G. O.; Moritz, M. O.; Melo, P. A. M. (2011). A pós-graduação brasileira: evolução e principais desafios no ambiente de cenários prospectivos. XI Colóquio Internacional sobre Gestão Universitária na América do Sul, Florianópolis.

Moritz, M. O.; Moritz, G. O.; Melo, M. B.; Silva, F. M. (2012). A implantação do planejamento estratégico em organizações complexas: o caso da Universidade do Estado de Santa Catarina. Revista GUAL. Florianópolis, *5*(1), 228-249.

Naveira, R. B. (1998). Caos e complexidade nas organizações. Revista da Administração Pública. Rio de Janeiro, *32*(5), 69-80.

Ortigoza, S. A. G.; Poltronieri, L. C.; Machado, L. M. C. P. (2012). A atuação profissional dos egressos como importante dimensão no processo de avaliação de programas de pós-graduação. Revista Sociedade e Natureza, *24*(2), 243-253.

Paiva, A. M. (2006). Rumos e Perspectivas do Egresso do Programa de Pós-Graduação *Stricto-Sensu*. Dissertação de Mestrado, PUC-Campinas, Campinas, São Paulo.

Serva, M. (1992). O paradigma da complexidade e a análise organizacional. Revista de Administração de Empresas. São Paulo, *32*(2), 26-35.

Souza, I. M. (2009). Gestão das universidades federais brasileiras: uma abordagem fundamentada na gestão do conhecimento. Tese de doutorado, Universidade Federal de Santa Catarina, Florianópolis.

Teixeira, G. C. S. (2015). Desenvolvimento de uma sistemática para acompanhamento de alunos e egressos sob a perspectiva da gestão de projetos. Dissertação de mestrado, Universidade Nove de Julho, São Paulo.

Tôrres, J. J. M. (2005). Teoria da complexidade: uma nova visão de mundo para a estratégia. Integra Educativa. Curitiba, *2*(2).

Vercesi, A.; Hogan, D. J.; Chambouleyron, I.; Martinez, J. M. (2002). Os desafios da pesquisa no Brasil. Caderno Temático – Suplemento do Jornal da Unicamp, *1*(12).

Innovation, creativity, and entrepreneurship as a teaching strategy

Gentil Luiz da Silva II,
Instituto Federal de Alagoas
Brazil

Juliano Bueno Barbosa da Silva,
Instituto de Química e Biotecnologia
Universidade Federal de Alagoas
Brazil

Rafael Rocha da Silva,
Instituto Federal de Bahia
Brazil

Enio Costa,
Instituto Federal de Ceará
Brazil

Rafael Thyago Antonello
Instituto Federal de Alagoas
Brazil

Abstract

In today's times, the amount of information is huge. With this, the speed of transformation also reaches very high levels. With technological advances being humans are being gradually replaced by machines in their daily mechanical functions. Banking self-service providers, supermarkets, and other retail giants evidence these changes daily. For the professional to be able to face these new challenges, he must become an innovator by nature. However, this intrinsically human characteristic has been forgotten in the student formation. This work presents the creation of a new movement emerged called inovatisvimo (the word in Portuguese that means the fusion between three words: Inovação (Innovation), criatividade (creativity) e empreendedorismo (entrepreneurship). Innovation, creativity, and entrepreneurship will be some of the essential pillars to differentiate us from the machines in the not so distant future. In which innovative, creative and entrepreneurial actions are stimulated and directed towards the students in order to face the challenges that the new world will present.

Keywords: innovation; creativity; entrepreneurship; learning strategies;

1. Introduction

Times have changed. And the world evolves. We are living in an era of expanding connectivity and technology. In recent years, we can see that evolution has caused jobs to be replaced by machines and computers generating unemployment [1]. This trend allows us to understand why businesses have changed their profile, the emergence of the Internet - increasing connectivity - enables a range of new business relationships to be created and established. For example, advising online consultants, distance education courses, obtaining products in other cities and states with distance-pricing research among others. Each professional, who has his function performed in the same way, is counting the days. For, soon a machine can replace it developing even more efficiently in many specific situations. This causes us to consider what decisions we can make to make our services necessary and irreplaceable. Thinking about it, that a movement is inspiring young people and making them aware of the need to innovate in whatever area of professional activity emerged called inovatisvimo (the word in Portuguese that means the fusion between three words: Inovação (Innovation), criatividade (creativity) e empreendedorismo (entrepreneurship). Innovation, creativity, and entrepreneurship will be some of the essential pillars to differentiate us from the machines in the not so distant future.

Education in Brazil is a difficult and poorly remunerated area. This creates a lot of problems and inevitably reflects on student learning. The lack of interest and lack of awareness of the value that education possesses make the work of the student difficult. As teachers, we must stimulate student interest through innovative techniques so that the class becomes attractive and surprising with each passing day. In fact, we can infer that this is the essence of innovativeness applied in the classroom. This idea of the new gives young people an interest in learning and a willingness to be present in the classroom. Consequently, once young people are stimulated by the insertion of innovation and creativity in the classroom, the lack of interest with some curricular components will be replaced by the power of the new, and by the curiosity of the unpredictability of the teaching methodology applied in the classroom.

Another challenge is to stimulate entrepreneurial thinking as a young person and to prepare for the job market. This essence is steeped in entrepreneurship. Through group dynamics, we build new entrepreneurial mindsets that will boost their career in the future.

2. Methods and Materials

Our work is divided into weekly meetings in the classroom. After working with the students on the programmatic contents established by the Brazilian national curriculum, we separated 15-20 min from the class to work on the development of innovative, creative and entrepreneurial thinking in students.

Once a week, we choose between two options: group dynamics with business objectives (stimulating the development of leadership, creativity) and oriental chronicles with a philosophical character (to improve personal relationships and life).

After performing the dynamics or the reading of the chronicle, we ask for feedback from the participating students and analyze the potential effect it will cause. In general, creating expectations about what is going to happen in this "innovative moment" is the main goal of inserting that moment at the end of class each

week.

The materials used for each moment depend on a lot of what is prepared creatively and innovatively. For example, post-its for mental maps workshops, paper and brush are quite used in moments. The main raw material used is creativity.

3. Results and Discussion

An interesting aspect of this work is the creation of an innovative community. That is, the dissemination of this work provides the growth of an extremely important young network these days. This network of connected contacts virtually generates a great brainstorm fostering ideas. Also, the mental trigger of the collective generated by the coexistence of young people who think of innovation and understand that regardless of the profession they will act is necessary for us to be in the constant modification of mindset and attitudes. In the era we live in, we can not stop doing our work in an innovative way, due to the many professions that are in danger due to computerization [1].

Another result is the creation of expectations due to the periodicity of the dynamics. This provides students with a significant improvement in acceptance of the discipline, as we can generate empathy and reciprocity. The student stops to visualize the teacher as a pure transmission agent of knowledge, but also as a mentor for life projects (due to the message that is passed in the dynamics), and as a projection frame. Then, the teacher can use this framework to improve the quality of learning in the classroom, to reduce school dropout due to the expectation generated in the innovative meetings.

Recently, this work was published on the Institute's official website in a journalistic article about the "young doctors" of the institute. This news report reported that innovative dynamics are based on corporate engagement strategies, with the main objective of generating empathy.

The students of the school in which we apply the dynamics belong in their great majority to a social class disadvantaged financially. Many of them do not have adequate environments in their residences for study, need to work at the opposite time to school and often suffer very serious problems with family members. This causes year after year, dropping out of school during the school year. With this work, we are providing other skills to students, stimulating the learning of truly innovative and differentiated skills in their lives. This strategy is leading students to expand entrepreneurial mindset, providing more reasons for staying in school and as a result, increasing the expectation of learning for several students in the municipality. In the personal context, the dynamics have led messages of overcoming, motivation, creativity, persistence, planning and time management causing a positive impact on the personal life of the students from the youngest age that we can reach.

In this paper, we take into account the consequences of these dynamics. They produce in students another important point: mindset change. Mindset is one of the most powerful tools for the entrepreneur's ascension. It is from it that we end up developing another point known as an angular habit. Angular habits are attitudes that can be realized and end up generating a chain reaction effect. We can cite the situation of ALCOA [3], which invested in job security to leverage its profits. Analogously we can associate in the personal and professional life of each. We take some actions that provoke other areas of our lives, generating a domino effect and amplifying the positive effect of the primary attitude in several areas of our lives.

In the Institute where the dynamics are applied the effect has generated repercussion within the walls of the school. Several classes mentioned interest in participating, but it is up to the teachers of each class to develop their disciplines and classes in the way that is most convenient for the principle of freedom of teaching.

4. Conclusion

It is well known that in the teaching-learning process, the student has a preponderant role when thinking about long-term learning and the fulfillment of personal goals, thus requiring an active and voluntary participation in many of the activities proposed by the teacher and by the educational institution. However, it is clear that, in practice, few students act in this way. In this context, it is up to the teacher to dialogue with the students to make them aware of their role and also to alert them that they will suffer the consequences of the way they put themselves in this process. With this in mind, through educational coaching, teachers present students with tools that aim at self-knowledge; increasing students' performance by using the knowledge acquired by them to create new ones, transforming the boundaries of each one into promising resources, thinking and discussing goals and actions observing the past, aiming at the future, focusing on accelerating results.

This change in teaching practice will allow a positive influence on students' choices since they live in constant times of difficult choices that will influence the rest of their lives. Choices related to the desired profession and its articulation with the academic paths, reasons of professional preference, and perception of professional opportunities and characteristics valued by the market. In this way, the experience of these innovative moments can help the student in this decision making, thus influencing the perspective of building a life mission for the young crucially.

5. Acknowledgement

In short, the work has a great scientific contribution given the current need of students to face the future of work. It is extremely important to publicize this movement so that more education professionals are witnesses of the possibilities that collective mindset change can provide for each. Also, evidence of improvement in school performance transforms the student environment in a replicating and expansive way, serving as a stepping stone to levels of excellence for future youth. Fruitful discussions like these serve to stimulate the divergence of thinking management by expanding creativity and providing unusual and effective solutions.

We are thankful for the partial financial support by CNPq, CAPES, and IFAL.

6. References

[1] FREY, Carl Benedikt; OSBORNE, Michael A. The future of employment: how susceptible are jobs to computerisation?. Technological Forecasting and Social Change, v. 114, p. 254-280, 2017.

[2] MARCIANO, P. L. Cenouras e recompensas não são tudo: como motivar e engajar seus funcionários com base na administração moderna – Rio de Janeiro, RJ: Alta Books, 2011.

[3] DUHIGG, Charles. O poder do hábito: por que fazemos o que fazemos na vida e nos negócios. Objetiva, 2012.

[4] BRASIL, Lei de Diretrizes e Bases da Educação Nacional. Lei no 9394, de 20 de dezembro de 1996.

[5] BARETTA, P. A. Estatística Aplicada às Ciências Sociais – Florianópolis, SC: Ed. da UFSC, 1999.

[6] GIL, A. C. Métodos e Técnicas de Pesquisa Social – São Paulo, SP: Atlas, 1999.

[7] MIZUKAMI, M. G. N. Ensino: as abordagens do processo – São PAulo, SP: EPU, 1986.

[8] BACHELARD, G. A formação do espírito científico – Rio de Janeiro, RJ: Contraponto, 1996.

Copyright Disclaimer

Copyright for this article is retained by the author(s), with first publication rights granted to the journal. This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).

A Decade of Implantation of the Bachelor's Degree in Electrical Engineering in the Western Amazon

Carlos Alberto T. Carvalho Jr.; Ciro J. Egoavil; Lucas F. Ramos; Mauren P. C. Silva; Priscila L. Vianna; Viviane B. Silva; Walterlina B. Brasil
Universidade Federal de Rondônia
Brazil

Abstract

This paper deals with the implementation of the Bachelor's Degree in Electrical Engineering in Western Amazonia, as well as it presents an analysis of the academic performance of students in the Basic and Professional Core. The Federal University of Rondônia Foundation (UNIR), located in Porto Velho, Brazil, started the activities of the course in 2007 and continued to invest in the infrastructure and qualification of human resources to stimulate technological development in the region. Analyzing the performance data of the academics regarding the degree of difficulty established from the curricular offer, it is possible to infer some answers. In the course of the analysis, the databases emerged by taking note, such as students who only enroll and do not attend the course, among others. The disciplines diverged into two segments, Basic Core (NB) and Professional Core (NP). The data refers to the grades obtained by the students in all the disciplines studied and offered by the Academic Electrical Engineering Department (DAEE) in the period from 2007/1 to 2016/2. Along the analysis, two graphs demonstrated the evaluation. The analysis of the academic performance of students in the subjects during the NB and NP reinforces the result obtained in the Program for International Student Assessment (PISA) since Brazil has not obtained progress in science, reading, and mathematics averages. The results obtained indicate the necessity of effective measures in primary and secondary education since the deficit propagated to superior levels.

Keywords: *Electrical Engineering Course; Academic Achievement; Western Amazon Education.*

1. Introduction

The States of Rondônia along with the States of Acre, Amazonas, Amapá, Pará, Roraima, and the Tocantins, represents 45% of the Brazilian territory and constitutes the greatest part of the Brazilian Amazon. The territorial extension and natural characteristics favored its recognition by the Military Government, with the intention of incorporating the region into the processes of country development, but not the people. Public policies portrayed the region as a part of Brazil whose demand for societal education was a secondary issue [1]. It was necessary to guarantee the basic schooling of local elites, while enabling access to higher education with other resources and in other States. It was this notion of "take up not to deliver" that brought the population closer to the offer of higher education through the Rondon Project, which was carried out through advanced units without local identification, as it represented an advantage for the institution that participated in the proposal [2]. In this case, the Federal University of Rio Grande does Sul as a space to be occupied, contributing to the start of higher education activities in the region. Thus, the

South of Brazil took a closer approach to development policies, which fulfilled the presence and offer of higher education, settling on May 2, 1971, with its priority areas defined by the military government of the time.

Thus, the development of public higher education in Rondônia occurred in the mid-1970s, but the proposal, as an activity of the State of Rondônia, took place in the 1980s [3]. The expansion process became fast and more expressive in 2005, especially as a participant in economic development, considering the growth data of private institutions with the expansion of the offer, students, and courses [4]. Also, in Rondônia, the expansion process is especially significant, since all the data accessed from Higher Education always overlap the national average.

The consequence is that UNIR, created through Federal Law 7011/1982 with the impulse of the creation of the State itself, incorporated courses in progress from the extensions of the other Universities. There are three remaining Bachelor's courses (Administration, Accounting Sciences, and Economic Sciences). The expansion was especially motivated from the Constitutional determination that established ten years for the Federal Higher Education Institutions (IFES) to internalize, a fact that materialized during the quadrennium 1986-1989, creating the campus of Vilhena and Ji-Paraná (1988), with the courses of Sciences. In 1989, the campuses of Guajará-Mirim, Cacoal, and Rolim de Moura were created, offering courses in Literature, Pedagogy and Accounting Sciences. Today, the UNIR headquarters is located in Porto Velho and has offices in the municipalities of Ariquemes, Cacoal, Guajará-Mirim, Ji-Paraná, Porto Velho, Presidente Médici, Rolim de Moura, and Vilhena. From this internalization, UNIR increased from 707 (seven hundred and seven) students in 1983, distributed in 9 (nine) undergraduate courses, to 8485 (eight thousand four hundred and eighty-five) enrolled in the undergraduate program in 66 (sixty-six) undergraduate courses and 768 professors in 2015, also began to expand with the offer of distance learning courses. According to [5], since 1992, it has been observed that, in a bit more than a decade, there a 318% approximate increase in the number of professors employed and an increase of approximately 347% in students enrolled, as can be seen, Figure 1.

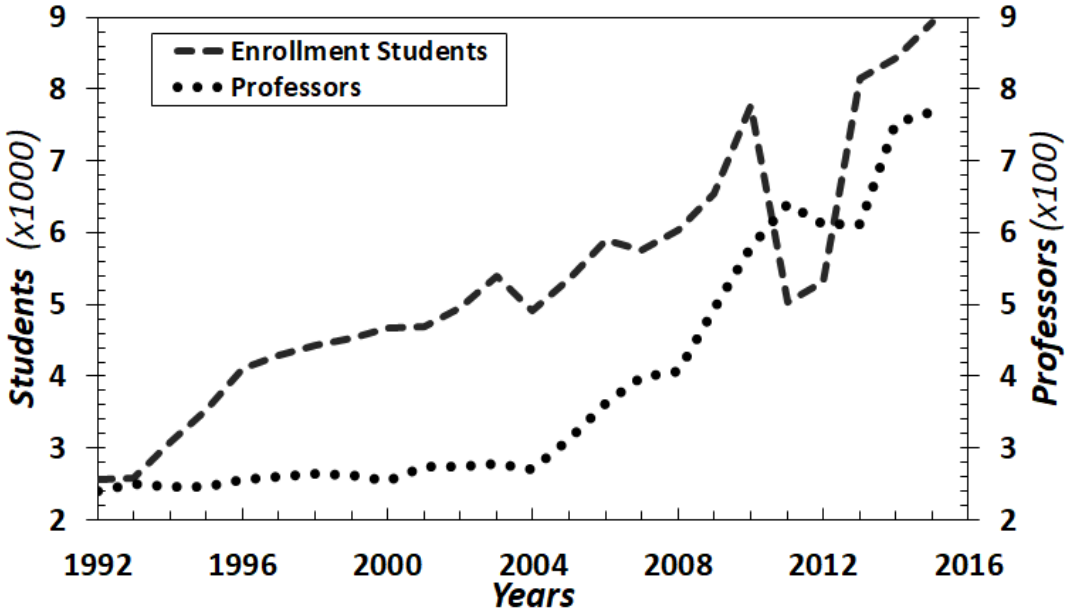


Figure 1. Enrollment Evolution and Hiring Professors [5].

1.1 Progress and Consolidation of UNIR

Despite starting with the training of bachelors to attend to the state bureaucracy, following the tradition of the professions in Brazil, the training of teachers for middle and high school became the most important point of the offer [6]. In the 1980s, undergraduate courses in Letters, Geography, History, Physical Education, Mathematics) and Pedagogy (Teaching and Technician Qualification in School Supervision).

In the mid-1990s, courses began in the area of Health, in the notice of the precariousness of the State in this area, the courses of Nursing (1988) and Psychology (1992) emerged. The implementation of the courses of Biological Sciences, Physics (Ji-Paraná), Spanish Language and Linguistics (1996), and Informatics (1997) occurred to meet the political-economic and geographical reality of this University and to the local and regional communities. Next, in 2002, the courses of Medicine, Chemistry, Communication (Vilhena), and Agronomic Engineering (Rolim de Moura). In 2006, the creation of the courses of Electrical Engineering and a full degree in Physics in Porto Velho, and Environmental Engineering in Ji-Paraná. In 2010, the course of Civil Engineering in Porto Velho was implemented, among other courses of the Restructuring and Expansion of Universities (REUNI) project, instituted by Decree No. 6096/2007.

The area of Engineering emerged as demand in the IFES in the 1980s when there was a proposal of the offer's regionalization, considering the sectors of production and economy. However, this project was not welcomed by the community [7]. During the Ecological Socioeconomic Zoning developed in Rondônia, the possibility of localized investments was also observed; this perception of the relation between the projects and the contribution of Higher Education was not considered either. This type of procedure delays the insertion of engineering in any community, and in this case, it did not allow the immediate progress of this area in the 1990s. In this way, the conditions of differentiation and diversification of the system arose from relations with pressures external and internal conditions [4].

UNIR has made strong investments in the qualification of its faculty, always seeking partnerships with high-level research development and scientific production institutions, such as USP, UNESP, UNICAMP, UFRJ, UFPA, and UFMS. With such partnerships, in addition to the hiring and release of professors for qualification, in less than a decade, it was possible to leap from less than ten doctors to 134 in 2006, in addition to having surpassed the number of 200 masters in the most diverse areas. Currently, the university has 300 doctors, 333 masters, 86 specialists and 15 graduates, which shows that the university prioritized the qualification of its faculty in recent years [5].

All these achievements accompany mobilizations focused on the creation of regional alternatives for the expansion and diversification of the offer. In this context, it includes the area of Engineering.

1.2 A Brief History of the Implementation of the Electrical Engineering Course

An implementation of the Electrical Engineering major at UNIR began in open discussions in 2002 by the Science Center, and Technology (NCT) at the Technical Committee event of Energy carried out in Manaus with the company Eletronorte, dealing with the possibility of implementing the undergraduate course in Electrical Engineering.

In 2003, a technical team established to carry out the Project for the Implementation of the Electrical Engineering Course. In the year of 2004, Eletronorte signaled the possibility of financing the course when

it officialized the decision to support five (05) courses in Electrical Engineering in the Amazon; considering that it was in the company's interest to invest in the qualification of labor, due to the need to renew the workforce by approximately 80% in the next ten years, in addition to the possibility of working together with the researchers of the area established in these new courses.

In 2006, the Superior Council of UNIR approved the implantation project and the pedagogical policy project of the course. The first entrance examination for the Electrical Engineering Course took place at the end of the same year.

In 2007, the transversal action entitled "Information Center for Engineering Technology for Legal Amazonia – CITEAL" was elaborated, where Eletronorte made available today US$1.543 million for the implementation of Electrical Engineering courses in the North Region in the form of ordering at the Fin, an economist for Studies and Projects (FINEP). The project was launched and sent to the FINEP (Infrastructure Cross Order, Protocol No. 60, 07/18/2008) by UNIR which financial resources of US$1.543 million would be distributed among the IFES, but due to various problems and bureaucratic obstacles, it did not obtain success.

In mid-2012 began the teaching qualification of the Academic Department of Electrical Engineering (DAEE) using an Interinstitutional Doctorate (DINNER) promoted by the Graduate Program in Electrical Engineering (PPGEE) of the Federal University of Santa Maria (UFSM). It had a simple objective, but not least, to train and qualify the teaching staff as well as the partners in the scenario until 2016. In 2017, 7 PhDs in Electrical Engineering graduated from DINNER.

It is important to note that a doctoral program contributes considerably to the training of researchers, enabling the creation and installation of skilled work, to meet the regional peculiarities. Also, the implementation of DINNER, among other objectives, further strengthens the academic ties established among higher education institutions, opening new spaces for permanent actions.

Currently, the Electrical Engineering course is in full operation with five classes in progress and a new group scheduled for entry in the second semester of 2017.

1.3 Bachelor of Electrical Engineering at UNIR

The Northern Region was an isolated electrical system, and this was a characteristic in which the State of Rondônia was inserted, since it has a total 69 projects in operation, generating 8343.15 kW of power, 91.19% of this power being generated by Hydroelectric Power Plants (HPP). Among the main works are the Jirau Hydroelectric Power Plant with a generating capacity of 3750 MW, and the Santo Antonio Hydroelectric Power Plant with 3568 MW, located in the Madeira River, in Porto Velho, Rondônia [8].

According to the characteristics and specificities of the training in Electrical Engineering, which are foreseen in the National Curricular Guidelines (DCNs), the course demands a qualification of the professors, being the masters and doctorate levels in the following areas: 36% Basic Core (NB); 47% Vocational Core (NP) and Specific (NE); 10% Practical Activities; 3% Work Completion Course and 4% Supervised Internship.

1.4 Academic Electrical Engineering Department

The DAEE currently has 14 (fourteen) faculty professors members, with 5 (five) with doctorate degrees and 3 (three) with specialization, 6 (six) with a master's degree.

1.4.1 Technical Support Staff

The DAEE currently has 5 (five) technicians to support the didactic, research and extension activities, mainly in the area of electronics and electrotechnology.

1.4.2 Infrastructure

The DAEE has the support of the provisional infrastructure located at the Campus of Porto Velho, Building 1H, with four air-conditioned rooms to hold the following laboratories: Electrical Circuit Didactic Laboratory, Laboratory of Digital and Microprocessed Systems and Laboratory of Electrical Machines I and II. The laboratories are available to attend other courses, such as Computer Science and Civil Engineering, among others. The activities carried out in the laboratories are teaching, monitoring, development, and testing of projects, as well as any working meetings.

Currently, the specific building for the DAEE is in the completion stage and consists of three floors distributed in five classrooms, restrooms, academic center room, warehouses, canopy, auditorium, office, department core, fourteen offices for professors, three technical laboratories, eleven teaching laboratories, and one research laboratory.

2. Analysis of Academic Performance

According to the Pedagogical Course Project (PPC), the teaching process is in-person. This supports the purpose of attending to a solid technical and scientific training of the professional, where the student may absorb and develop new technologies, stimulate their critical and creative role in identifying and solving problems, consider their political, economic, social, environmental, and cultural aspects, with an ethical and humanistic vision in response to the demands of society.

During first periods of the course, the students experienced the subjects of basic contents, with some disciplines of specific contents and vocational content. In the second half of the course, it includes some disciplines of vocational content and basic content, and the specific contents of the Electrical Engineering course have an emphasis on Electrotechnology, although it is a generalist.

During the development of the Academic Performance Analysis (ADA), as the main objective, it sought the statistical outline of the academic profile of the Bachelor's Degree in Electrical Engineering, to subsidize administrative and pedagogical strategies to improve academic performance.

The data presented were obtained from the Integrated University Management System (SINGU) through the Technology and Information Board (DTI), and treated to avoid inconsistencies and distortions. The data refers to the grades obtained by the students in all the disciplines studied and offered by the DAEE in the period from 2007/1 to 2016/2. The sample set of Basic Core (NB) scores is 37873 elements, with a mean of 63.18 and the standard deviation of 22.904. For Professional Core (NP), the sample set is 51400, with a mean of 68.91 and the standard deviation of 20.607.

2.1 Evolution of Academic Performance

In the course of the analysis, the databases emerged by taking note (nil), and other inconsistency problems, such as students who only enroll and do not attend the course, among others. The disciplines diverged into two segments, Basic Core (NB) and Professional Core (NP).

Along the analysis, two graphs demonstrated the evaluation, the first being, in descriptive statistics, a box or boxplot chart, a method for graphing the sets of notes through their quartiles. The box diagrams may have lines extending vertically from the whiskers, which indicate variability outside the upper and lower quartiles, and Outliers displayed as individual points. The box charts are not parametric, as they present varying student scores without making any assumptions about the underlying statistical distribution. The spacing between the different parts of the box indicate the degree of dispersion as well as the affinity in the data and show sporadic values.

In the analysis of the data, ranges for the degree of difficulty of the disciplines were taken into consideration, using the empirical domain and widely accepted in designing the scale from 0 to 100 within these parameters:

- The first track considers as a grade with "Difficult" degree, that is, when the first quartile is below the average of approval (60 points), that is, the desired threshold as a reasonable indicator of student achievement;
- The second track considers as a discipline with a Medium or Intermediate degree, i.e., when the value of the third quartile is between the average of approval (60 points) and less than 80 points;
- The third range is considered as an Easy discipline, i.e., when the value of the third quartile is greater than or equal to 80 points.

The second type of graph presented, the histogram deals with the precise representation of the distribution of student grades. It is an estimate of the probability distribution of a continuous variable (quantitative variable). In this evaluation, it explores the behavior of the grades by the frequency that they are assigned in order to quantify the knowledge acquired in the subjects, as well as it can subsidize the reflection on the models/methods of content evaluation in the subjects offered in the scope of the Bachelor's Degree in Electrical Engineering UNIR.

Analyzing the performance data of the academics regarding the degree of difficulty established from the curricular offer, it is possible to infer some answers to the following questions:

- Which subjects are easy, medium or difficult in NB? What about NP?
- What influences the difficulty level of the classes about NB and NP?
- It is possible to identify which contents are deficient?
- Is it possible to identify characteristics of the evaluative methodologies?

The following is the result of the data related to the evaluative period 2007/1 to 2016/2. Figure 2 presents the boxplot of this analysis, generally identifying the disciplines with their degrees of difficulty during NB, and Figure 3 presents the frequency of the grades obtained in that period.

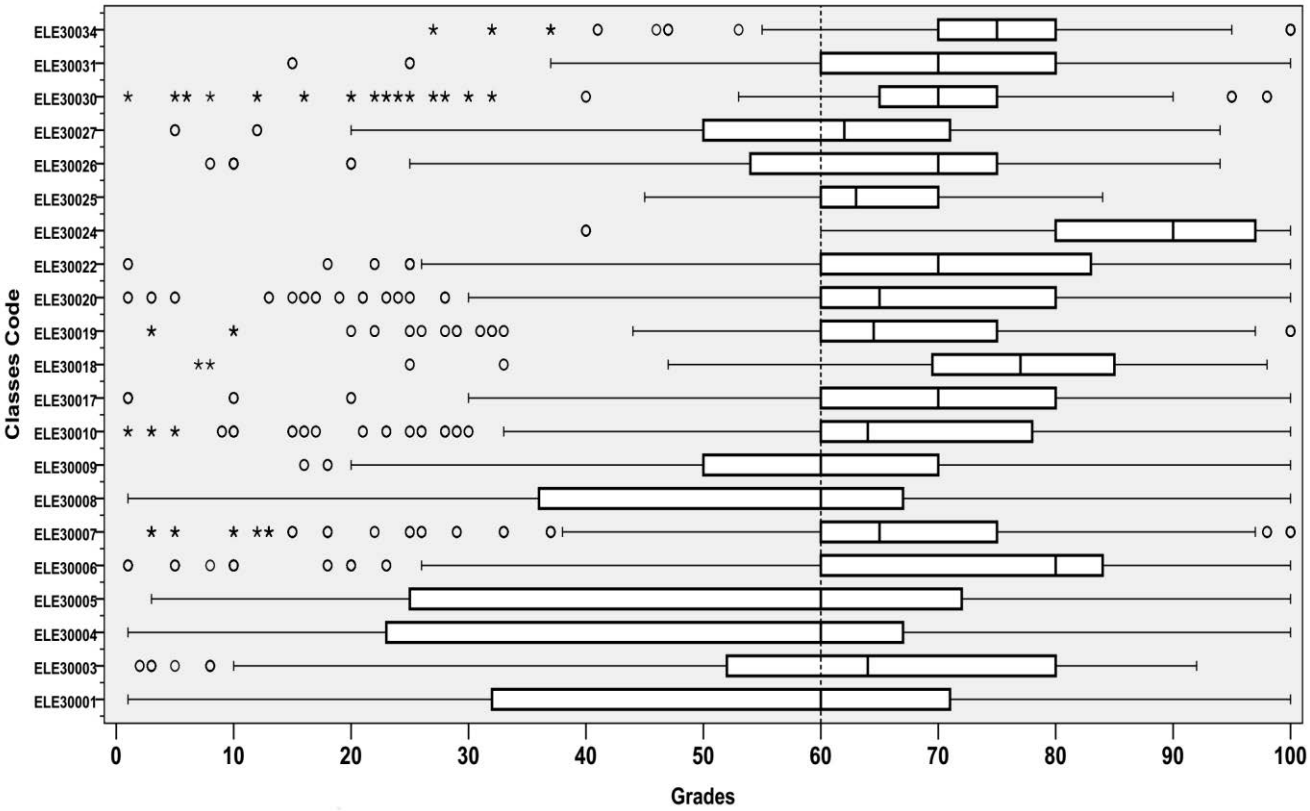


Figure 2. Performance analysis by the degree of difficulty of the NB of the Bachelor's Degree in Electrical Engineering from 2007/1 to 2016/2.

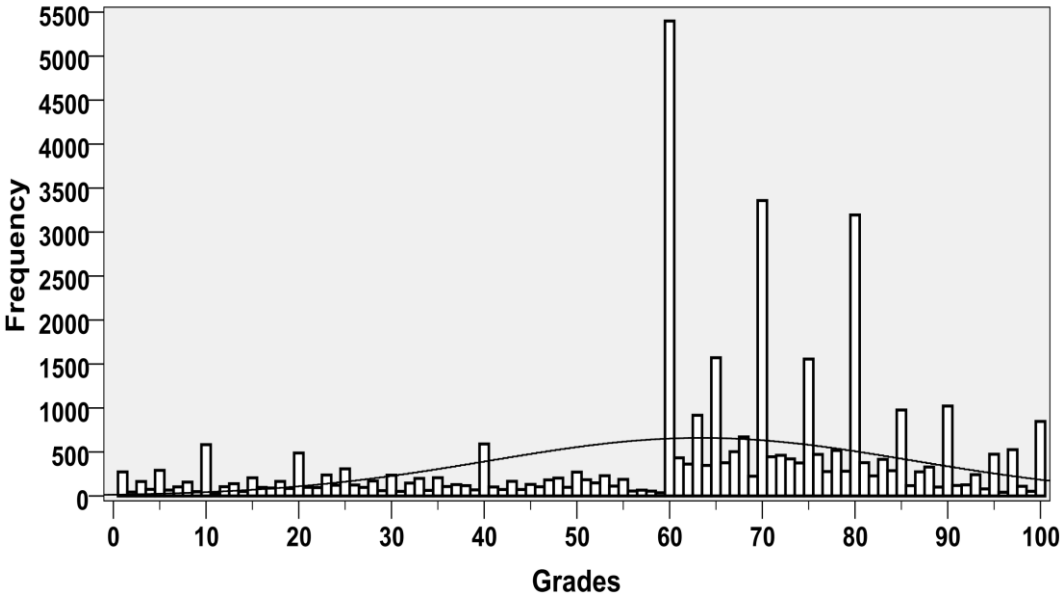


Figure 3. Performance analysis by a note of the NB of the bachelor's degree course in Electrical Engineering in the period from 2007/1 to 2016/2.

Figure 4 presents the analysis boxplot identifying in general form the disciplines with their degrees of difficulty during NP, as well as Figure 5, shows the frequency of the grades obtained in that period.

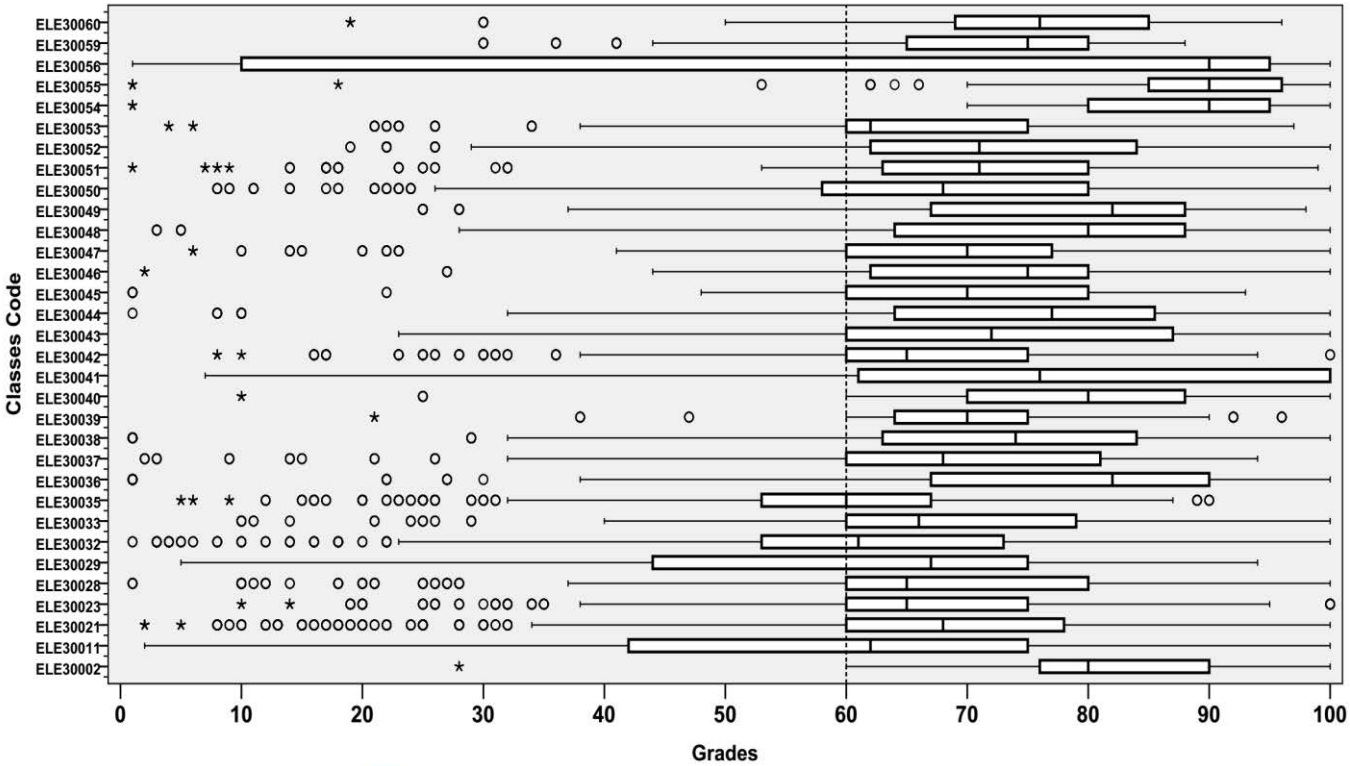


Figure 4. Performance analysis by the degree of difficulty of the NP of the baccalaureate course in Electrical Engineering in the period from 2007/1 to 2016/2.

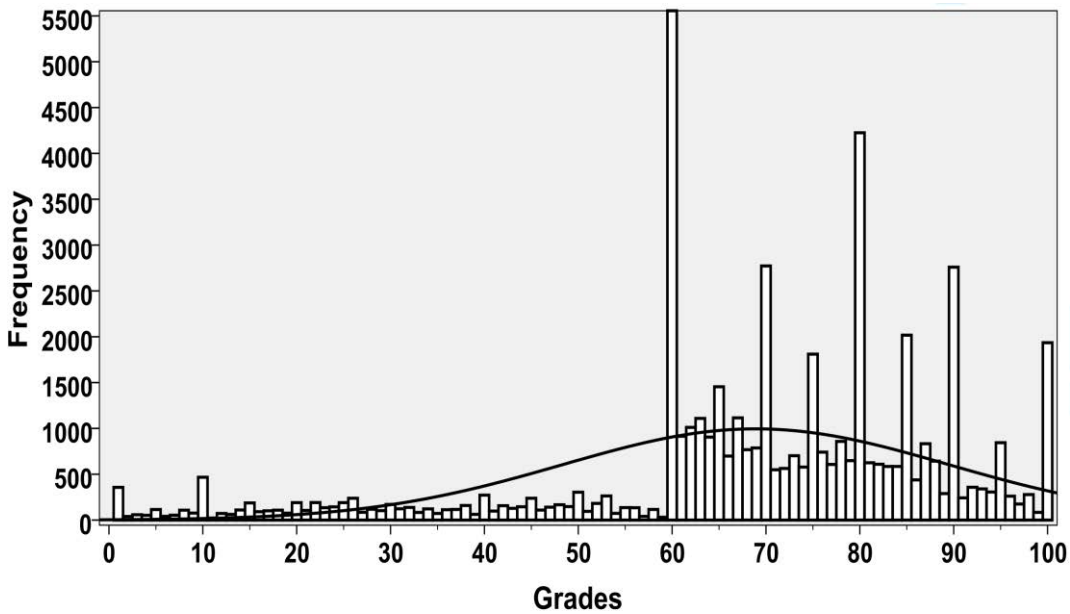


Figure 5. Performance analysis by a note of the NP of the bachelor's degree course in Electrical Engineering from 2007/1 to 2016/2.

3. Results and Discussions

In the analysis, it is possible to note some considerations about the performance of the students of the Bachelor's Degree in Electrical Engineering. One can identify the easy, medium/intermediate, and difficult

disciplines.

Tables 1 and 2 emphasize, according to the graphs, the results on this topic and represent the NB disciplines evaluated between 2007 and 2016.

In this distribution, it states that the entrance disciplines in the area of mathematics and physics are considered more difficult, suggesting that there is a deficit of knowledge regarding elementary mathematics. This deficit directly influences the other basic subjects, since they use basic knowledge to subsidize the concepts presented in the higher-level subjects.

Table 1. The Basic Core Difficult Disciplines

Code	Discipline
ELE30001	Differential and Integral Calculus I
ELE30003	General and Experimental Chemistry
ELE30004	General and Experimental Physics I
ELE30005	Analytical and Vectorial Geometry
ELE30008	Linear Algebra
ELE30009	Statistics and Probability
ELE30026	Mechanics of Solids
ELE30027	Differecial Equations and Modeling
ELE30030	Transport Phenomenon

Table 2. The Basic Core Medium Disciplines

Code	Discipline
ELE30006	Environmental Sciences
ELE30007	Differential and Integral Calculus II
ELE30010	General and Experimental Physics II
ELE30017	Portuguese I
ELE30019	Differential and Integral Calculus III
ELE30020	General and Experimental Physics III
ELE30022	Scientific Methodology
ELE30025	General and Experimental Chemistry
ELE30031	Notions of Economy
ELE30034	Technical Drawing

After the NB (First Period), when disciplines are completed and approved, it perceives that the students maintained an intermediate performance in the disciplines offered in the following periods. The discipline of NB, Notions of Law - ELE30024, was the only one considered easy.

Regarding NP, initial contact with specific contents of the electrical engineering course provides some degree of difficulty. Again, we infer that in the first period, low knowledge of mathematical tools as well as theoretical concepts undermines student academic performance.

After the completion and approval of NP disciplines (First to the Third Period), students are observed to have maintained an intermediate performance in the subjects offered in the following periods, as shown in Table 3.

Subjects ELE30054 and ELE30055, Supervised Internship I and II, respectively, are considered NP, since evaluations are performed by supervisors in the labor market, and the students do not depend exclusively on the technical or theoretical component for understanding and solving a situation, besides being in an environment of professional practice.

Table 3. The Professional Core Medium Disciplines

Code	Discipline
ELE30002	Introduction to Engineering
ELE30021	Electric Circuits I
ELE30023	Complex Variables
ELE30028	Electronics I (Theory and Lab)
ELE30029	Numerical Calculation
ELE30033	Electronics II (Theory and Lab)
ELE30036	Industrial Organization
ELE30037	Mathematical Methods Applied to Engineering
ELE30038	Polyphasic Circuits
ELE30039	Electrical and Magnetic Materials
ELE30040	Control I
ELE30041	Energy Conversion
ELE30042	Electromagnetism
ELE30043	Digital Systems I
ELE30044	Communication Theory
ELE30045	Applied Electromagnetism
ELE30046	Control II
ELE30047	Electric Machines
ELE30048	Data Transmission System
ELE30049	Energy Conversion Lab
ELE30051	Generation, Transmission, and Distribution of Electricity
ELE30052	Power System Analysis
ELE30053	Embedded Systems
ELE30059	Analysis of Electricity Distribution Systems
ELE30060	Protection of Electrical Power Systems

Table 4. The Professional Core Difficult Disciplines

Code	Discipline
ELE30011	Basic Electricity (Theory and Lab)
ELE30032	Electric Circuits II (Theory and Lab)
ELE30035	Electromagnetism I
ELE30050	Electrical Installations
ELE30056	Final Work of Course

Evidently, about the frequency of the assigned grades, there is a high concentration of grade 60, the average for approval. This information may suggest that the evaluation methodology used by the professors does not adequately stratify the expected knowledge of the student during the course offer, and it is still possible to suggest that the professors round up the grades for approval.

4. Conclusions

The creation and implementation of the Bachelor's Degree in Electrical Engineering brought opportunities for the establishment of skilled work of the local community, public and private companies operating in the energy sector. The institutional support provided the qualification of the faculty, which can consolidate research group and raise funds to improve infrastructure, as well as support the implementation of a graduate program.

The evolutionary analyzes of students' academic performance from 2007/1 to 2016/2 showed that there is a lack of solid knowledge in the basic tools in the areas of mathematics and physics.

To observe deficient contents, it is important to note the international responses to the area standard and its prerequisites. In this case, the database of the Program for International Student Assessment (PISA) was used. Thus, it was possible to verify a correspondence with the results of PISA in this international exam, Brazilian students have indicators in science (401 points, compared to the average of 493 points) [9], in reading (407 points, compared to the average of 493 points) [10] and mathematics (377 points, compared to the average of 490 points) [11], below the average of the countries of the Organization for Economic Co-operation and Development (OECD). Since 2006, the Brazilian average in science has remained stable, with an approximate increase of 10 points in the grades (390 points in 2006 to 401 points in 2015), which does not represent a statistically significant change. The results obtained by PISA are similar to the historical evolution observed among the OECD countries, as there was a slight decline from 498 points in 2006 to 493 points in 2015. In reading, Brazilians increased the score from 396 points in 2000 to 407 points by 2015 but also does not represent a statistically significant change. In the area of mathematics, there was a significant increase of 21 points in the average of students between 2003 and 2015. At the same time, there was a decrease of 11 points if we compare the average of 2012 with the average of 2015 [9-12].

The data does not allow the identification of deficient contents, but with greater inference, the gaps and areas that hamper student performance. The characteristics of the methodologies differ greatly about the nature of the curricular component, its objective in the project of vocational training and the conditions of

the offer. In fact, a safe description is given of where and what aspects of the engineer's training need to be articulated between the previous contents and the requirements of the professional training. It is important to realize that these articulations of mathematics and physics content are paramount to the intellectual maturity of the student for better understanding and the applications in the specific disciplines of the bachelor's degree in electrical engineering.

Finally, based on this information, it is also necessary to reassess basic and secondary education by observing and improving the teaching of science, reading, and exact subjects to guarantee better use at the beginning of the activities at the higher level and improving the student's performance. Also, a leveling program should establish with the higher-level students to reduce the effect of such retention and avoidance. As a suggestion, intensive pre-calculus and pre-physical courses should emerge, a practice that some universities already use, and these can take place about two weeks before the beginning of the semester for those incoming students who feel somewhat insecure in these areas.

5. Acknowledgement

The authors thank the Federal University of Rondônia for the support to carry out this work.

7. References

1. Brasil, W.; Andretta, P.I. e Sousa, N. G. Constituição Regional da Qualificação Docente Universitária. In: AMARAL, J.J.O e HILARIO, R. (Org.) A Amazonia, Território e Educação. Migrações e Políticas Públicas. São Carlos, SP; Pedro & João Ed. pp. 153-206, 2013.
2. J. C. Asberg, “Rondônia cresce com Campus de Porto Velho”, Jornal Correio da Manhã (Acervo Fundação Biblioteca Nacional), pp.28, Rio de Janeiro, RJ, BRA, 1971. [Online]. Avaliable: http://memoria.bn.br.
3. Albuquerque, Eva da S. & MAIA, Moacyr B. R. A trajetória do ensino superior público em Rondônia: 1970 - 1990. Porto Velho, EDUFRO, 2008.
4. Dias, Alessandra C. S. M; Brasil, Walterlina. A diversificação e diferenciação da oferta na expansão do ensino Superior em Rondônia. In MORET & BASTOS (ORGs) Desenvolvimento Regional em Rondônia. Rio de Janeiro, Letra Capital, 2011.
5. Catálogo de Dados 2015, Coordenação de Informação e Desempenho, PROPLAN, UNIR, Porto Velho, RO, BRA, 2015. [Online]. Avaliable: http://www.cid.unir.br.
6. Dias, Alessandra C. S. M; Brasil, Walterlina. A Expansão do Ensino Superior em Rondônia: Políticas Públicas e Desenvolvimento Regional na Amazonia. Dissertação de Mestrado em Desenvolvimento Regional e Meio Ambiente. Universidade Federal de Rondônia. PGDRA/UNIR, 2008.

7. Dias, Alessandra C. S. M., Brasil, Walterlina; Fujihara, Arlene M; Políticas de desenvolvimento e educação superior na Amazonia: Ensaio sobre processo de expansão em Rondônia. In BRASIL, Walterlina (org.) Desenvolvimento Regional e Meio Ambiente em Rondônia. Porto Velho; EDUFRO, 2007.
8. Agencia Nacional de Energia Elétrica, Banco de Informações de Geração – BIG, Brasil, 2017. [Online]. Avaliable: http://www.aneel.gov.br.
9. OECD (2017), Science performance (PISA) (indicator). doi: 10.1787/91952204-en (Accessed on 16 August 2017).
10. OECD (2017), Reading performance (PISA) (indicator). doi: 10.1787/79913c69-en (Accessed on 16 August 2017).
11. OECD (2017), Mathematics performance (PISA) (indicator). doi: 10.1787/04711c74-en (Accessed on 16 August 2017).
12. Programme for International Student Assessment (PISA), 2015, Organisation for Economic Co-operation and Development (OECD), France, 2015. [Online]. Available: https://data.oecd.org/brazil.htm.

Copyright Disclaimer

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.
This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).

The Use of Cryodehydratated Animal Anatomical Segments for Veterinary Anatomy Teaching

Ana Luísa S. Valente[1], Lygia Almeida[1]

1. Universidade Federal de Pelotas, Instituto de Biologia, Depto. de Morfologia. Brasil.

ABSTRACT

Anatomical education in the Veterinary Schools around the world has been supported by diverse kinds of innovations such as digital resources and applications, being the use of cadaver's dissections very limited. In the present study, the use of cryodehydrated anatomical pieces of musculoskeletal structures from large and small animals were experimented for five years and the vantages and advances were computed. The material was prepared using a fixation of fresh material with 10% formalin followed by dissections and freezed-unfreezed sequences until completely be dried. Paints were performed to give a natural appearance. The material produced, including complete limbs from large and small animals had a good quality and preservation of the structures such as ligaments, muscle mass, tends and aponeuroses. The topographical relationships were perfectly maintained and revealed to be a reliable material for the practices class of musculoskeletal anatomy. The method used was easy applied, very cheap, of stress-free manipulation and storage and due to its high durability reduced the discharge of biological wastes and chemical products. The students show very friendly to this kind of material what reflected in high coefficient of approval during the practical examinations. The experience of create additional assignment to teaching how to prepare the material was successful and have been a great integration opportunity to students from last years of the course work together and share experiences with the beginners, when they check anatomic contents considering the applicability in clinics and surgical assignments.

KEY-WORDS: veterinary anatomy teaching, criodehydration technique, cadaver conservation

INTRODUCTION

It is unquestionable that the recognition of gross anatomical structures and their normal aspect and positioning in health animals is basic in the veterinary formation. Most of Veterinary Scholars around the world have at least two teaching assignments at the curricula about gross anatomy. Historically, the experience in this area counted with the use of cadaver's dissections but this subject has been much discussed[1,2] and not more employed in most universities. Although some studies suggest that dissection, coupled with associated educational activities, is an effective pedagogical strategy for learning[3,4], nowadays, the use of digital ways to explain this subject is more frequent to describe muscular structures[5], being the cadaver's use very limited. Unlike osteological material, that has a permanent character and is available in the laboratories and museums where is stored with relative easiness, muscular structures are expensive to preserve. Many techniques are known to keep this kind of material for long time[6], but most

of them implies in high cost of maintenance in suitable tanks. Digital lectures[7] and three-D applications[8] based on reconstructions of series of drawings are very popular and helpful among veterinary students because the applications allows to put or remove layer of muscles and provide basic knowledge about spatial anatomy[9] but, in most of them the interpolation of data is far of the natural structure and students have difficulty when in front an anatomical piece in the laboratory. Synthetic models are also useful, but have an expressive cost of acquisition and are not so attractive and interesting to the student as the laboratory practices. The gross anatomical dissection is a crucial part of the education of veterinarians because it takes important manual skills, anatomic knowledge as well as an understanding of spatial relationships of structures and organs of the body.

Reasons because practices with cadavers are each more scarce includes the low availability of dead animals designed to this kind of practices once animals are protected by international laws that forbid the euthanasia for education or investigation studies, the use of toxic substances to preserve the material, and need of appropriated facilities to storage the anatomic pieces, mainly treating of large animals, which the discharges of conserving fluids may a terrible source of environmental contamination.

At South Brazil, many veterinary schools are focused mainly in farm animals due to the expressive impact of the cattle farming in the country economy. Other areas of veterinary medicine, including large animals, are also imperative, such as the equine clinics and sheep and swine productions. At Federal University of Pelotas, classes of veterinary gross anatomy are offered in the first and second semesters of the curricula, and composed by a total of 136 hours each one, with a half charge in laboratory practices. The assignment entitled Anatomy of Domestic Animals I (ADA I) receive annually about 160 academics and focus in the musculoskeletal structures, being comparative among domestic species including both, large and small animals. Parts of bovine carcasses are obtained by donation from slaughterhouses located near the university, but just corporeal segments without economic value are available. Other source of biological material is the University Animal Hospital, where the bodies of dead animals (small and large size) free of infectious and zoonotic diseases are carried to the Anatomy Sector to class proposes. Given it is a public institution, the university have limited financial resources, including those to buy synthetic models to contemplate all students and, a small number of technicians to support the laboratories. Considering the high number of students supported and suitable quantities of material in the labs, the logistics is compromised due the space to storage and posterior discharging of cadavers. To become viable appropriate classes of musculoskeletal structures, since the two last decades, we have applied and developed anatomical techniques[10] to solve these problems. This work has as aim to present these techniques as well as shows how those have worked which good results in the veterinary teaching.

MATERIAL AND METHODS

Fresh cadavers from equines, bovines and dogs were used in present study, the carcasses were obtained from animals that dead during treatment at the Animal Hospital from University of Pelotas. Cryodehydration technique described by previous works[10] incremented with paintings and resin layers were performed, and anatomical pieces with superficial and deep muscle dissections were produced. A quick pass-by-pass is exposed here:

1. Fresh carcasses were used immediately or frozen at -20^{0}C to posterior studies;
2. Bodies with complete integrity (i.e. without missing of some parts and with skin without sections) were preferably perfused with dilution of formalin at 10% thorough cannulation of the External Carotid Artery, just in one side of the neck. The solution was spread out in the carcass via the vascular system using a press produced by the elevation of the formalin solution deposit at 2,5m from the floor. Expected positioning of the head and limbs should be provide before this step, because fixed tissues are hard to move after the process. The perfusion is given complete when verified muscular stiffening and frothy secretion released from the nares is.
3. When just parts of the body are available, multifocal perfusion through muscular tissues and articular cavities are conducted using manual injection with needles coupled to 50ml syringes. Perfusion is given complete after all tissues, including the deeper ones to be exposed to the fixer solution. Additionally the material should be immersed in formalin 10% tanks in the next 48h.
4. In both cases, the carcasses are covered with plastic material and stored at room temperature (8-22^{0}C) during 24 to 48h.
5. Carcasses are washed with tap water and dissected as a convenience of the proposed class, using traditional anatomic dissections techniques for musculature visualization.
6. At this stage, the anatomical pieces can be used in some lab classes, taking account the partial volatilization of the formalin, with could be irritant to eyes and nose mucosa.
7. Dissected anatomical pieces pass a at least twenty criodehydration sequences, including freezing at -20^{0}C and unfreezing at 10 to 22^{0}C, air relative humidity around 70-80%.
8. After that, the material is kept out of the freezer until its complete drying, with is proved when a fine paper towel compressed on structures is removed completely dry.
9. A new careful debriding of tissues using the bistoury to produce scrapping and removal of dry fascies and perimysium will expose better the muscular fibers. Removals of periosteum in some parts are also need and will grant a better recognition of the structures.
10. Finally, structures can be painted with gouache painting combination colors closer to the natural appearance of a fresh tissue. Three coatings of gum composed by acetate of polyvinyl are used. First coating with 50% of dilution in water and the next two using the pure glum. Drying time is about 12 hours.

Teaching application of the material

For ten semesters, this kind of material have been used in the ADA I and was freely available at labs, which were opened at least 2 hours daily for extra-class study. In some pieces, structures were permanently labeled. Other kind of gross anatomical pieces included those fixed in formalin and cryodehydrated metameric sections.

The presence of students in the labs was monitored as well as the use that they made of the material and the general conservation of the anatomical pieces. The performance of the students in subsequent examinations was computed.

RESULTS

Dehydrated anatomical pieces completed about 70% of the material used in practical classes of veterinary anatomy during the study. Some students complementary used digital applications but synthetic models were not available by the university. The material produced, including complete limbs from large and small animals had a good quality and conservation of the structures such as ligaments, muscle mass, tends and aponeuroses. The topographical relationships are perfectly maintained and revealed to be a reliable material for the practices class of musculoskeletal anatomy. Some regions of clinical concernment, as *manus* and foot ligaments, including all sesamoids suspensory apparatus are very distinguishable in equine and bovine pieces. Thorax and abdomen of dogs also provide excellent visualization of the muscles. All dehydration pieces are storage in cabinets with glass door (Fig 1) and are freely used on laboratory tables by the students. Anatomical pieces were odorless, dried and resistant to the touch. The students are friendly to use it because they are very didactic, easy manipulation and learning. The frequency in the practical laboratory was increased even when technicians were not available to provide material.

Topics with a good visualization of structures using criodehidratation anatomical pieces.

I. Head of equine and dog: We used to divide using an electric band saw, the head in left and right antimeric sections, with can be used in the medial and lateral aspect. In the medial aspect, it is appreciable to visualize the encephalon, ethmoid turbinates, nasal turbinates, hard palate, tongue, pterigoid medial muscle, parts of hyoid apparatus, digastric muscle (in horse). From lateral aspect is visualized most of face musculature, deep or superficial structures according to the previous dissections (Fig.2).

II. Limbs of equine, bovine and dog: The relationships among muscles and articular structures are clearly verified (Fig.3). Hooves were also sectioned and internal components and their exact positioning and sinthopy can be easily studied (Fig.4)

III. Thorax and abdomen of small animals:

These corporal segments were also studied in left and right antimeric sections and internal organs were removed to allow highlight to the muscles. Dogs of medium size breeding were chosen and most of accumulated fat between muscles was manually removed prior dehydration. In general, material with no more than 2cm of thickness was more quickly dehydrated. As the most of animals used dead due to traumatic injuries, we need to use hydrogen peroxide 50% diluted in water to promote clarification in surfaces with blood impregnation. In practices classes, the approaching of the muscles of the trunk was also performed using formalin fixed pieces what allowed the better understanding the layers of muscles.

DISCUSSION

Cryodehidrated anatomical pieces from the digestive tract have been applied in the some veterinary schools from Brasil[11] with satisfactory results in the anatomical teaching[12]. The methodology explained in the present study for musculoskeletal structures of large and small animals has been applied with

success in the veterinary anatomy teaching at Federal University of Pelotas for more than 25 years, but the experience have not evaluated and published. The great contributions of employing the cryodehydrated material as a teaching tool are: the low cost, high durability, easy handling and storage, low toxicity, long term reduction of environmental contamination by biological and chemical wastes and the attractive effect on the students. Similar material is also produced using a plastination process[13,14] in which the water and fat are replaced by certain plastics, yielding specimens that can be touched, do not smell or decay, and even retain most properties of the original sample[11]. However, this process is not available in most Veterinary Schools around the world due to high cost of execution, once require specific equipment and chemical components. The cryodehydration technique used in the present work have a low cost, requiring just formalin, domestic freezer (for small animals) and artisanal material for completion, easily found in hardware stores. Once prepared, the anatomical material can be stored for long time (more than 20 years) in places free of humidity and decompositors insects (coleopterans). This reduces the logistic and costs to keep large formalin tanks to store body parts. As water is lost during the process, there is a reduction of approximately 60% of the original weight of the material which became it slighter and of easy handling[10]. During the class and extra practical classes, the students are not exposed to volatile toxic substances becoming this moment more long and comfortable. Due its great durability, the same piece can be used for several years without need of replacement, which minimizes the probability of environment contamination. Lastly, the material produced in colors or in pale tones (without paints) arouses interest in students with is expressed in the low disapproval coefficients (8 to 11%) observed in the assignments.

Actually we counted just with a technician to general activities in the sector that receive also students of Zootechny course, in a total of 600 students annually. Little skilled labor to produce the material is required. As the interest of students and curiosity in to know how to prepare the material have increasing, the Anatomy Sector decided to create an optional assignment with maximum 10 undergraduates to provide specific training (Fig. 5). Two classes are planned each year and, year after year, they have increasing the anatomical collection available to next students, sequentially. There is a great integration opportunity to students from last years of the course work together and share experiences with the beginners, when they check anatomic contents considering the applicability in clinics and surgical.

ACKNOWLEDGMENTS

We are grateful to the students of the Complementary Formation in Morphological Science Assignment, whose have been collaborating in preparing anatomical pieces. To ..for review of this manuscript.

REFERENCES

1. Jones, D. *G*areth. 1997. Reassessing the importance of dissection: a critique and elaboration. Clinical Anatomy 10, n. 2, p. 123-127.

2. Nwachukwu, C., Lachman, N., & Pawlina, W. (2015). Evaluating dissection in the gross anatomy course: correlation between quality of laboratory dissection and students outcomes. *Anatomical sciences education*, *8*(1), 45-52.

3. Pizzimenti MA, Pantazis N, Sandra A, Hoffmann DS, Lenoch S, Ferguson KJ.Dissection and dissection-associated required experiences improve student performance in gross anatomy: Differences among quartiles. Anat Sci Educ. 2016 May 6;9(3):238-46. doi: 10.1002/ase.1574. Epub 2015 Nov 4.

4. Ghosh, S. K. 2017. Cadaveric dissection as an educational tool for anatomical sciences in the 21st century. American Association of Anatomists, 10: 286–299. doi:10.1002/ase.1649

5. Moore, J. 2017. Muscle Motion. 3D4 Medical. Aplications in https://3d4medical.com/support/complete-anatomy/muscle-motion

6. Hildebrand M. 1968. Anatomical Preparations. University of California Press, Berkeley and Los Angeles. 100p.

7. Singh, A., Min, A.K. 2017. Digital lectures for learning gross anatomy: a study of their efficacy. Korean J Med Educ. 29:27-32.

8. Hoyek, N., Collet, C., Di Rienzo, F., De Almeida, M. and Guillot, A. (2014), Effectiveness of three-dimensional digital animation in teaching human anatomy in an authentic classroom context. American Association of Anatomists, 7: 430–437.

9. Skrabe, V.E. – Ilustraçoes Biomédicas. Tools for learning and teaching – Veterinary Anatomy. http://biosphera.org/international/

10. Teixeira, A.; Teixeira, A.F.; Guarenti, V.P.J. 1990. Desidratação de músculos no preparo de peças anatômicas. Rev. bras. Ciên. Morfol., v.7/8, n.2/1, p. 45-47.

11. Kremer R., Schubert J.M. & Bonfíglio N.S. 2011. Criodesidratação de vísceras do canal alimentar no preparo de peças anatômicas para estudo veterinário. Pub.Vet, Londrina, Ed. 160, 5(13):1-7.

12. Cury, F. S., Censoni, J. B. & Ambrósio, C. E. 2013. Técnicas anatômicas no ensino da prática de anatomia animal. *Pesquisa Veterinária Brasileira*, *33*(5), 688-696.

13 . Latorre, R.M, García-Sanz, M.P, Moreno, M., Hernández, F., Gil, F., López, O., *et al*. 2007. How usefull is plastination in learning anatomy? J Vet Med Educ 34:172-6.

14. Ravi, S.B. and Bhat, V.M. 2011. Plastination: A novel, innovative teaching adjunct in oral pathology. J Oral Maxillofac Pathol 15:133-7.

FIGURE LEGENDS

Figure 1. Dehydration thoracic limbs (bovine, equine and canine) storage in cabinets at laboratory.

Figure 2. Cryodehydrated heads of dog (A) and horse, B – lateral view and C –medial view.

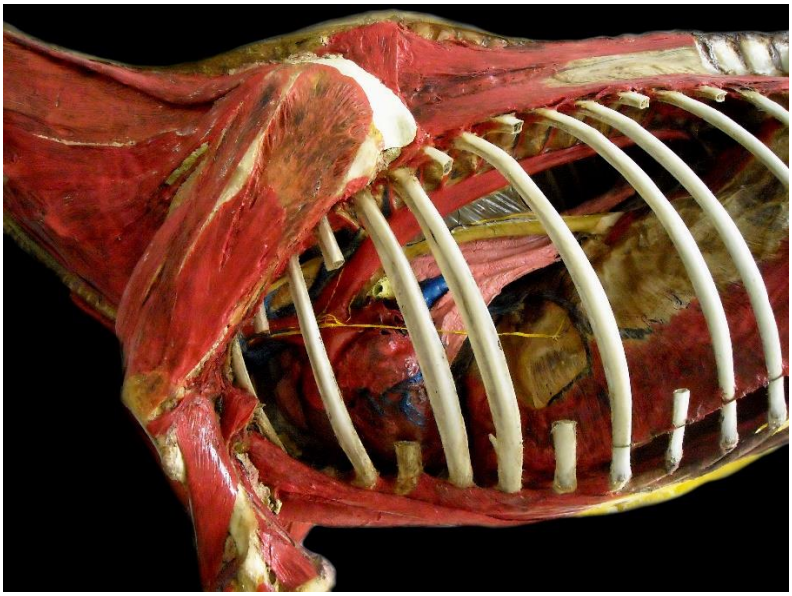


Figure 3. Cryodehydrated anatomical pieces used in gross anatomy teaching. A – Deep dissection of horse thorax and thoracic limb. B. Thoracic limb of a bovine without paint. C – Forearm of dog (medial –at left and lateral views –at right)

Figure 4. Cryodehydrated sagittal section of the hoof of equine.

Figure 5. Students learning how prepare the dehydrated anatomical pieces – Complementary Formation in Morphological Science Assignment.

Strategic Human Resource Management Practices and Performance of Employees in the Ministry of Health, Nairobi City County, Kenya

Josephine A. Nyambane
Corresponding Author: Stephen M. A. Muathe
School of Business, Kenyatta University

Abstract

Performance of employees in the Ministry of Health, Nairobi City County has been dismal. There have been instances of inability amongst employees to meet deadlines, low efficiency and dismal productivity. The objectives of the study included; assessing the influence of recruitment, career management, reward and performance appraisal practices on performance of employees in the Ministry of Health. The study was guided by the strategic management and performance theories. The study adopted mixed methods approach and thus applied descriptive research design. The target population comprised of 15 Departmental Heads and 425 employees all totaling to 440. Using the Central Limit Theorem, 132 respondents, that is, 30.0% of 440, was selected. Stratified sampling was applied to create five strata based on the number of departments in the Ministry of Health Nairobi. Heads of department will be selected using purposive sampling whereas 25 employees will be selected from each department using simple random sampling to avoid bias. This procedure enabled the researcher to realize a sample of 5 heads of departments and 127 employees. Questionnaire was used to collect data from employees whereas interviews from heads of departments. Qualitative data was analyzed thematically along the objectives and presented in narrative forms whereas quantitative data was analyzed descriptively using frequencies and percentages and inferentially analyzed using ANOVA Test Analysis with the help of SPSS Version 23. The study established that, at the Ministry of Health in Nairobi County, employees' efficiency, productivity and ability to meet deadlines are low. It is also evident that strategic human resource management practices such as recruitment, career management, reward and performance appraisal practices have not been fully exhausted. Thus, the study recommends that the Ministry of Health should endeavor to train their employees in order to improve the organizational performance. The Ministry of Health should provide employees opportunity to make decisions on how to go about their tasks, seeking employees' input in managerial decisions, delegating to them tasks that they can handle, equipping them with skills required by their jobs, setting achievable targets and incorporating employees in fair evaluation of performance, salary increase and fair administration of rewards. Job performance should be considered in determining the compensation of employee's performance.

Keywords: Strategic Human Resource Management Practices, Performance of employees

1.1Background of the Study

In global perspective, many government organizations and firms face competition which demands the need for employees to register higher performance through quality services to citizens so as to increase productivity through improved efficiencies and reduced costs. Ivancevich (2007) reports that performance of employees has been a challenge in the world and particularly in the third world countries. Successful organizations have realized that several practices have great impacts to the performance of organizations with human resource being the most critical (Mello, 2006). In a study conducted in the Netherlands, Chan and Kuok (2011) reports that strategic human resource management practice refers to the generally accepted rules or procedures set to guide organization to achieve the set goals as they appear in the mission and vision of the organization. Chan and Kuok (2011) further assert that practices are the processes undertaken to meet the objectives of the organization.

In Sub-Saharan Africa, the scenario is similar. Effective commitment and job satisfaction are desirable outcome of employees' perception on organizational experiences derived from appropriate strategic human resource management practices (Ekwoaba, Ikeije and Ufoma, 2015). The employee behavior outcomes have strongly and consistently been associated with the anticipated results such as efficiency, profitability, productivity and low meeting deadlines among others (Ekwoaba et al, 2015). Strategic human resource management scholars suggest that organizations can use performance and commitment oriented human resource practices to drive the desired organizational effectiveness (Ahmad & Schroeder, 2013). In a study conducted in Nigeria, Wright, Gardener and Moynihan (2011) argue that strategic human resource management practices influence employees' knowledge, skills, motivation and behavior which have an impact on operational efficiency, productivity, profitability, learning and growth.

In Kenya, Ministry of Health, Muchiri and Cooksey (2012) agreed that by empowering employees they get to believe that they form part of the organization. Lagat (2013) reported that performance management is a plan and an all-inclusive process which helps institutions to strive towards attainment of its objectives through proper utilization of its human resources by identifying what each can input into the organization so as to work as teams. However, much still needs to be done to find out how strategic human resource management practices conducted at the Ministry of Health, Nairobi, City County Kenya, influences the performance of employees, thus the study.

1.2 Statement of the Problem

Human resources are the most valuable assets an organization has and efficient use of them foresees any organization at top level. It is important for employees to have a healthy and secure workplace. Every organization whether in the public sector or private sector desires to achieve its goals, objectives, or set targets efficiently and effectively. In the Ministry of Health in Nairobi, performance of employees has been dismal. There have been instances of not meeting deadlines, low efficiency and dismal productivity. As stated in the background, Lagat (2013) reports that most employees at the Ministry of Health have registered and continue to register low efficiency, high instances of not meeting deadlines and low productivity. According to a report by Muchiri and Cooksey (2012), there has been a growing regarding

performance of employees and service delivery at the Ministry of Health. However, while above human resource practices are considered to have a positive influence on service delivery, they too may have a negative effect on staff performance leading to staff turnover if they are not well planned and managed hence causing organizations to perform poorly. Despite these observations, it is not known how human resource plans interplay to enhance productivity of employees, thus, the study.

1.3 Objectives of the Study

The general objective of the study was to investigate the influence of strategic human plans on the performance of employees in the Ministry of Health, Nairobi city County Kenya. The specific objectives were:

- To find out the influence of recruitment practices on performance of employees in the Ministry of Health, Nairobi City County, Kenya.
- To establish how career management practices influence performance of employees in the Ministry of Health, Nairobi, City County Kenya.
- To determine how reward practices influence performance of employees in the Ministry of Health, Nairobi City County, Kenya.
- To assess the influence of performance appraisal practices on performance of employees in the Ministry of Health.

2.1 Theoretical Literature Review

This study was based on strategic management (Kuo, 2009) and performance theories (Walberg, 2002). The strategic management theory describes how managers interact with the supervisors in relation to the information regarding the set goals. Employees should be motivated so as to strive towards increased productivity. Managers all over the world may have achieved managerial success without having basic theoretical knowledge in management. Rationale of using the theory in this study was to enhance staff and management at the Ministry of Health to recognize their participation towards attainment of the organizational goals as they appear in the mission and vision statements. The performance theory states that psychological behavior of an employees and the environment influence performance. Walberg (2002) found out that performance of an employee is influenced by the employee's capability, efficiency, productivity, self-esteem, character, emotions, motivation, and how willing is the employee ready to involve in learning organization. Job evaluation can provide leaders with useful information for proper functioning of the organizations. The importance of this theory in this study was based on the fact that objectives of institutions are considered to consist of employee's feelings of the social environment, innovation, self-concept and interest in their work.

2.1.1 Recruitment Practices and Performance of Employees

Recruitment is a component of human resource function that affects input of employees towards organizational performance. Anderson and Cunningham-Snell (2001) established that even though known,

insufficient decisions on recruitment affects employee performance making it difficult for organizations to achieve the set targets. Public service agencies in many different countries have taken long to identify and adopt effective hiring plans. In a study carried out in Pakistani Banks by Haroon (2010) it was noted that obtaining and maintaining high-quality talent is important to organization's success. That is, it involves hiring employee with right qualifications, positive attitude and sufficient work experience. Haroon (2010) stated that as a result of employees being in the same scale for long and exiting job due to old age, many organizations are not able to identify the right candidates to fill vacancies left.

This implies that recruitment and selection processes are currently the best way to ensure that applicant with the requisite skills and qualities are successfully attracted to the health organizations. In a study conducted in Nairobi County, Okoth (2014) reports that such effectiveness is achievable if the Ministry of Health is can hire staff in possession of the required skills and are ready to determine their destiny as far as knowledge acquisition is concern in order to reduce on training expenditure, staff turnover, poor performance and dissatisfied customers. However, Okoth (2014) as did other empirical studies have not articulated how different recruitment practices adopted by the Ministry of Health impact on performance of employees; hence the need for the study.

2.1.2 Career Management Practices and Performance of Employees

This is the process by which individuals gather information about a specific carrier by assessing its strengths and weaknesses so as to develop a career goal which will concentrate on strategies to increase the profits. Greenhaus, Callanan and Godshalk (2008) found out carrier management process to include discovery, developing career goals, and applying career strategies so as to achieve career goals. Institutions require employees with necessary skills and knowledge so has to take advantage of their competitors. Greenhaus et al (2008) agrees that in the changing world, organizations need ongoing professional and managerial development programs. Parties involved will have to put in place structures and processes to support the development of employees.

In a longitudinal study carried out amongst 124 employees in five Commercial Banks in the United States, Hall (2014) revealed that banks which provided opportunities for their employees to undergo continuous professional training leave for personal development and exchange programmes registered higher productivity compared with their competitors who did not. A study carried out in Machakos Level V Hospital by Musyoka (2013) revealed that employees were anticipating more than what their jobs offered in the changing environment. Okoth (2014) stressed the importance of career development management to employees and the institution. However, this is not the case in the Ministry of Health; Nairobi County which is characterized by undefined career advancement which has killed morale of employees. Further, the study by Okoth (2014 did not indicated how different approaches and practices adopted by the Ministry of Health influence performance of employees.

2.1.3 Reward Practices and Performance of Employees

Motivation and interest arouse an employee's curiosity to perform, respond and attend to subject matter. According to Armstrong (2004), employee's ability to perform is affected by both extrinsic motivation,

that is, their engagement with an activity in order to receive reward or avoid punishment and intrinsic motivation, that is, engagement because it is personally satisfying and unrelated to the external reward or punishment they might receive.

These points to the fact that strategic motivation practices most organizations adopt play critical roles in enhancing employee's performance in the organizations. Al-Jabari (2013) posits that the vast amount of research, which has been done on the relationship between these two types of motivation and performance of employees, indicates that intrinsic motivation is of particular significance to sustained employee performance. In Kenya and the Ministry of Health in particular, motivation strategies managers adopt play an influential role in organizations and act as a primary source of gendered messages received by employees (Okoth, 2014). Mogaka (2011) and other empirical studies have fallen short of specifying how motivation practices and approaches enhance performance of employees.

2.1.4 Performance Appraisal Practices and Employees' Performance

Performance appraisal is a human management technique adopted to evaluate the performance of an employee. According to Nykodym, Simonett and Welling (2009), performance appraisal analyses the achievements attained in regard to the targets set. It further looks into areas were the target was not made to establish the courses for none performance. Through performance appraisal employees are rewarded according to the targets achieved. Employees' development and training for potential performance improvement. It provides information for succession planning to validate selection process and training which encourages supervisory understanding of the subordinates. In a study conducted in the Netherlands, Hackman and Oldham (2000) assert that performance appraisal is a means through which an individual's performance is assessed towards the attainment of organizational goals. It provides necessary information about a worker's performance by identifying the training needs of an individual and reward plans such as advancement, promotion, pay increase, demotion and work or performance improvement plans.

In most countries in Africa, Greasley, Bryman, Dainty, Price and King (2005) asserted that several institutions used different methods of appraisal depending on the platforms they were operating on though similar checklists were used on similar skills of employees to ensure employers were receiving their profits. In most firms in Kenya, appraisal assists to flag the needed skills required by an employee so as to organize the necessary training. It also sets grounds for salary increment and allowances (Muchiri, 2011). However, appraisal system is hindered by lack of standards, unreliable reward systems and untrained supervisors. For instance, in a study conducted in Kisumu Municipality amongst middle cadre employees, Wafula (2014) revealed that performance appraisal practice was not considered in improving the performance of the employee. Wafula (2014) noted that most employees who were rated below their expectations were hearted and discouraged as they feel that their supervisors acted with bad intentions. Differences on the inputs and targets may result to conflict which may continue over the years, Nzuve (2007) reported that the Ministry of Health, Nairobi, Kenya uses performance appraisals to measure the performance of employees and to access salary and wage increment. However, performance appraisal is also associated with other benefits among them job security, status, eligibility for promotion. However, in some instances it may be associated with biasness. Appraisal shows the capability of the worker as it assesses the performance of the worker.

Nzuve (2007) failed to articulate how different performance appraisal practices interplay to enhance performance of employees; hence the study.

3.1 Research Methodology

The study employed Descriptive research design as it gave complete description of persons, events, or group (Burns & Grove, 2003). Quantitative method was used to gathered huge information on the reasoning capabilities of the responndents and exhausted the problem as gven by (Kothari 2005). Quantitative research was used to arrieve at numbers which were transformed into usable statistics. Attitudes, views, actions and other stated variables were quantified. Measurable information was used to put together facts and unearth patterns. Results were generalized from the entire population. The target population comprised of 15 Departmental Heads and 425 employees. One hundred and thirty-two respondents were considered using the Central Limit Theorem. Stratified sampling was applied to arrive at five strata classified as per the number of departments in the Ministry of Health Headquarters. From each department, head of department was selected using purposive sampling. By use of simple random sampling 25 employees were chosen from each department.

A self-designed questionnaire with closed-ended test items was used to gather quantitative information from the 127 employees whereas interviews were used to gather qualitative information from heads of departments. Piloting was conducted amongst 13 employees who consisted ten percent of the population selected for the study as by Kothari (2005), Validity was measured against construct and content of the instruments. In this regard, instruments validity was measured through consultation with experts and professionals in related studies and researchers who have participated in similar studies. Test retest technique was used in establishing the reliability of the instruments.

Test items in the questionnaire were used to group respondents twice at intervals of two weeks. Calculation of the reliability coefficient between the two sets of scores was done using Cronbach Alpha Method and the results were as follows; Objective 1, $r = 0.608$, objective 2, $r = 0.696$, objective 3, $r = 0.620$ and objective 4, $r = 0.663$ which on average results in $r = 0.647$. The test items were reliable and thus consistent.

3.2 Data Collection Procedures

Data was collected in two stages after obtaining the letters of authorization and permits from the relevant authorities. The sampled departments were pre-visitedinorder to make appointment with the respondentsand to get used with the respondents before the commencement of the study.The employees were issued with the questionnaires to administor. Those willing to fill were given sometime to fill then the questionnaire was collected. Those who were busy on the material day for issue were given sometime to fill. The questionnnire was later collected after some days. Heads of the departments were interviewed.

3.3 Data Analysis Procedures

Qualitative data was analyzed thematically along the research objectives and presented in narrative forms whereas quantitative data was analyzed descriptively using frequencies and percentages and inferentially analyzed using ANOVA Test Analysis with the help of Statistical Packages for Social Science (SPSS

Version 23). Analysis of Variance (ANOVA) was carried out to test the significance of the overall model, while also testing null hypotheses of the study. The decision rule for F-statistic was to reject the null hypothesis if p-value is smaller or equal to the critical value of 0.05 level of significance or to accept the null hypothesis if p-value is greater than the critical value 0.05 level of significance (Kothari, 2005). The quantitative findings were presented using tables and charts.

4.0 RESEARCH FINDINGS AND DISCUSSIONS

Research findings and discussions were presented as per the research objectives

4.1 Recruitment Practices and productivity in the Ministry of Health, Nairobi County, Kenya

The study sought to establish influence of recruitment practices on performance of employees in the Ministry of Health. The study established that 25.0% of the employees indicated that levels of efficiency is good, slightly less than a third 32.3% indicated that efficiency levels are fair, whereas 42.7% indicated that efficiency levels are below average. Only 29.8% of the employees indicated that levels of employees' productivity are good, 30.6% indicated that productivity is fair whereas slightly more than half (54.8%) indicated that levels of employees' productivity are below average. Slightly more than a third (34.7%) of the employees indicated that absenteeism levels are good, a quarter (25.0%) indicated that absenteeism levels are fair whereas 40.3% indicated that levels of absenteeism are below average. In the same vein, a quarter (25.0%) of the employees indicated that rates at which employees meet deadlines are good, 27.4% indicated that such levels are fair whereas 47.6% indicated that levels of meeting deadlines are below average. During the interviews, departmental heads also admitted that performance of employees at the Ministry of Health has been at its bottom level. The findings affirmed the fact that performance is measured through efficiency, benchmarking, set targets and the financial measurement. The study also established that 52.4% of the employees indicated that the Ministry of Health very often set requirement for recruitment, 19.4% indicated that the Ministry often set requirements, 21.0% indicated sometimes whereas 7.2% indicated never.

Majority (63.7%) of the employees reported that the Ministry of health very often advertise existing vacancies, 21.8% indicated that the Ministry of Health often advertise, 9.7% indicated that it sometimes advertises whereas 4.8% indicated never. 40.3% of the employees indicated that the Ministry of health very often select successful candidates for recruitment, a quarter (25.0%) indicated often, 24.2% indicated sometimes whereas 10.5% indicated never. During the interviews, departmental heads also responded in favor of the view that the Ministry of Health often sets requirements for a job placement, advertises the existence of such vacancies and selects successful candidates. These findings are consistent with the findings of a study conducted in Kuala Lumpur by Stewart and Knowles (2014) which revealed that the availability of competent and efficient lab our force does not happen by gambling but through an articulated recruitment exercise. In other words, larger corporations implement sophisticated recruitment processes with majority of smaller organizations relying on referrals and advertising as their recruitment practices of

choice (Stewart & Knowles, 2014). These findings point to the fact that the success of any organization heavily depends on its ability to attract and hire the right personnel with the necessarily required skills.

The study also established that 71% of the respondents strongly agreed that the Ministry of Health sets requirements while recruiting staff though it has rarely enhanced their efficiency, and productivity at work. On the other hand, 12.3% of the respondents agreed, 1.3 % of the respondents were not decided, 10.1% disagreed while 5.3% strongly disagreed to the test item. It was clear that 66.9% of the respondents were in agreement that setting requirements before recruiting employees at the Ministry of health has rarely reduced absenteeism levels as did 13.2% of the employees. Thus, these findings affirm the fact that setting requirements for recruitment is a vital function of human resource management practice for any type of business organization. 2.4% of the respondents were not decided while 12.7% disagreed and 4.8% totally disagreed. 80.5% of the employees strongly agreed that the Ministry of Health usually advertises existing vacancies before recruiting staff which enhances their efficiency, and productivity at work. 12.4% of the employees agreed with the test while 1.6% of the employees were undecided, 3.3% disagreed and 2.2% strongly disagreed with the test. As for the test that existing vacancies are advertised before recruiting employees at the ministry of health which has reduced levels of absenteeism the findings were that 67.4% of the Employees strongly agreed with the view 19.7 % agreed, 3.5% were undecided, 5.3% disagreed and 4.1% strongly disagreed. Interviews for departmental heads also indicated that advertising existing vacancies before recruitment is often conducted at the Ministry of Health.

One departmental head reported, that the ministry advertises the existing vacancies so to attract the right personnel. 69.6% of the employees strongly agreed with the view that the Ministry of Health rarely selects successful candidates to enhance efficiency, and work productivity as did 13.8% of the employees. On the other hand, 1.6% of the employees were undecided, 10.6% disagreed whereas 4.4% strongly disagreed. On the test whether selection of successful candidates at the ministry of health has reduced absenteeism of the respondents 61.8%strongly agreed,14.5% agreed, 2.1%, were undecided, 15.2% disagreed and 6.4% strongly disagreed. However, departmental heads discounted the view that the Ministry of Health rarely selects successful candidates to enhance efficiency, and work productivity. It is taking a long time for public service agencies in many jurisdictions to identify and implement new, effective hiring strategies.

Table 4.1: ANOVA Analysis of the Difference between Means of Frequency of Adherence to Recruitment Practices, Employees' Efficiency, Productivity and Rates of Meeting Deadlines

		Sum of Squares	df	Mean Square	F	Sig
Frequency of Adherence to Recruitment Practices		595.865	3	198.622		
Efficiency	Productivity	4999.280	3	1666.427	21.389	.001
	Rates of Meeting Deadlines	701.195	9	77.911		
	Total	5700.475	12	475.040		
Total		6296.340	15	419.756		

Grand Mean = 15.650

Source: SPSS Generated Data (2017)

ANOVA analysis also showed a significance level of 0.001 that indicated information collected was ideal for drawing conclusion on the sample. P-value of 0.001 was less than 5%, The results were statistically significant and that there is a significant difference between means of the frequency of adherence to recruitment practices adopted by the Ministry of Health and employees' efficiency, productivity and rates at which they meet their deadlines. Thus, the Null Hypothesis, **Ho1**, is rejected. These findings thus affirm the fact that recruitment practices adopted by the Ministry of Health play a pivotally important role in shaping the Ministry's effectiveness and performance of employees. Such effectiveness is achievable if the Ministry of Health can hire employees in possession of the required skills and are willing to undertake development courses to equip themselves with the current changes in the market so as to compete well in the competitive market. This will result in reduced employee turnover, low training costs, and it will improve the morale of employees.

4.2 Career Management Practices and Performance of Employees in the Ministry of Health, Nairobi County

The study established that only 29.0% of the employees indicated that the Ministry of Health very often arranged for continuous professional training for employees, 14.5% indicated that the Ministry often organize such opportunities, 45.2% indicated sometimes whereas 11.3% indicated never. Slightly more than a third (33.9%) of the employees reported that the Ministry of health very often plan for exchange programmes, 13.7% indicated that the Ministry of Health often plan for exchange programmes, 41.1% indicated that it sometimes plans whereas 11.3% indicated never. 40.3% of the employees indicated that the Ministry of health very often provide opportunities for employees' personal development, a quarter (25.0%) indicated often, 24.2% indicated sometimes whereas 10.5% indicated never. Departmental heads who were interviewed discounted the views expressed by the employees. One departmental head said that the ministry organizes exchange programs for the employees. This implies that parties involved should put in place of systems to assist in the training of workers.

It was also revealed that slightly 55.9% employees were of the opinion that the Ministry of Health rarely organizes for continuous professional training to enhance efficiency, and productivity at work. At the same time, 15.1% agreed. On the contrary 2.8% was undecided, 16.8% did not agree, 9.4% totally disagreed. 59.1%of the employees were of the opinion that organizing for continuous professional training of employees by the Ministry of health has rarely reduced levels of absenteeism as did 23.5% of the employees. However, 2.7% of the Employees were undecided, 5.9% disagreed whereas 8.8% strongly disagreed.

However, during interviews, departmental heads refuted the view that the Ministry of Health does not organize for employees' professional development. One departmental head pointed out that the ministry organizes for training and development courses for the employees. The findings show that career development covers the entire life that an employee spends on the institution starting from the time he/she

enters the organization up to the time of exit. Similarly, slightly more than half (58.9%) of the employees strongly agreed with the view that the Ministry of Health rarely plans for exchange programs for employees to enhance efficiency, and productivity at work as did 17.2% of the employees. However, 2.0% of the employees were undecided, 19.3% disagreed whereas 2.6% strongly disagreed.

Majority (78.4%) of the employees strongly agreed with the view that planning for exchange programmes for employees by the Ministry of health has rarely reduced levels of absenteeism as did 11.1% of the employees. However, 2.1% of the employees were undecided, 3.9% disagreed whereas 4.5% strongly disagreed. During interviews, the departmental heads did not respond in favor of the view that the Ministry of Health rarely plans for exchange programmes for employees to enhance efficiency, productivity at work and reduce absenteeism. This implies that employee development is the foundation on which the confidence and competence of individual staff is built. With the test that the Ministry of health rarely provides opportunities for employees' personal development to enhance efficiency, and productivity at work the results were that 54.9 % of respondents strongly agreed with the view, 20.2% agreed, 3.0% were undecided, 15.3%disagreed whereas 6.6% strongly disagreed.

The study also revealed that majority (62.4%) of the employees strongly agreed with the view that providing opportunities for personal development amongst employees by the Ministry of health has rarely reduced levels of absenteeism as did 21.1% of the employees. However, 4.1% of the employees were undecided, 5.9% disagreed whereas 6.5% strongly disagreed. The departmental heads disagreed with the employees in that the Ministry of Health rarely provides opportunities for employees' personal development to enhance efficiency, and productivity at work. These findings thus affirm the fact that career advancement affects the motivation of employees and different approaches and practices adopted by the Ministry of Health influence performance of employees. These findings therefore agree with the assertion that career management is the process by which employees' gathers market information concerning employment So as to set goals or plans on how to suit into the market demands.

Table 4.2: ANOVA Analysis of the Difference between Means of Frequency of Employees' Professional Training, Employees' Efficiency, Productivity and Rates of Meeting Deadlines

		Sum of Squares	df	Mean Square	F	Sig
Frequency of Employees' Training		724.452	3	241.484		
Efficiency	Productivity	4503.668	3	1501.223	20.445	.001
	Rates of Meeting Deadlines	660.857	9	73.429		
	Total	5164.525	12	430.377		
Total		5888.977	15	392.598		

Grand Mean = 17.588

Source: SPSS Generated Data (2017)

ANOVA analysis generated a significance level of 0.001 which showed that the data can be used for making a conclusion as the p-value of 0.001 was <5%, The results showed a significant difference between averages of the frequency of employees' professional training and employees' efficiency, productivity and rates at which they meet their deadlines. The Null Hypothesis, **H_o2**, should be rejected as the p-value was 0.046<0.05. The findings point to the fact that career advancement affects the motivation of employees and different approaches and practices adopted by the Ministry of Health influence performance of employees. Institutions require workers in possession of the needed knowledge and skills.

4.3 Reward Practices and Performance of Employees in the Ministry of Health, Nairobi County, Kenya

The study also revealed that only 30.6% of the employees indicated that the Ministry of Health very often offer material rewards to employees, 16.1% indicated that the Ministry often offer material rewards, 41.9% indicated that sometimes the Ministry of Health offer material rewards whereas 11.3% indicated never. 55.6% of the employees agreed that the Ministry of health very often offer social rewards such as recognition and praises, 17.7% indicated often, 16.1% indicated sometimes whereas 10.6% indicated never. Slightly less than a third (32.3%) of the employees indicated that the Ministry of Health very often set reward policies, 18.5% indicated often, 41.1% indicated sometimes whereas 8.1% indicated never. During the interviews, departmental heads indicated that the Ministry of Health does offer material and social rewards and that the Ministry of Health has reward policies. Strategic motivation practices adopted by institutions play important roles in improving performance of employees in organizations. The study also revealed that slightly more than half (fifty eight percent) were of the opinion that the Ministry of Health does offer material rewards to excellent performance to enhance to enhance efficiency, and productivity at work.21.6% agreed, while 4.1% of the employees were not decided. 10.4% disagreed, 5.1% strongly disagreed. The study revealed 61.6%employees strongly agreed that by offering material rewards to excellent performance, the Ministry of Health has reduced levels of absenteeism as did 17.7% of the employees. 3.9% of the employees were not decided. 10.5% did not agree while 6.3% strongly disagreed. The departmental heads also echoed these sentiments that the Ministry of Health offer both social and material rewards to enhance employees' efficiency, productivity and reduce absenteeism. These findings lend credence to the assertions of Al-Jabari (2013) that an individual's inside motivation is influenced by organization management practices which promotes an employee's sense of responsibility. These findings thus attest to the fact that strategic motivation practices adopted by most organizations play critical roles in enhancing employee's performance.

Fifty-nine-point nine percentage employees supported that the Ministry of Health rarely recognizes and praises well-performing employees to enhance efficiency, and productivity at work as did 19.8% of the employees. However, 2.5% of the employees were undecided, 12.2% disagreed whereas 5.6% disagreed, 65.9% agreed that recognizing and praising well-performing employees by the Ministry of Health has not reduced levels of absenteeism as did 13.4% of the employees. However, 3.7% of the employees were undecided, 10.3% disagreed whereas 6.7% strongly disagreed. The departmental heads, however, disagreed

with the employees. One departmental head noted, that the ministry offers material ad social rewards like recognition and praises as a way of motivating the employees.

These findings agree with the findings of a study conducted in Ethiopia by Hamdan and Defever (2010) that in organizations where management offers different forms of motivation to employees, their number tends to increase as more get enrolled. Hence, these findings affirm the fact that reward or motivation strategies managers adopt play an influential role in organizations. 69.1% of the employees were in agreement that the Ministry of Health has a reward policy which has not enhanced employees' efficiency, and productivity at work.18.1% agreed,2.8% of the Employees were not decided. 7.0% disagreed whereas 3.0% strongly disagreed. Similarly, slightly 59.9% of the employees conquered with the view that setting a reward policy has not enabled the Ministry of health to reduce levels of absenteeism as did 19.8% of the employees. However, 2.5% employees were not decided, 12.2% did not agreed, while 5.6% totally did not agree. During the interviews, departmental heads however, indicated that the Ministry of Health has a reward policy of motivating well-performing employees.

One departmental head reported that the Ministry usually rewarded employees who met their targets.

Table 4.3: Analysis of the Difference between Means of Frequency of Rewarding Employees, Employees' Efficiency, Productivity and Rates of Meeting Deadlines

		Sum of Squares	df	Mean Square	F	Sig
Frequency of Rewarding Employees		610.153	3	203.384		
Efficiency	Productivity	4782.168	3	1594.056	20.638	.002
	Rates of Meeting Deadlines	695.157	9	77.240		
	Total	5477.325	12	456.444		
Total		6087.477	15	405.832		

Grand Mean = 16.338

Source: SPSS Generated Data (2017)

When the results were subjected to ANOVA analysis, it generated a significance level of 0.002 which showed that the information gathered was important as it can be used to determine the population's parameter as it showed p-value of 0.002 <0.05. The results were statistically important as they showed the difference between means of the frequency of rewarding employees and employees' efficiency, productivity and rates at which they meet their deadlines. Thus, the Null Hypothesis, **H_o3**, should be rejected. These findings point that organizations where management offers different forms of motivation to employees, they play a great role in influencing employees to improve on their performance.

4.4 Performance Appraisal Practices and Performance of Employees in the Ministry of Health, Nairobi County, Kenya

The study also established that 48.4% of the employees indicated that the Ministry of Health very often do job evaluation, 16.9% indicated that the Ministry often do job evaluation, 29.8% indicated sometimes whereas a paltry 4.9% indicated never. 31.5% of the employees reported that the Ministry of health very often factor employees' SWOT analysis during appraisal, 15.3% indicated often, 42.7% indicated sometimes whereas 10.5% indicated never. Departmental heads who were interviewed discounted the views expressed by the employees. One departmental head noted that job evaluation was carried out in the Ministry of health by analysis the strengths, weaknesses, opportunities and threats of employees. These findings affirmed the findings of Nykodym, Simonett and Welling (2009) that performance appraisal considers the strengths and weaknesses of a worker to improve on their performance, it provides a basis for rewards and punishment. This means that appraisal gives information for succession planning to agree with the selection process and training which encourages understanding between the managers and the subordinates. The study also established that 69.1% employees totally agreed that the Ministry of Health rarely does job evaluation to enhance efficiency, and productivity at work. 19.4% agreed, 1.1% of the employees were undecided, 6.9% disagreed whereas 3.5% did not agreed. The study also revealed that 71.4% employees totally agreed that by conducting job evaluation, the Ministry of Health has not reduced levels of absenteeism as did 17.9% of the employees. However, 2.3% of the Employees were not decided, 5.2% disagreed and 3.2% did not agree. The departmental heads however, refuted view that the Ministry of Health rarely does job evaluation.

The findings were in agreement with the study conducted in the Netherlands where Hackman and Oldham (2000) assert that appraisal system assists to find out the input of a worker towards attainment of organizational goals. Job evaluation results provide necessary information about the worker on the training and development needs as well as the monitoring part on the achievements. The study also found out that 75.1% employees agreed with that the Ministry of Health rarely appraises the strengths and weaknesses to enhance efficiency, and productivity at work as did 12.7% of the employees. However, 2.7% of the employees were not decided. 6.1% did not agree whereas 3.4% totally disagreed. 67.4%employees strongly agreed that conducting SWOT analysis amongst the employees by the Ministry of Health has not reduced levels of absenteeism as did 13.0% of the employees. However, 2.1% of the employees were not decided. 7.3% disagreed whereas 10.2% strongly disagreed.

During the interviews, the departmental heads did not agree with the employees. One departmental head observed that the Ministry carries out SWOT analysis while appraising the employees so as to improve on their productivity and reduce cases of absent seem. The findings further were in agreement with a study conducted in Mexico by Miller and Monge (2008) which found out that if not well conducted will have a negative impact on the employee as well as on the institution. They further found out that organizations which practiced appraisal effectively the decisions such as promotions, terminations, training and merit pay increases do ensure employee performance. Those employees who earn high marks in appraisal are motivated to perform well and maintain the performance.

Table 4.4: ANOVA Analysis of the Difference between Means of Frequency of Performance Appraisal, Employees' Efficiency, Productivity and Rates of Meeting Deadlines

		Sum of Squares	df	Mean Square	F	Sig
Frequency of Performance Appraisal		666.052	3	222.017		
Efficiency	Productivity	4624.168	3	1541.389	20.574	.044
	Rates of Meeting Deadlines	674.257	9	74.917		
	Total	5298.425	12	441.535		
Total		5964.477	15	397.632		

Grand Mean = 16.963

Source: SPSS Generated Data (2017)

The processed data had a significance level of 0. 044. The information was important for drawing conclusion on the population's parameter. The p-value of 0.044<5%, which showed that the results were statistically significant and that there is a significant difference between means of the frequency of rewarding employees and employees' efficiency, productivity and rates at which they achieve their deadlines. Null Hypothesis, **H_o4**, should be rejected as the p-value was 0.027<0.05. When performance appraisal is effectively done, decisions such as promotions, terminations, training and merit pay increases do ensure employee performance.

5.1 Conclusions

The study established that employees' efficiency, productivity and ability to meet deadlines were low. Recruitment practices such as setting requirements, advertising existing vacancies and selecting successful candidates were commonly undertaken. However, these practices have rarely enhanced employees' efficiency, productivity at work and ability to meet deadlines. These further points to the fact that, at the Ministry of Health, recruitment practices carried out play important role in determining effectiveness and performance of employees. Such effectiveness is achievable if the Ministry of Health hires workers with the relevant knowledge, skills and aptitudes. Effective recruiting will avoid unnecessary costs, staff turnover, poor performance and dissatisfied customers.

Hence, these findings are indicative of the fact that institutions which find and attract staff with the necessary requirements register impressive performance, efficiency, intuitional image and ability to meet deadlines. From study findings, it is also evident that the Ministry of Health rarely organize for employees' continuous professional training, exchange programmes nor does it provide opportunities for personal development. Thus, these findings affirm the fact that providing opportunities for employees to undergo continuous professional training, leave for personal development and exchange programmes registered higher productivity compared with their competitors who did not. The Ministry of Health rarely conducts job evaluation or factor employees' SWOT analysis during performance appraisal. High marks on appraisal motivates employee to aim higher.

5.2 Recommendations

The Ministry of Health should use efforts in identifying an ideal mix of benefits that matches employee needs, developing a supportive culture respecting individual needs/values, and the continuous evaluation and improvement of organizational work life programmes, to bring in fruitful gains to individual employees as well as organizations. The Ministry of Health has to come up with good performance in behavioral terms and reward those employees who engage in performance behaviors. Training, performance strategy and goals are connected directly and indirectly. The study further evidenced that employees use and apply knowledge to improve efficiency, and solve problems when they are facilitated well. In regard to this, it is recommended that the Ministry of Health should endeavor to train their employees in order to improve the organizational performance. The Ministry of Health should provide employees chances to come up with ideas on what they want, they should delegate duties downwards. The management should assist employees to come up with achievable targets. Job evaluation should be used to determine employee's compensation. Contributions of employees should be considered by management in decision making.

5.3 Suggestions for Further Research

A study should be conducted to assess the influence of employees' attitude on performance at the Ministry of Health, Nairobi County, Kenya.

REFERENCES

Ahmad, S. & Schroeder, R. G. (2013). The Importance of Recruitment and Selection Process for Sustainability of total quality management, *International Journal of Quality & Reliability Management*, Vol. 19 No. 5, pp. 540 – 50.

Al-Jabari, M. (2013). Factors affecting human resource practices in a sample of diversified Palestinian organizations. *Tourism and Management Studies*, 2, 594-603.

Anderson, N. B, & Cunningham-Snell, N. M. (2001). *Recruitment and selection: Applicant Perspectives and Outcomes;* in Anderson London, Sage Publications, p 200

Armstrong, M. (2004). *Reward Management:* A Handbook of Strategy and Practice, 5th Edition, Kogan-Page

Chan, S. & Kuok, O. (2011). A study of human resources recruitment, selection, and retention issues in the hospitality and tourism industry in Macau. *Journal of Human Resources in Hospitality & Tourism*, 10(4), 421-441.

Ekwoaba, J. O., Ikeije, U. U., &Ufoma, N. (2015). The impact of recruitment and selection criteria on organizational performance. *Global Journal of Human Resource Management*, *3*(2), 22-23.

Greasley, K., Bryman, A., Dainty, A., Price, A., Soetanto, R., & King, N., (2005). Employee perceptions of empowerment, *Employee Relations Journal,* 27(4), pp 354-368.

Greenhaus, J.G., Callanan, G.A., &Godshalk, V.M. (2008). *Career management*. (3rd ed.). New York: The Dryden Press.

Hackman, J.R. & Oldham, R.G. (2000). Motivation through the design of work: test of a theory, *Organizational Behavior and Human Performance*, Vol. 16 pp.250-79

Hall, D.T. (2014). *Career development in organizations*. (1st ed.). San Francisco: Jossey-Bass Publishers.

Hamdan, M. &Defever, M. (2010). Human resources for health in Ethiopia: A policy analysis. Part I: Current situation and recent developments. *Health Policy*, 64(2), 243-259.

Haroon, M. (2010). Determination of Relative Effective Recruitment Sources. A case Based on experience of Pakistani Banks. *Interdisciplinary J. Contemp. Res*. 6(7), 78

Ivancevich, J. M., (2007). *Human Resource Management 10th Edition*, McGraw-Hill Publishing

Kothari, C. R. (2005). *Research Methodology*. New International Publishers, New Delhi.

Kuo, L. (2009). Principles of Strategic Management Theories and Practices. *International Journal of Management Theory & Practices. Vol. (3), 234-255*

Lagat, C. (2013). *A Survey of the Extent of Use of Electronic Recruitment by State Corporations in Kenya*, MBA Project in the University of Nairobi.

Mello, K., (2006). Achieving Competitive Advantage through Human Resource Strategy: *a.* Towards a Theory of Industry Dynamics. *Human Resource Management Review,* 8(3),25-38

Mogaka, P. (2011). Relationship between strategic human resource management and firm performance: A contingency perspective. *International Journal of Manpower*, 26(5)

Muchiri, M. K. & Cooksey, R. W. (2012). Examining the Effects of Substitutes for Leadership on Performance Outcomes. *Leadership & Organization Development Journal*, Vol. 32 No. 8, pp. 817-836

Muchiri, M. K., (2011). Leadership in Context: A Review and Research Agenda for Sub-Saharan Africa. *Journal of Occupational and Organizational Psychology*.Vol 84, pp.440 -452.

Muchiri, M. K. &Ayoko, O. B. (2013). Linking Demographic Diversity to Organizational Outcomes: The Moderating Role of Transformational Leadership. *Leadership & Organization Development Journal,* Vol. 34, pp. 384-406.

Musyoka, K. (2013). HRM in the SME sector: Valuable employees and coercive networks. *The International Journal of Human Resource Management,* 16 (11): 1976.

Nykodym, N., Simonett, J. L. & Welling, B. (2009). Employee Empowerment, *Empowerment in Organizations Journal*, Vol. 2 No. 3, pp. 45-55.

Nzuve, S.N.M. (2007). *Management of Human Resources, a Kenyan Perspective*, Basic Modern Management Consultants.

Okoth, P. (2014). The Effect of Human Resource Management Practices on the Perceptions of Organizational and Market Performance of the Firm, *Human Resource Management, Fall*, 38(3): 185-200.

Robbins, T. (2010). Challenges and Industry, Industrial and Labor Relations Review, prospects of HRM in developing countries: *International Journal of Human Resource Readings*, 17(1): 86-105.

Stewart G. l. & Knowles, V. (2014). *Graduate Recruitment and Selection Practices in Small Businesses*, Career Department International. vol. 5 no 1 pp 21 – 38

Wafula, S. (2014). Linking Business Strategy and Human Resource Management Practices in Multinational Corporations: A Theoretical framework. *Advances in International Comparative Management*, 8(1), 199-215

Walberg, H. (2002). A theory of productivity. *Psychological and Education* pp. 81-110.

Wright, P., Gardener, T. & Moynihan, L. (2011). The Impact of HR practices on the performance of business units'. *Human Resource Management Journal* 13:3 21-36

Active and Latent Failures in Customer Services and Opportunities for Quality Innovation for Convenience Stores

An-Che Chen, Ph.D.
Department of Industrial Engineering & Management
MingChi University of Technology
Taipei 24301
TAIWAN

Abstract

Due to the characteristics of customer participation and heterogeneity in service operations, the demands and contents of service tasks are usually with great diversity. Therefore it is usually preferred to conduct failure analysis, instead of rigidly structured questionnaire, for the purpose of assessment and innovation in service quality. Furthermore, rather than conducting the survey to customers directly that seems to comply with the concept of customer orientation, it possesses great advantages in expertise and insights in failure analysis through service personnel surveys. In this study, service failure cases were collected using the Critical Incident Technique through the interviews to the service personnel from various chain convenience stores in Taiwan. These service failure incidents were then analyzed using the active-latent framework proposed in this study. Both active failures and latent failures from these collected incidents are categorized in hierarchical structures. These two failure categorizations were further mapped for providing empirical bases to the opportunities of quality innovation in system design and personnel training/education for this particular service domain. The interpretations and implications from the resulted failure patterns are also discussed.

Keywords: service failure analysis; quality innovation; retailing

1. Introduction and Background

Innovation in providing interactive customer services is critical and beneficial in retailing. (Berry et al., 2010) Due to the characteristics of customer participation and heterogeneity in interactive service operations, the demands and contents of such service tasks are usually with great diversity. Therefore, instead of using rigidly structured SERVQUAL-based questionnaires (Parasuraman et al., 1988) which are oriented for strategic planning, it is usually preferred to conduct service failure analysis, which has the advantage in preserving crucial context information, for the purpose of assessment and innovation for service quality in particular. (Stauss, 1993)

1.1 Critical Incident Technique and Latent Failure Analysis

Among various data collection methods, Critical Incident Technique (CIT) is the most common instrument utilized for collecting cases of service failure in service quality research (Bitner et al., 1994). The failure

cases collected were then usually categorized in terms of their common features to establish the bases for service quality analysis. Most of the categorizations established by previous research in service quality are, however, mainly from the perspective of active failures, i.e., the errors or violations committed at the "sharp end" of the system by the "front-line" operators: mostly customers or service personnel in service domains. Latent failures are, in a different sense, those adverse conditions that derive from the decisions or activities made by supervisors and managers who are separated in both time and space from the physical system. (Reason, 1990; 1997) As Reason (1990 & 1997) further pointed out, in comparison with active failure analysis, the investigation on latent failures provides a greater beneficial effect upon the improvement and error prevention in system designs. Therefore, in order to have better understandings on the opportunities of innovation in interactive customer services, it is important to conduct analyses on latent failures, in addition to the conventional active failure analyses.

In fact previous studies, such as Wenner & Drury (2000) and Chen (2002 & 2006), have attempted to conduct investigations on the potential avenues for quality interventions through the analysis of the interrelationships between active failures and latent failures in various service domains. Wenner & Drury (2000) used SHELL model as the basis of framework in classifying latent failures and further make cross-classifications with the active failure patterns in aircraft ground damage incidents with promising suggestions on preventing human errors. Chen (2002 & 2006) also used similar approach as Wenner & Drury (2000) for cross-classifying latent failures with active failure patterns, but the categorization schemes used to classify the latent failures collected in these two studies were specifically constructed for customer services. Chen (2002 & 2006) also showed meaningful results in applying the active-latent mapping approach to reduce human errors for quality purposes in various service domains. However, the frameworks of failure analysis generated in the studies mentioned above are either team-work oriented (Wenner & Drury, 2000) or focused on the services dealing with intangible services (Chen, 2002 & 2006) such as financial transactions or making reservations. That is, the failure analysis frameworks of similar kind but oriented for retail services, i.e. only one or two service persons assisting customers with tangible merchandises such as corner drugstores or convenience store services which are also of a significant portion of service industries, has not yet been established.

For service quality purposes, rather than conducting the survey to customers directly that seems to comply with the concept of customer orientation, it possesses great advantages in expertise and insights in failure analysis through service personnel surveys. (Bitner et al., 1994; Chen & Hsu, 2006) It is therefore effective and efficient to conduct service failure survey by interviewing service personnel especially for preliminary studies.

1.2 Quality Innovation in Retail Services

For interactive retail services, Berry et al. (2010) proposed a model for identifying the opportunities for innovative customer services through five important avenues; namely, the increasing power of consumers, channel synergies, pre- and post-transaction service, optimal use of resources, and consumer heterogeneity. Their research further suggested that demand-driven innovations with better understanding of the cumulative cross-channel effects on customers and retailers throughout all the consumption stages. Mou et

al. (2018) proposed that considering omni-channel retailing, facilitating new technologies, and emphasizing workforce management for better customer experience are the three directions of research opportunities in retail store operations. In particular, this study identified the critical roles of the interactive relationships among customers, employees, and products in retailing.

With the impact of service failure, Bougoure et al. (2016) showed that a service firm's effective complaint handling positively impacts satisfaction with complaining, overall satisfaction, and service brand credibility. Their study demonstrated the possibilities of maintaining service brand credibility during a service failure and therefore encouraged brand managers develop and implement effective handling procedures to service failures. By conducting a comprehensive literature review on retail store operations, A variety of literature in retail services suggest that quality judgement and customer royalty may also be influenced by, for example, perceived insecurity during service encounters (Koistinen & Järvinen 2016), perceived justice in failure recovery (Lopes & da Silva, 2015), and the response time of failure recovery (Crisafulli & Singh, 2017). Therefore, in order to identify the opportunities for quality innovation in retail services, it is necessary that service failure analysis should address both the interactive nature of customer behaviors as well as the processes during service encounters.

2. Method

2.1 Data Collection

In this study, failure cases were collected using the Critical Incident Technique (CIT) through the interviews to the service personnel from various chain convenience stores in Taiwan. Each interviewee was asked to report error or problematic incidents encountered on the job. Each incident "story" collected was then transcribed from the conversation audio-recorded in the interview.

2.2 Analysis of Service Failures

From each incident story, as the first stage of the analysis framework, the active failure associated with the outcome was determined. For service quality purposes, service failures are generally defined as unfavorable or dissatisfied service encounter experiences, i.e., from the customer's perspective. In this study, in a broader sense, service failures are defined as any error or incompliance, either intentionally or unintentionally, of the goals of the service system instead. The goals of a service system are often set for both the final outcome (e.g. customer satisfaction) and the process (e.g., correct change). For each active failure, the failure medium/interface, such as merchandise or payment, was identified as the primary category. The failure medium/interface of each active failure is further described by the primary interface between the active human (such as a customer or a service personnel) whose action directly contributes the active failure.

In the second analysis stage of this study, for the classification of latent failures, a framework that derived from those proposed by Wenner & Drury (2000) and Chen (2002 & 2006) is established considering the characteristics of the service interactions in convenience store services. The analysis framework of latent failures in this study consists of four major categories: *Human*, *Tangible*, *Procedure*, and *Supply*. The Human category can be further divided into two categories: *Customer* and *Personnel*. Another latent failure

category – Tangible – can also be broken down into *Equipment* and *Environment* categories.
Cross-classification of latent failures with active failure patterns is the third stage of the research framework proposed in this study. By analyzing these mapping patterns may provide useful insights or implications in ergonomic interventions for this particular service domain.

3. Results and Discussion

3.1 Active Failure Classification

The active failure pattern and the detailed case counts which generated in this study are presented in Table 1. Four major categories - *Access*, *Facility*, *Merchandise*, and *Payment* – are resulted. These failure cases are also sorted by the committed person, either customer or service personnel. As the results show, a great part (65%) of the active failure cases found in convenience store services in this study are associated with the interactions between merchandises and humans, customers in particular. *Poor quality*, *not complied with needs*, and *processing error* are the three subcategories found in this *Merchandise* category.

Table 1 The active failure patterns in convenience store services

Active failure category			Customer	Personnel	Total	% of Total
1	**Access**		**5**	**-**	**5**	**10%**
	1.1	difficult to enter	3	-	3	6%
	1.2	slip & fall	2	-	2	4%
2	**Facility**		**4**	**-**	**4**	**8%**
	2.1	failed to operate	1	-	1	2%
	2.2	unclean	3	-	3	6%
3	**Merchandise**		**30**	**3**	**33**	**65%**
	3.1	poor quality	15	-	15	29%
	3.2	processing error	5	1	6	12%
	3.3	not complied with needs	10	2	12	24%
4	**Payment**		**1**	**8**	**9**	**18%**
	4.1	incomplete checkout	-	1	1	2%
	4.2	incorrect change	-	7	7	14%
	4.3	incorrect payment type	1	-	1	2%
	Total		**40**	**11**	**51**	**100%**

The *Payment* category is the second largest category that possesses almost one-fifth of the failure cases collected. It is worth notifying that most of the failures in this category were committed by service personnel, especially in the *incorrect change* subcategory. On the other hand, another two main categories - *Access* and *Facility* - are solely encountered by the customers, as depicted in Table 1. *Difficult to enter* and *slip & fall* are the two subcategories found in the *Access* category while the *Facility* category also consists of two subcategories - *failed to operate* and *unclean*. As a summary, the active failures involved in customer-merchandise interactions and personnel-payment interactions should have higher priorities and be with greater leverage in service process improvement, i.e., better opportunities for quality innovation.

3.2 Latent Failure Classification

Table 2 shows the latent failure classification found in this study. Among all, the *Human* category possesses more than half of the total latent failure counts. In this latent category H (*Human*), *lack of awareness* and *lack of knowledge/skills* subcategories are commonly found in H1 (*Customer*) and H2 (*Personnel*). These two subcategories are the majority in H1 (customer) category as well, but relatively less prominent in H2 (Personnel) category. *Not checking as needed* and *time pressure* are in fact the two major subcategories in terms of failure counts in the *Personnel* category. Therefore, between customers and personnel, there exist similar subcategories in latent conditions but the emphases seem diverse. For customers, most of the latent problems are associated with unfamiliarity to service systems. On the other hand, overloading seems to be the primary issue in latent failures for personnel.

Table 2 Incidence of latent failures*

Latent failure category				Number of incidents	% of total
Human				**45**	**58%**
	H1	Customer		17	22%
		H1.1	lack of awareness	6	8%
		H1.2	lack of knowledge/skills	8	10%
		H1.3	incorrect knowledge	3	4%
	H2	Personnel		28	36%
		H2.1	lack of awareness	5	6%
		H2.2	lack of knowledge/skills	3	4%
		H2.3	not checking as needed	10	13%
		H2.4	time pressure	10	13%
Tangible				**8**	**10%**
	T1	Equipment		5	6%
		T1.1	Inappropriate for task	4	5%
		T1.2	lack of proper equipment	1	1%
	T2	Environment		3	4%
		T2.1	poor condition	1	1%
		T2.2	lack of space	2	3%
Procedure				**13**	**17%**
	P1	Procedure		13	17%
		P1.1	lack of proper procedures	2	3%
		P1.2	less reactive	2	3%
		P1.3	low maintenance	9	12%
Supply				**12**	**15%**
	S1	Supply		12	15%
		S1.1	no inventory/supply	8	10%
		S1.2	poor production/delivery	4	5%
Total				***78***	***100%***

*Note: Totals exceed the number of incidents due to multiple latent failures per incident.

The *Tangible* category, which consists of *Equipment* and *Environment* subcategories, is rather minor (10%)

in terms of latent failure counts. *Inappropriate equipment for the task* is the most crucial issue among all subcategories in *Tangible*. As to the *Procedure* category, three subcategories – *lack of proper procedure, less reactive, and low maintenance* – are derived from incident data. Among them, the *low maintenance* subcategory, which represents the latent conditions associated with the procedure design that the maintenance to merchandises, equipment/facility, or environment is less frequent as necessary, possesses the most failure counts. This specific result suggests frequent maintenance procedures are needed. In the *Supply* category, the *no inventory/supply* subcategory has twice the failure counts twice than the other subcategory – *poor production/delivery*. Therefore, strategic decisions in supplier management also play an important role of quality innovation in convenience store services.

3.3 Active-Latent Mapping

These latent failures discussed above are further mapped with their consequent active failure pattern in order to capture any specific significant cause-effect relationships for improvement purposes. Figure 1 shows a general cross-classification of the latent failure categories from Table 2 with the active failure patterns from Table 1, both at their top classification levels.

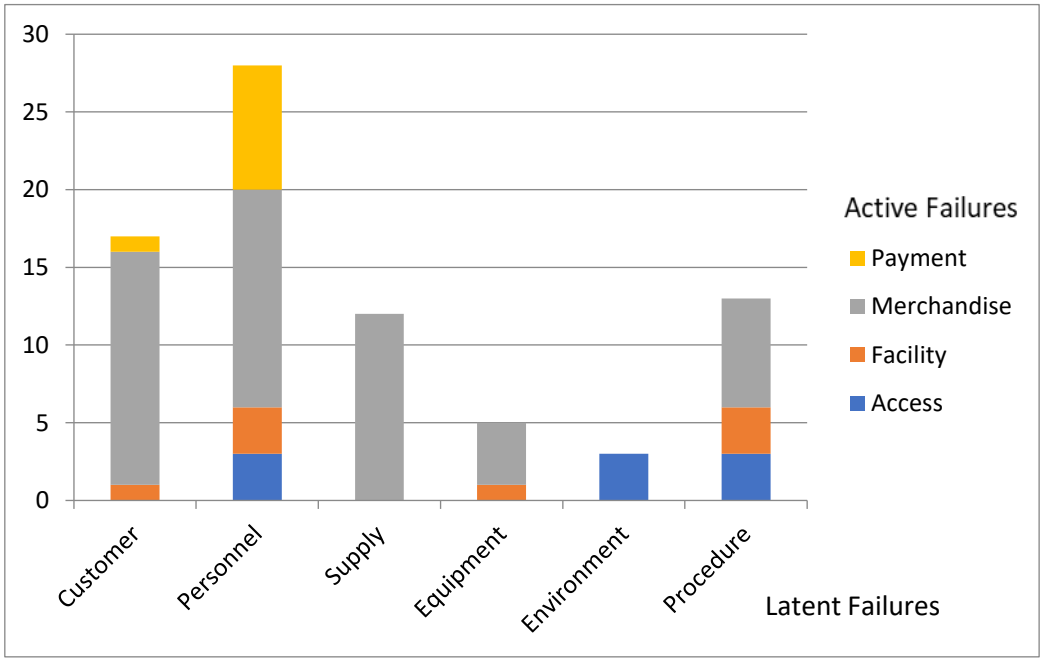


Figure 1. General cross-classification of latent failures with active failures

As depicted in Figure 1, *Customer* latent failures (H1) are linked mostly with *Merchandise* active failures, so are *Supply* (S1) and *Equipment* (T1) latent failures. In a similar manner, T2 (*Environment*) latent failures are exclusively found in the *Access* active failure category. Therefore, the remedy or innovative actions on any one of these four types of latent failures may benefit mostly on one specific active failure pattern linked respectively. These cause-effect relationships are rather straightforward. In a contrary fashion, the mappings to active failure categories with both *Personnel* (H2) and *Procedure* (P1) latent failures rather spread out. These particular mapping patterns with *Personnel* and *Procedure* latent failures actually suggest

their significance in service quality innovation, which may be beneficial in applying the research suggestions by Bougoure et al. (2016) and Lopes & da Silva (2015).

It is also interesting to interpret these mapping results from a different perspective, i.e., from active failure patterns to the related latent failure categories. For *Payment* active failures, almost all of the related latent failures fall into the *Personnel* category.

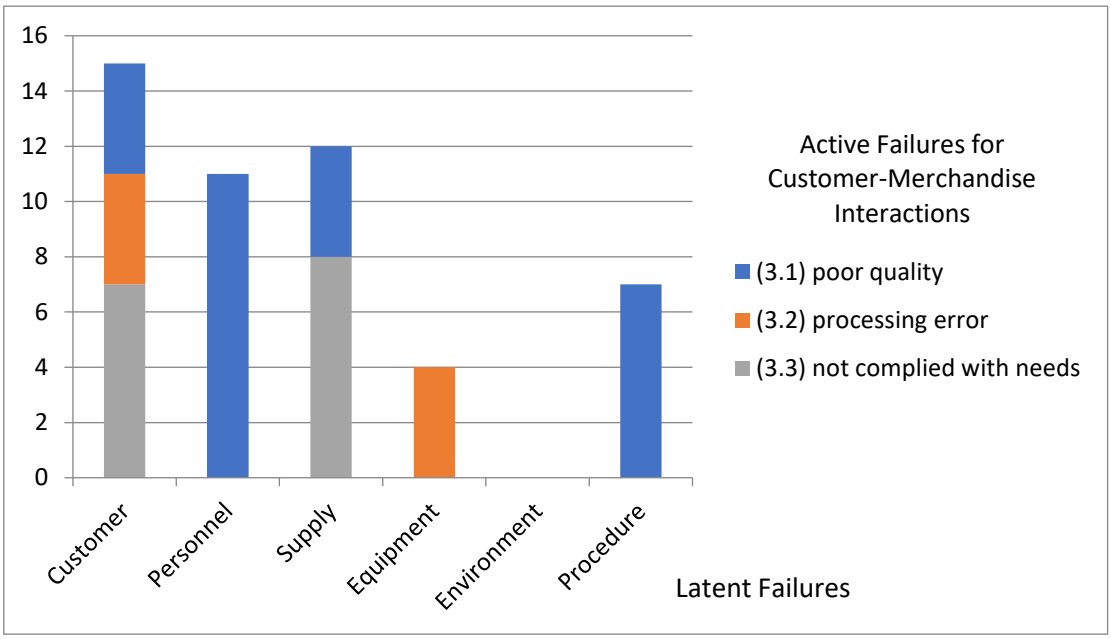


Figure 2. Cross-classification of latent failures with active failures for Customer-Merchandise interactions

Furthermore, as mentioned earlier, *Merchandise* active failures possess more than half of the incidents reported and most of the incidents in this category are *Customer-Merchandise* interactions. As an example, Figure 2 shows the detailed mapping patterns of latent failures with the active failures of customer-merchandise interactions specifically. Among all the cross-classification results in Figure 2, it is interesting to see that the latent failures of *Personnel* and *Procedure* are linked exclusively with the active failures of *poor quality* of customer-merchandise interactions. By further examining the data, it is found that the most incident counts in the active failures of *poor quality* in customer-merchandise interactions, are cross-linked with the latent failures of *not checking as needed* in the *Personnel* category and *low maintenance* in *Procedure*. This specific result suggests that any assistance to enhance the performance of service personnel on checking the statuses of merchandises, such as providing adequate warnings or timely information on food heating processes or expirations, or to improve procedure designs for adequate maintenance tasks, such as better task scheduling or action reminding, may fairly reduce the chances of the quality problems that customers may have with merchandises. As Berry et al. (2010) suggested, optimal use of managerial and technological resources with demand-driven approach may be beneficial to quality innovation. For failure recovery, the emphasis of perceived justice (Lopes & da Silva, 2015) may also be designed into service procedure deployment as well as personnel training. Generally speaking, this type of detailed investigation in those significant links between active and latent failure subcategories provide empirical

examples in such cause-effect mappings for quality innovation especially in failure prevention and recovery for retail services.

4. Conclusions

An analysis framework to service failures is proposed for quality innovation purposes in this study. This framework consists of three stages of analysis. The first analysis stage is active failures classification that is oriented on human-medium interactions. The application to convenience store services in this study results four main categories: Access, Facility, Merchandise, and Payment, along with their respective subcategories. The second stage of analysis is latent failures classification. A classification scheme for latent failure analysis is proposed in this study with four main categories: Human (Customer + Personnel), Tangible (Equipment + Environment), Procedure, and Supply. Those subcategories obtained from the domain of convenience store services may also provide a basis for transferring this analysis scheme to similar service domains. Cross-classification of latent failures with active failure patterns is the third stage of the research framework proposed in this study. The primary purpose of this mapping analysis is to provide empirical bases for the opportunities of quality innovation.

Some major findings for the failure analysis in convenience store services in this study are summarized as follows:

1) The active failures involved in customer-merchandise interactions and personnel-payment interactions should have higher priorities in service process innovation.

2) The latent problems associated with customers most are the unfamiliarity to service systems while overloading is the primary issue for personnel training.

3) Adequate maintenance procedures and supplier management also play important roles in reducing latent failures for convenience store services.

4) Any remedy or innovative actions on the latent failures associated with customers, supply, and equipment may benefit mostly on the active failures associated with merchandises. In particular, the poor quality problems in customer-merchandise interactions may be well reduced by enhancing the performance of service personnel on status checking and better procedural designs in maintenance tasks.

5) The fact that the latent failures in both personnel and procedure categories have diverse connections with active failure patterns suggests their significance in service quality. Optimal use of managerial and technological resources with demand-driven approach may be beneficial to such quality innovation.

5. References

Berry, L. L., Bolton, R. N., Bridges, C. H., Meyer, J., Parasuraman, A., & Seiders, K. (2010). Opportunities for innovation in the delivery of interactive retail services. *Journal of Interactive Marketing*, *24*(2), 155-167.

Bitner, M. J., Booms, B. H., & Mohr, L. A. (1994). "Critical Service Encounters: The Employee's Viewpoint." Journal of Marketing, 58(October), 95-106.

Bougoure, U. S., Russell-Bennett, R., Fazal-E-Hasan, S., & Mortimer, G. (2016). The impact of service

failure on brand credibility. *Journal of Retailing and Consumer Services*, *31*, 62-71.
Chen, A.-C. & Hsu, C.-W. (2006) "Connecting system usability and customer service quality for call center services", Proceedings of the 16th World Congress of the International Ergonomics Association, Maastricht, the Netherlands, 10-14 July, 2006.
Chen, A.-C. (2006) "Customer error pattern and the service quality impact in self-service customer systems", Proceedings of the 16th World Congress of the International Ergonomics Association, Maastricht, the Netherlands, 10-14 July, 2006.
Chen, An-Che (2000) Human Error Analysis For Customer Service Quality: An Ergonomics Approach Toward Service Quality Improvement, Ph.D. Dissertation, Department of Industrial Engineering, State University of New York at Buffalo, USA
Chen, An-Che (2002) "An Ergonomic Framework for the Human Error Analysis for Quality Customer Services." Proceedings of the 12th Annual Meeting & Conference of Ergonomics Society of Taiwan 2002, 283-287.
Crisafulli, B., & Singh, J. (2017). Service failures in e-retailing: Examining the effects of response time, compensation, and service criticality. *Computers in Human Behavior*, *77*, 413-424.
Koistinen, K., & Järvinen, R. (2016). Comparing perceived insecurity among customers and retail staff during service encounters. *Journal of Retailing and Consumer Services*, *31*, 80-92.
Lopes, E. L., & da Silva, M. A. (2015). The effect of justice in the history of loyalty: A study in failure recovery in the retail context. *Journal of Retailing and Consumer Services*, *24*, 110-120.
Mou, S., Robb, D. J., & DeHoratius, N. (2017). Retail store operations: Literature review and research directions. *European Journal of Operational Research*.
Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). "SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality." Journal of Retailing, 64(1), 12-37.
Reason, J. (1990). Human Error. Cambridge, UK: Cambridge Univ. Press.
Reason, J. (1997). Managing the Risks of Organizational Accidents. Ashgate.
Stauss, B. "Using the Critical Incident Technique in Measuring and Managing Service Quality." In Scheuing E.E. And Christopher W.F. (eds.) The Service Quality Handbook. (1993). 408-427. New York: AMACOM.
Vadi, M., & Suuroja, M. (2006). Training retail sales personnel in transition economies: Applying a model of customer-oriented communication. *Journal of Retailing and Consumer Services*, *13*(5), 339-349.
Wenner, C. A. & Drury, C. G. (2000). "Analyzing human error in aircraft ground damage incidents." International Journal of Industrial Ergonomics, 26, 177-199.

Copyright Disclaimer
Copyright for this article is retained by the author(s), with first publication rights granted to the journal.
This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).

Report on Experience on Health Education as A Tool in The Prevention of Hypertension and Diabetes Mellitus with Male Female Civic Policies in The Integrated Regions of Public Safety - Risp and 1st Regional Delegacy of Juiz De Fora Mg – Brazil

Martha Bezerra Vieira
Faculdade Presidente Antônio Carlos de Leopoldina – Leopoldina – Minas Gerais Brasil

Karla Julião Villani Felippe
Faculdade Presidente Antônio Carlos de Leopoldina – Leopoldina – Minas Gerais Brasil

Juliane da Silva Barros
Faculdade Presidente Antônio Carlos de Leopoldina – Leopoldina – Minas Gerais Brasil

Abstract

The male population can be considered one of the most vulnerable groups to suffer from chronic diseases, taking into account the socio-cultural factors that hinder the search for health services, as well as the objection to prevention and self-care practices. This situation is further aggravated in police officers, due to the inherent attributions of the profession that directly interfere with the stress level and quality of life of these professionals. Therefore, an extension project was carried out to promote health education for civilian male police officers, with emphasis on the care of stress-related diseases such as hypertension and type 2 diabetes mellitus. It is an experience report about activities carried out with 83 police officers, from November 2015 to February 2016, in the municipality of Juiz de Fora – MG, Brazil. The project involved the presentation of banners, lectures, and tests to verify blood pressure and blood glucose levels of civilian police officers. At the end of the activities, it was verified g the project performed satisfactorily and fulfilled its objective, which can be proven by the engagement and concern of the participants in improving their quality of life, notably in relation to the themes addressed. It was also noticed the importance of extension activities in university education, insofar as it enabled new experiences and knowledge, as well as the opportunity to put into practice the knowledge obtained while theory.

Keywords: *Civilian police; stress; health education; arterial hypertension; type 2 diabetes mellitus.*

1 Introduction

Disease prevention, as well as health promotion, can be considered as naturally applied practices among women. Men, on the other hand, mostly choose to postpone the search for help and assistance as much as possible, only when they can no longer deal alone with their injuries. Among these, it is also common for

the valorization of healing practices to the detriment of preventive and health promotion guidelines (SCHRAIBER et al., 2010). It is challenging to include men in health care for the absence of health care as a social issue (CARRARA; RUSSO; FARO, 2009). It should be noted that males have a lower life expectancy than females and are more predisposed to diseases such as diabetes, cancer, cholesterol, heart disease and hypertension (SILVA, 2010).

According to the World Health Organization (1986 apud SALCI et al., 2013), health promotion is an extended concept that goes towards global and social well-being. It is associated with a set of values such as health, life, solidarity, democracy, citizenship, participation, and self-care.

In this perspective, according to Girondi; Santos (2011), health education constitutes a set of practices aimed at transforming the lifestyle of individuals and society and, consequently, in the promotion of quality of life and health. To put it into practice, it is necessary to know the available strategies that can be applied aiming at greater proximity, sensitization, and adequacy to the target population.

And in the scope of health promotion practices, the quality of life at work is paramount and deserves attention, since the health of the individual is directly influenced by the situations that occur in his daily life and work activities. According to Sanchez-Milla et al. (2001), the profession of police officer deserves attention because it is considered a risk factor for the development of several health problems since it has some characteristics which may trigger or precipitate the onset of some diseases. This professional is an individual who deals, in his daily life, with situations of violence, exposure to danger, brutality and death. Such factors can still be exacerbated by the dull workload, rigidity, discipline, and hierarchy, which increase their physical and mental fatigue, which can compromise their health and quality of life.
And among the injuries that have caused the most damage in the police work environment, stress occupies a prominent place. The literature has demonstrated not only the relationship of stress to working conditions but also the risk of developing or aggravating metabolic diseases, such as type 2 diabetes and diseases of the circulatory system, such as arterial hypertension (ALMEIDA et al., 2011).

Stress is a physiological alteration that occurs when the body is in a situation that requires a more intense reaction than its normal organic activity, that is, it is a factor exerted on the organism that exceeds its capacity of adaptation. The same is posited as an adaptive reaction of the organism to an event that requires a response that goes beyond what is usual. At first, it is an expected response that may even lead to awareness and use of energy to deal coherently with situations. However, this happens to be a risk factor, when it damages the quality of life with the persistence of the stressor and the inability to establish behaviors and ways of dealing with a certain occurrence (FIGUEREIDO; CASTRO, 2015).

According to Mesquita et al., (2014) neural and endocrine activities are physiological responses generated by stress, which, consequently, may influence other physiological processes, such as, for example, motivate

increased cardiovascular, metabolic and autonomic functioning, leading to increased heart rate and blood pressure.

From the above-mentioned episodes, stress initiates a psychophysiological process of excitation, where hormones are secreted, which can alter the levels of glucose and free fatty acids in the blood. Such a reaction has the purpose of generating energy for the body and performing the fight or flight action. In type 1 diabetes, for example, stress reduces glucose levels, while in type 2 diabetes, it increases glucose levels (MESQUITA et al., 2014).

In this aspect, according to Hairstyle; Oliveira (2009) occurs with the continued activation of the hypothalamic-pituitary-adrenal axis (HPA), with hypersecretion of cortisol, among other hormones. In diabetes mellitus 2, HPA axis disorder may involve complex interactions between altered sensitivity to hormonal response and factors such as hypoinsulinemia, hyperglycemia and / or hyperleptinemia, stimulating the HPA axis. Hyperactivation that occurs is associated with the increased corticotropin-releasing hormone in the hypothalamus and the hippocampal glucocorticoid receptor.

Second, Junior; Neto (2010) describes that the circulating adrenocorticotrophic hormone (ACTH) is responsible for the regulation of glucocorticoid release by the adrenal gland cortex, as well as other hormones from the adrenal medulla involved in this process. Glucocorticoids have relevance in the regulation of the basal activity of the hypothalamic-pituitary axis and in the final responses to stress, by the existence of negative feedback in the central nervous system stress components. In addition, they are final effectors in the hypothalamic-pituitary axis and participate in the control of homeostasis in the human body, as well as the responses to the body's stress.

The structures of the hypothalamus and thalamus play an important role in this process, as they are involved in the mechanisms of emotion and establish connections with the sympathetic and neuroendocrine nervous system. The hypothalamus has several functions, such as regulation of food intake, water, diuresis, emotional and sexual behavior, as well as sleep and wake regulation, as they have relevant characteristics in the integration of physiological responses, being one of those responsible for body homeostasis. (JUNIOR; NETO, 2010).

In fact, among diseases related to stress and its implications, Type 2 diabetes mellitus (DM) occupies a prominent place. Although not considered a professional disease, its occurrence may be directly related to work activities, since these can compromise the quality and healthy habits of life. Studies have shown that excessive amounts of work, poor diet, sedentary lifestyle and mental stress increase the amount of free glucose in the blood and are considered to be potent risk factors for its onset (RODRIGUES et al., 2013).

It is estimated that the world population with diabetes is approximately 387 million and that by 2035 the number of diabetics reaches 471 million. It may become epidemic and can be classified into the group of

metabolic diseases associated with complications, dysfunctions and insufficiencies of various organs and systems, such as the kidneys, heart, and circulation (Milech et al., 2016).

In relation to systemic arterial hypertension (SAH), according to Brandão et al., (2016), this is a multifactorial clinical category characterized by a rise in blood pressure levels equal to or greater than 140 and / or 90 mmHg. It is usually associated with metabolic disorders, functional and / or structural alterations of target organs, being intensified by the presence of other risk factors, such as glucose intolerance, dyslipidemia, abdominal obesity, stress, among others. It is the most prevalent cardiovascular disease in Brazil, being a serious national and worldwide public health problem. In Brazil, hypertension affects 32.5% (36 million) adults, more than 60% of the elderly, contributing to 50% of deaths due to cardiovascular disease (BRANDÃO et al., 2016).

Chronic stress has psychological characteristics in the environment that contribute to the development of hypertension. They are effects mediated by the activation of the sympathetic nervous system and neuroendocrine pathways, including the strong link between stress and hypertension. Heart rate and blood pressure are controlled by the nucleus located in the posterior portion of the brain. The spinal cord, hypothalamus, and cerebellum are important to heart rate controllers. (JUNIOR; NETO, 2010).

And when thinking about the prevention of diseases such as type 2 diabetes and hypertension, one of the great difficulties is the need for the cooperation of the individual, especially with regard to self-care. In this sense, projects that call attention to the responsibility of individuals, especially males, should be stimulated and valued, since access to knowledge makes possible the understanding of the functions of the organism and draws attention to the necessary preventions for the well- being (CARDOSO; ZUSE, 2009).

And given the conditions that affect the police profession, to realize the importance of programs aimed at the health of this professional, with the definition of actions that aim at the promotion of health and prevention of diseases. In this perspective, the objective of this work is to report a health education project developed with civilian police of the Integrated Region of Public Security (RISP) and 1st Regional Police Station of Santa Terezinha, located in the municipality of Juiz de Fora- MG, which sought to awaken the self-care, as well as prevention and health promotion practices, with emphasis on stress-related diseases such as hypertension and type 2 diabetes mellitus.

2 Methodology

This is a descriptive study, of the type of experience report, of the project entitled: "Health Education as a tool in the prevention of hypertension and diabetes in Civil Police." The project was carried out at RISP and 1st Regional Civil Police Station of Juiz de Fora / MG, from November 2015 to February 2016 and is part of the extension activities of the Biomedicine course promoted by Faculdade Presidente Antônio Carlos de Leopoldina (FAPAC).

The target audience consisted of 83 police officers, men of all categories, including, delegates, researchers, clerks, experts and employees of Minas Gerais Administration and Services (MGS), with ages ranging from 32 to 59 years of age.

Participated in the project a student of the biomedicine course and two psychologists. The participation of the psychologists occurred voluntarily, by invitation of the student, who proposed an interdisciplinary action, aiming at the insertion of psychology in the activities proposed by the project. The contribution of these professionals involved from the initial sensitization to the service to the police. They also provided important guidelines about the student's posture regarding possible events during the project.

In the first contact with the institution, the delegate was exposed the purposes as well as the activities that would be developed. After acceptance, it was recommended that project members attend departmental offices to understand the functionality and planning of police management, as well as seeking greater proximity to police officers.

The first stage of the project included a lecture in the Integrated Region of Public Security, known as RISP, and the other lectures were given at the 1st Regional Civil Police Station of Juiz de Fora / MG, whose theme of both was: Health and Quality of Life of the Civil Police of Minas Gerais (PCMG) - The Stress of Civil Police.
The lectures were used as an instrument to provide information about stress and the possible consequences for the individual, focusing on the relationship of this with hypertension and type 2 diabetes.

Concurrent with the lectures, additional information on the subject was provided through banners .In a second stage, blood pressure levels and capillary blood glucose levels were verified. It is important to emphasize that the accomplishment of this stage did not have a proposal the local health diagnosis, but it was used as a tool, within the proposal of health education, in order to awaken on the importance of these exams in the prevention, diagnosis, and monitoring of diabetes mellitus and hypertension.

The verification of capillary glycemia was performed according to the Guidelines of the Brazilian Diabetes Society 2015-2016. Monitoring was performed by an 8-hour previous fast, in an environment provided by the Civil Police, with a digital glucometer, lancet and respective brand lancets (G-tech) graduated from 1 to 5 in increasing degrees of penetration depth in the skin. Grade 5 was used as the standard to perform the work. The measurements were performed on the palmar face of the distal phalanx of the 2nd, 3rd or 4th fingers of the right hand.

For blood pressure measurement, participants were advised to remain at rest for approximately 5 minutes. After this period, the left arm was positioned at the level of the heart (level of the midpoint of the sternum), resting on the table, with the palm of the hand facing upwards and the elbow slightly flexed. The cuff of adequate size was positioned to the arm about 2 to 3 cm from the ulnar foramen. Next, the middle of the

compressive part of the cuff was centered over the brachial artery, and the diaphragm of the stethoscope was placed on top of the artery. With the stethoscope in the ear, the cuff was inflated and thus obtained the values of systolic and diastolic pressure. After the first pressure measurement, each participant was informed that their pressure should be re-evaluated, taking into account the criteria established and provided by the Brazilian Arterial Hypertension Guideline VII (BRANDÃO et al., 2016).

After the exams were done, each participant received the results obtained along with guidelines on the importance of their repetition, as well as other periodic exams. And those who showed results outside the guidelines recommended by the guidelines were advised to seek medical attention.

The third step involved the individual servicing of the police by the psychologists. The same occurred by passive demand, by appointment, once a week, in a room provided by the institution.

The resources used in the project, such as pressure gauges, blood glucose meter, disposable gloves, alcohol gel, reactive tapes, explanatory banners, shirt, tickets, and food were all funded by the student, who was supported by the 1st Regional Police Station and FAPAC Leopoldina.

3 Results and Discussion

This study is an experience report of an extension project developed by the student of the course of Biomedicine, having a counselor and co-supervisor of the area of health and education. Through health education, we sought to draw attention to the importance of self-care, as well as health promotion and prevention practices, focusing on stress as a factor related to arterial hypertension and type 2 diabetes mellitus.

At the beginning of the activities, one obstacle was found in relation to the employees resistance to exposing their perceptions and opinions, even with the guarantee that the individual data would be preserved. This situation was verified during the individual visits with the psychologists. Although many police officers indicated that they lacked care, they realized that the search for help was hampered by individual internal and external factors.

Faced with these assumptions, educational activities were carried out with the purpose of bringing to the police know about the risk factors associated with their routine, at the same time making it possible to clarify doubts related to the subject.

However, during the meetings, through a participatory methodology, it was possible to break the initial resistance and interact with the police. Acceptance was perceptible through participation with questions and answers, which contributes considerably to learning. Another factor that contributed to the acceptance of the project was the fact that the activities were developed within the work environment, which created a stronger bond.

During the lecture, the police punctuated the factors considered stressful in work and the way each one dealt with the situation. There were even reports of those who were experiencing some stress situation outside of work. Faced with the opening and exchange of information, suggestions were suggested to reduce the reported stress. Based on the information obtained, the guidelines were directed towards meeting the reality. Changes in the lifestyle of civilian police to improve quality of life were addressed, and healthy habits were discussed. Emphasize the importance of a balanced diet and the valuation of preventive practices for a satisfactory quality of life.

The Institution of the Civil Police in focus does not have on its staff of collaborators a psychologist who works together with the doctor. Likewise, there is no biomedical or another professional that watches over the health of these professionals through research and follow-up of the same, or even that has the autonomy to propose to the police some type of treatment and clinical support. Given this scenario, the conduct for those who need more care is the removal of their functions by means of a medical certificate, so that a more detailed evaluation of their clinical and psychological profile can be made.

According to Dantas et al. (2010), police officers, due to the specific nature of the activities carried out, coupled with some factors such as work overload, organization and working conditions and frustrated personal demands constitute one of the categories of workers more exposed to physical-mental illness, understanding the body in its unity. These factors reduce the quality of life and increase vulnerability to chronic diseases, such as diabetes mellitus and arterial hypertension, in the focus of the project.

The practice of the police profession leads these professionals to face daily situations of great psychological wear and tear, since they must always be ready to protect society, careful to perceive any dangerous situation and act at the exact moment in a preventive manner, without loss of control of the situation and possible accidents (SPODE; CRESPO, 2004).

In this perspective, for Dantas et al., (2010), the phase of exhaustion is when the organism is weak and cannot adjust or resist the stressor. And it is precisely at this moment that the aggravations or the compromise of the well-being, both at the psychological level, begin to appear as acute anxiety, depression, lack of initiative to make decisions, frustration, as well as physical, with organic changes such as hypertension and diabetes.

Corroborating the relationship between stress and chronic diseases in police officers, Gonçalves; Veiga; Rodrigues (2012), in a study that sought to describe the importance of research on the quality of life of Military Police officers working in the 2nd CIA of the 10th Military Battalion of Miguel Pereira (RJ) and Paty de Alferes (RJ), found an association between stress and individuals with diabetes and hypertension (10%). At the end of the study, the authors also found that the investigated police showed a strong tendency to develop other chronic diseases, which make up the metabolic syndrome, such as dyslipidemias and sclerotic diseases.

Several studies have been carried out with police officers in Brazil to verify the prevalence of chronic diseases such as diabetes and hypertension. For example, in a recent study conducted in 2017 with military police in the state of Paraíba, prevalence rates of 63% and 5% were observed for hypertension and diabetes, respectively. The authors point to the need to incorporate preventive actions into police daily life, with the purpose of avoiding greater losses both in the professional life and in the personnel of these individuals (PAIVA et al., 2017).

It is important to consider that when systemic arterial hypertension (SAH) occurs along with Diabetes Mellitus, its complications (cardiac, renal and stroke) have a higher impact on the labor and consequently family income, estimated at the US $ 4.18 billion between 2006 and 2015 (MACHADO et al., 2016).

The work environment is a factor that directly affects the health of the individual. When a person acquires any kind of illness or injury in the work environment, one should make a diagnosis and remove the person from what is directly or indirectly assaulting his organism (ALMEIDA et al., 2011).

In addition, it must be considered that stress is, in most situations, reversible, thus validating the importance of the institution to seek methods and ways to minimize its effects on the professional life of the police officer. Some preventive measures such as balanced nutrition, relaxation, leisure, physical exercises, psychological counseling, coping tactics to maintain the emotional stability of the police, positive attitude towards work, educational and preventive actions can make a difference in the professional life within the institution.

According to the objectives of the project, the glycemic and blood pressure tests were carried out within the health education proposal, not aiming the analysis of the data. However, this study supports the need for a deepening of these conditions so that the local health diagnosis of the police can be carried out. In this regard, it is also suggested to carry out other work with the previous submission to the Ethics and Research Committee with human beings for further dissemination of the results.

According to the authors, health education is an important tool for the dissemination of knowledge acquired at university level (Chaves et al., 2006; For example, for Silva, Ribeiro, Silva Junior (2013), health education provides society with the benefits of developing skills and actions, being a means in which academics are inserted and participate in strategies developing extension projects in which the theory and practice thus having an early contact with the future professional practice.

In this paper, Chaves et al. (2006), in an article that aimed to analyze strategies to develop health education with hypertension, report that this practice has contributed considerably to the prevention of pathologies in the last 20 years. According to the authors, the proposal of health education is to provide knowledge for the purpose of stimulating individuals to operate changes in their behaviors.

And in the scope of health education combined with interdisciplinary and integrative actions, it should be

mentioned that the biomedical is a qualified professional and can assume a role of relevance within the practices of prevention and awareness for the diagnosis and adherence to the treatment of diseases chronic diseases, such as type 2 diabetes and hypertension. At the end of this experience, the importance of extension projects in order to promote a better quality of life for the society, through the dissemination of practices of prevention and health promotion, became evident in the university context. The exchange of knowledge and experience is equally constructive and productive for the academic community. Thus, this project not only aroused care in relation to the health of the target population but also contributed valiantly to the professional construction of the academic.

4 Final considerations

At the end of the project, we noticed that the educational actions carried out performed satisfactorily and complied with the proposed objective, since through the meetings it observes an engagement and concern of the policemen to improve their quality of life, especially in relation to the topics addressed.
Police participation was satisfactory after terminating their resistance, as many participants sought medical and psychological help in the face of the facts exposed in the execution of the project.
To hope that the present work contributes to other similar actions and also instigates future investigations on the subject, including the investigation of other aspects related to the work activity of the policemen that can compromise the physical, mental health of these professionals.

Referências

Almeida, V. C. F. *et al*. (2011). Ocupação e fatores de risco para diabetes tipo 2. **Revista Latino Americana**, Fortaleza, v. 3, n. 19,(pp. 2-3).
Brandão, A. A. *et al(2016)*. Sociedade Brasileira de Cardiologia: 7° Diretriz Brasileira de Hipertensão Arteria**l**. Revista da Sociedade Brasileira de Cardiologia, São Paulo, v. 107, n. 3. (pp. 21-103) .
Cardoso, G. S.; Zuse, C. L.(2009). O conhecimento do homem a respeito do autocuidado. **Revista Eletrônica de Extensão da URI**, Santo Ângelo, vol.5, n.8,(pp.42-52).
Carrara, S; Russo A J; Faro, L. (2009). A política de atenção à saúde do homem no Brasil. **Revista de Saúde Coletiva**, Rio de Janeiro, v. 19, n. 3,(pp.659-678).
portadores de hipertensão arterial. **Revista Brasileira de Enfermagem**, Fortaleza, vol. 59, n. 4, (pp 543-547).
Chaves, E. S. *et al*.(2006). **Eficácia de programas de educação para adultos**.
Coleta, A. S. M. D.; Coleta, M. F. D.(2008) **Fatores de estresse ocupacional e coping entre policiais civis.** 2008. 10 f. Tese de doutorado em Psicologia – Universidade Federal de Uberlândia, Uberlândia.
Dantas, M. A. *et al*.(2010) **Avaliação do estresse em policiais militares**: psicologia: teoria e prática, v.12, n.3,(p. 66-77).
Figueiredo, J. O.; Castro, Emma E. C.(2015) Ajustamento criativo e estresse na hipertensão arterial sistêmica. **Revista da Abordagem Gestáltica**, Belo Horizonte, v. 7. n. 1,(pp. 37-4).

Girondi, J. B.R.; Santos, Sílvia M. A.(2011) Acessibilidade de idosos com deficiência física na atenção primária: revisão integrativa da literatura. **Revista Gaúcha de Enfermagem**, Porto Alegre. v. 32, n. 2, (pp 378-384).

Gonçalves, S. J. C.; Veiga, Alan J. S.; Rodrigues, L. M. S.(2012) Qualidade de Vida dos Policiais Militares que atuam na área da 2ª CIA do 10º Batalhão Militar de Miguel Pereira e Paty do Alferes. **Revista Fluminense de Extensão Universitária**, Vassouras, v. 2, n. 2,(pp. 53-76).

Junior, E. L. , Neto, E.. L.(2010). Hipertensão arterial: aspectos comportamentais – estresse e migração. **Revista Brasileira de Hipertensão**, São Paulo, v. 17, n. 4,(pp. 210-255).

Machado C. A. *et al*.(2016). Sociedade Brasileira de Cardiologia: 7° Diretriz Brasileira de hipertensão Arterial: **Revista Hipertensão**, São Paulo. v. 19. n. 4. (pp.10-126).

Mesquita, A. A. *et al*.(2014). Estresse, enfrentamento e sua influência sobre a glicemia e a pressão arterial**. Revista Psicologia e Saúde,** Campo Grande, v. 6, n. 1, (pp48-55).

Milech, A. *et al*.(2016) **Diretrizes da Sociedade Brasileira de Diabetes**. 7.ed. São Paulo: A.C. Farmacêutica. 348 p.

Paiva K. *et al*. (2017). Prevalência de doenças crônica em policiais militares de uma Companhia do Estado da Paraíba. In II CONGRESSO BRASILEIRO DE CIÊNCIAS DA SAÚDE. 2. 2017. Prevalência de doenças crônica em policiais militares de uma Companhia do Estado da Paraíba. Campina Grande: Realize.

Penteado, M. S. , Oliveira, T. C. (2009) Associação estresse – diabetes mellitus tipo 2. **Revista da Sociedade Brasileira de Clínica Médica**, São Paulo, v. 7, n. 1, (pp. 40-45).

Rodrigues L. *et al*.(2013) Estresse Laboral x Diabetes tipo 2. In XIII SAFETY HEALTH AND ENVIRONMENT WORLD CONGRESS. 8. Porto. **Estresse Laboral x Diabetes tipo 2**. Porto: Copec. jul. 2013. p. 1-5.

Salci, M. A. *et al*.(2013) **Educação em saúde e algumas perspectivas teóricas**: algumas reflexões. 2013. 234 f. Estudo teórico-reflexivo - Universidade Federal de Santa Catarina, Santa Catarina.

Schraiber, L. B. *et al*. (2010) Necessidades de saúde e masculinidades. **Caderno de Saúde Pública**, Rio de Janeiro, v. 26, n. 5, p. 961-970.

Silva, A. F.L., Ribeiro, C. D.M., Silva J. A. G.(2013). Pensando extensão universitária como campo de formação em saúde. **Revista Interface**, Botucatu, v. 17, n. 45, p. 84-371.

Silva, S. O. (2010). **Cuidado na perspectiva de homens**: um olhar da enfermagem. 2010. 98 f. Dissertação de mestrado em Enfermagem - Universidade Federal de Santa Maria, Santa Maria.

Spode, C. B., Crespo, A. M. (2004). **Trabalho Policial e Saúde Mental**: uma pesquisa junto aos Capitães da Policia Militar: Psicologia: Reflexão e Crítica, v. 19, n. 3, p. 362-370.

Using simulation as cervical and anal cytology teaching-learning strategy

Janaina Coser
Curso de Biomedicina (UNICRUZ); Programa de Pós Graduação Stricto Sensu em Atenção Integral à Saúde (UNICRUZ/UNIJUÍ)
Universidade de Cruz Alta – UNICRUZ
Brazil

Janice de Fátima Pavan Zanella
Curso de Biomedicina (UNICRUZ); Programa de Pós Graduação Stricto Sensu em Atenção Integral à Saúde (UNICRUZ/UNIJUÍ)
Universidade de Cruz Alta – UNICRUZ

Vanessa Laís Diefenthäler
Programa de Pós Graduação Stricto Sensu em Atenção Integral à Saúde (UNICRUZ/UNIJUÍ)
Universidade de Cruz Alta - UNICRUZ

Sara Gallert Sperling
Programa de Pós Graduação Stricto Sensu em Atenção Integral à Saúde (UNICRUZ/UNIJUÍ)

Dario Gervasio Ronchi
Programa de Pós Graduação Stricto Sensu em Atenção Integral à Saúde (UNICRUZ/UNIJUÍ)
Universidade de Cruz Alta - UNICRUZ

Tatiana Mugnol
Curso de Biomedicina (UNICRUZ)
Universidade de Cruz Alta – UNICRUZ

Juliana Lemes dos Santos
Curso de Biomedicina (UNICRUZ)
Universidade de Cruz Alta - UNICRUZ

Abstract

The current descriptive study is an experience report about the use of gynecological simulators in teaching and research activities developed in the Undergraduate and Postgraduate courses in Health at Cruz Alta University in Southern Brazil. The present study aims to describe the use of gynecological simulator as cervical and anal cytological sample collection teaching-learning strategy, as well as to describe the protocol adopted in such procedure. The gynecological simulator is a useful instrument applied to the sample collection practice for cervical and anal cytological examination purposes since it is a static dummy

anatomically similar to the female body. Simulating the procedure allows students to train and improve skills required to the technique; however, the theoretical contextualization must precede the practice in the simulator to stimulate students to reflect on all aspects involved in the exam. The use of a gynecological simulator is recommended as a complementary tool in cytologic examination teaching-learning scenarios.
Keywords: dummies; educational technology; professional training.

1. Introduction

The paradigm in health professionals' education has been changing. Students and young professionals in the field need to continuously develop skills, which must be acquired outside the operating room, outpatient clinic, hospital or laboratory [1]. Thus, different strategies such as simulation may be adopted as active teaching methodologies in the health field [2].

Simulation is an educational process that reproduces health-work scenarios in several aspects through an interactive environment close to the reality faced by healthcare services [3, 4]. This environment may be represented through different strategies and technologies, for example: patient simulator (dummy), simulated patients (people playing the role of patients, role-play), simulator in virtual environments, videos, audios, educational games, mobile telephone applications, hypertexts and mixed methods (use of more than one simulator type) [5,6].

All these resources allow training the necessary skills to apply the actual procedures to patients. Simulations enable a safe training, since the self-recognition of possible errors during the procedures, along with the theoretical contextualization of knowledge, helps to assure patient safety [5].

Patient safety is paramount and must be emphasized since academic training. Thus, simulations gained prominence in professional training [7], since procedures performed in simulators help improving students' performance. Such improvement process reflects trainees' desire and devotion since it requires hours and hours of practice [1]. Although simulation does not replace real clinical scenarios, it allows improving students' clinical skills and helps to reduce the anxiety of professionals when they perform procedures [8]. Varga and collaborators (2009) emphasize that students have the opportunity to learn and make mistakes in the protected environment provided by simulations, as well as that students' reasoning about their mistakes works as cognitive learning stimulus [9]. This characteristic is also the purpose of active methodologies, i.e., integrating theoretical-practical knowledge and enabling a critical-reflexive professional training [10].

Although technical skills may be developed in the operating room, in the hospitalization unit or directly with the patient, the difficulty in standardizing procedures, the restricted procedure time and the need for excellence in the clinical care given to patients, make the learning process difficult. Thus, using simulators gives students the opportunity to practice and maximize their performance [1, 11, 12].

Therefore, the aim of the current study was to describe the use of gynecological simulators as a teaching-learning strategy for the collection of cervical and anal cytological samples, as well as to describe the protocol adopted in this procedure, based on the literature, on guidelines and on the experience acquired in our academic and professional practices.

2. Methods

The current descriptive study is an experience report about the use of gynecological simulators in teaching-learning scenarios developed in the Undergraduate and Postgraduate courses in Health at Cruz Alta University, Cruz Alta County, the Rio Grande do Sul State. The simulator is stored in the Cytology Laboratory of the institution and, since 2013, has been used for the following purposes: I) complementary strategy to teach contents encompassing fields such as Cytology, Laboratory Methods, Oncology and Women's Health; II) *permanent health education* directed to professionals working in Health Services; and, III) *health education* within the community, in order to demonstrate and demystify the examination process. The study emerged from the initiative of describing a theoretical-practical approach to the use of simulations in the health field, with emphasis to the cytological examination, since there are no national guidelines for anal collection, whereas health services use protocol adaptations for cervical collections. Thus, the description of a teaching-learning experience based on theoretical and practical knowledge, on the activities mentioned above and on requirements set in the literature, was considered relevant.

The current experience report was developed by a biomedical scientist and a pharmacist, who are clinical cytology specialists with teaching experience; by a biomedical scientist and a nurse, who are post-graduate students; and by an obstetrician-gynecologist and two biomedicine undergraduate students, who are scientific initiation fellows.

3. Experience report and discussion

3.1 Cytological examination used as screening *strategy* for the early diagnosis of neoplasias

Screening is defined as the application of a test or examination to an asymptomatic and apparently healthy population to identify cancer-precursor or suggestive lesions, thus enabling them to be referred to further investigation and treatment. On the other hand, early detection strategy is defined as the one that allows approaching individuals are presenting disease signs and symptoms [13].

Cytological examinations are used to screen several neoplasias since the first Papanicolaou and Babes studies have emerged. Their basic principle lies in the identification of cellular morphology changes by observing the cytoplasm and the nucleus of stained cells. Cytoplasmic features indicate the cell differentiation level, whereas nuclear features indicate whether the cell is normal or undergoes inflammatory, pre-neoplastic and even neoplastic changes [14].

National and international guidelines recommend cytology examinations as public cervical cancer (CC) screening strategy because they are effective, safe, cost-effective and present 86% to 100% specificity; besides being recommended by the Brazilian Ministry of Health (MS - Ministério da Saúde) for sexually active women in the age group of 25 to 64 years. The examination should be repeated every three years, after two consecutive negative annual examinations [15].

Assuring 80% to 85% minimum coverage of vulnerable populations, as well as the quality of the cytological examination, and the timely treatment and follow-up of patients is necessary to help to influence the epidemiological profile of CC [16,17]. Accordingly, from 2010 on, the Brazilian Ministry of Health prepared propositions aimed at improving the effectiveness of cytological examinations through the

training and qualification of health professionals working in organized screening programs at primary healthcare level [18].

Similar to cervical cancer screening, the anal cancer screening based on cytology is also an efficient method that can be made available in health services by using the same infrastructure [19]. This strategy allows identifying neoplastic changes at early stages and enables early treatments. Current recommendations indicate anal screening for at-risk groups, including individuals who practice receptive anal sex, people living with HIV/AIDS, and those with a history of anogenital malignancies caused by human papillomavirus (HPV) [20,21].

The use of cytological examinations as anal cancer screening method remains under discussion. Although anal cancer is rare in the general population, in comparison to other cancer types, the number of cases has increased in recent years, mainly in women [22]. Therefore, prevention and screening strategies based on anal cytology can be adopted to help early detecting this neoplasm, as well as reducing its development risk [23].

3.2 The use of gynecological simulators as teaching-learning strategy

Simulation is a teaching strategy that complements the traditional training of health professionals and students to avoid potential risks to patients. Laboratories - from the most modest to the most sophisticated ones - offer adequate teaching conditions within the healthcare context based on the introduction of the simulation-fidelity concept [11].

Professionals in charge of collecting cytological cervical and anal specimens should be trained and qualified to do so to assure that the procedure will be performed efficiently, with quality, and without intercurrences. Gynecological simulators, which are characterized as patient simulators or low-fidelity static dummies, are among the instruments used for this purpose.

This simulator type allows making coarse movements in the main joints, does not present any interaction or response to the interventions, besides presenting robustness, simple maintenance and low cost [24]. It is mainly indicated for the training of technical procedures [25].

It is known that skills acquired during simulation exercises are successfully transferred to the clinical practice by promoting greater patient care [1,11]. Therefore, a partial body gynecological simulator representing the lower part of the adult female body is used in our teaching-training practice, which is focused on the collection of samples for cytological examination purposes (Figure 1A). In addition to providing familiarity with the materials used in collection procedures (Figure 1B), the contact with the dummy and the different uterine cervix aspects (Figure 1C) allows future professionals to develop greater intimacy with the examination scenario, to practice the visual inspection of the uterine cervix and to handle collection instruments.

An important benefit from this type of training lies on the increased self-assurance and competence of the trainee, since the practice with simulators reduces anxiety and stress, besides reducing the margin of error. Also, repeating the movements triggers a muscle memory that leads to technical skill [1, 12].

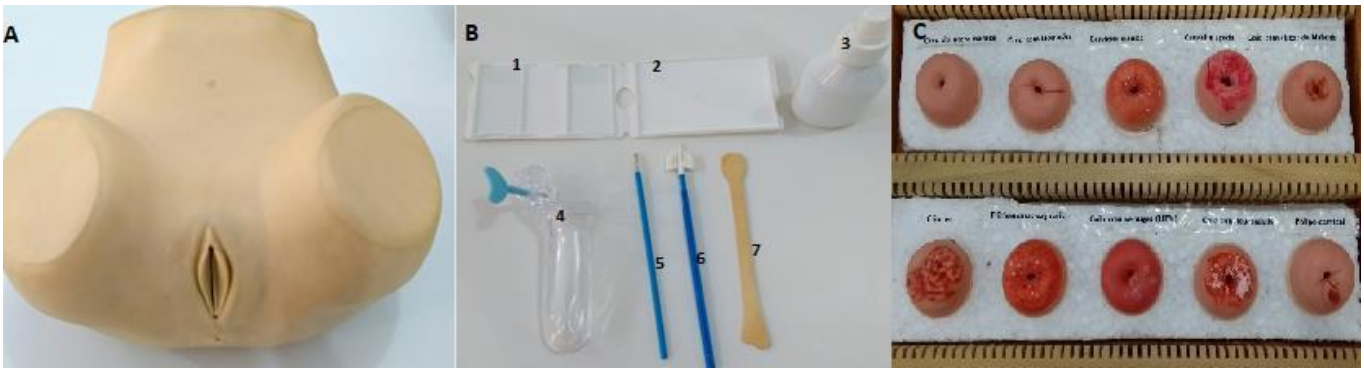


Figure 1. Materials used to simulate the collection of samples for cervical and anal cytology examination purposes. (A) Gynecological simulator; (B) Materials needed for the cytological collection procedure: 1- glass slide with frosted edge; 2- slide holder; 3-cytological fixative agent; 4- vaginal speculum; 5- endocervical brush - conventional cytology; 6- endo- and ectocervical brush - cytology in liquid medium; 7- wooden spatula. Source: Authors' files; (C) Uterine cervix models presenting distinct aspects.

3.3 Cervical cytology

Women should be instructed before the examination, since there are many avoidable factors, such as sexual intercourse 48 hours before the examination, remnants of medications in the vaginal canal, and the presence of sperm or blood in the smear, which may interfere in the cytological collection result [26].

Patients shall be placed in gynecological position (as comfortable as possible) during the collection procedure. A speculum presenting adequate size for the patient to be examined shall be gently inserted in an upright position (Figure 2A). Once the introduction has begun, the speculum shall be rotated into transverse position to allow the opening of the instrument to be placed in horizontal position. Once the instrument is fully inserted into the vagina, it shall be slowly and gently opened (Figure 2B) to allow observing the vaginal walls, their contents and the uterine cervix (Figure 2C) [27, 28].

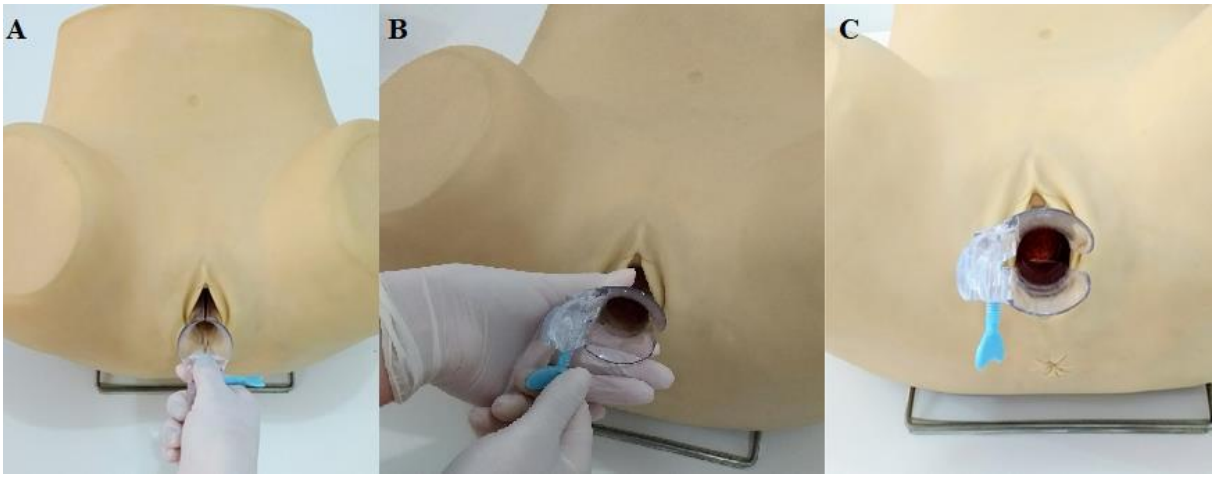


Figure 2. Simulation showing vaginal speculum insertion. (A) Initial vaginal speculum insertion position; (B) Opening; (C) Final position with uterine cervix visualization. Source: Authors' files.

The U-shaped side of the Ayre spatula shall be used in collection procedures performed in the ectocervix. The longest tip of the spatula shall touch the external *orifice* of the uterine cervix and smear it through 360° rotation around the orifice (Figure 3A) to enable the entire uterine cervix surface to be smeared and represented on the slide. A firm, although delicate, pressure shall be applied without harming the uterine cervix in order avoid affecting the quality of the sample. The endocervical brush shall be used in collections performed in the endocervix; its bristles shall be fully inserted into the vagina, and a 360° rotating movement shall be made to cover the entire contour of the uterine cervix orifice (Figure 3B). [27,28].

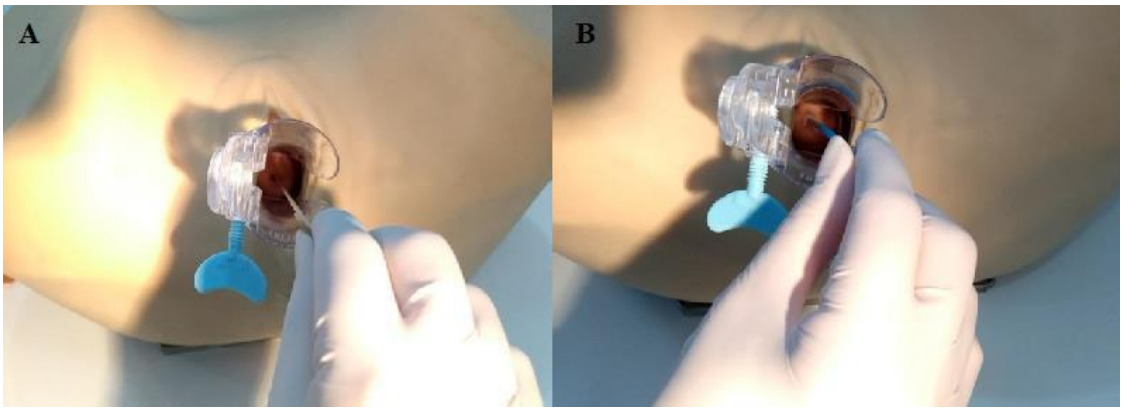


Figure 3. Simulation showing cervical sample collection. (A) Ectocervix collection using the Ayre spatula; (B) Endocervix collection using the endocervical brush. Source: Authors' files.

The Ayre spatula shall be used to collect samples from the fundus of the vaginal sac in hysterectomized women. Concerning pregnant women, the collection shall be preferably performed by using the Ayre spatula due to the physiological eversion of the squamocolumnar junction that takes place during pregnancy; most of the time, this procedure allows obtaining satisfactory smears without taking the risk of causing bleeding events [27,28].

The following procedures shall be adopted to prepare the smear: the ectocervical sample shall be transversely placed in the upper half of the slide close to the frosted region, and previously identified with the patient's initials and registration number (Figure 4A). The material removed from the endocervix shall be longitudinally placed on the lower half of the slide (Figure 4B). The smear shall be immediately fixed to prevent the collected material from drying (Figure 4C). The properly-packed slides shall be sent to the laboratory (Figure 4D) along with their respective requisition forms. The forms shall be properly filled, and their identification shall meet that of the vial or slide holder box and the initials on the slide [27,28,29].

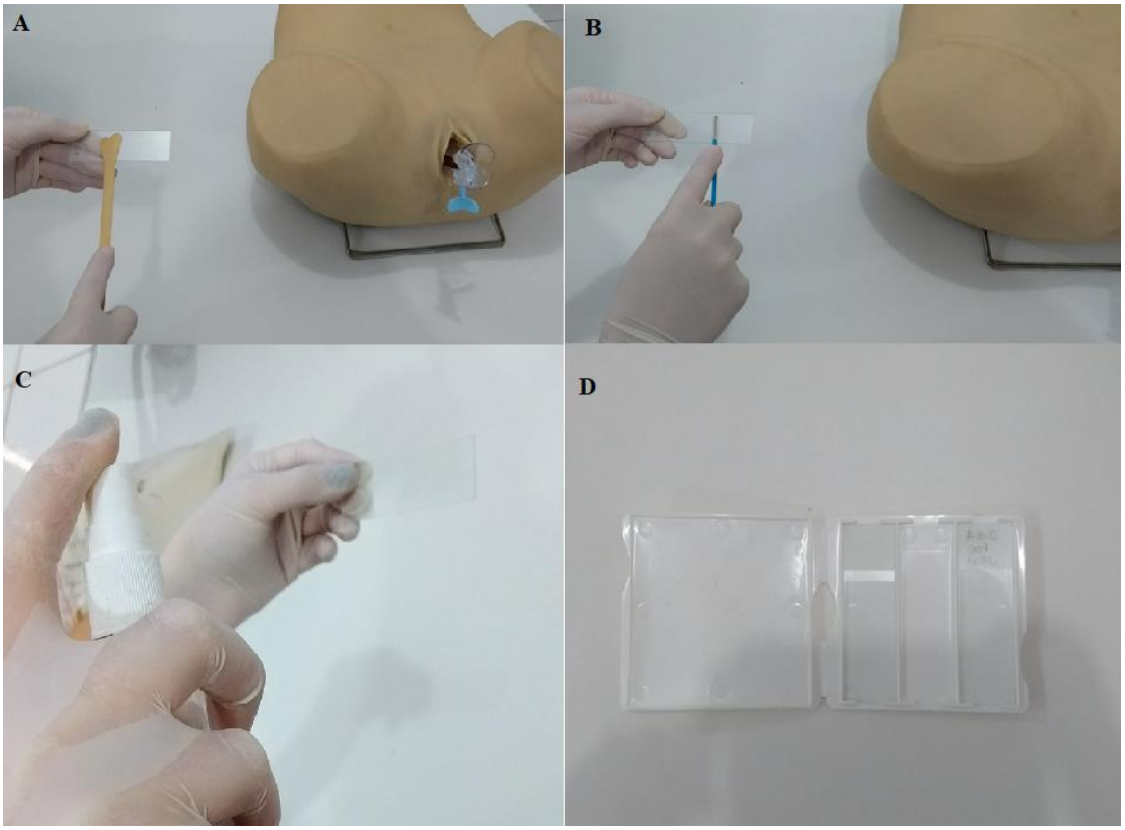


Figure 4. Simulation is showing the preparation and fixation of the uterine cervix cytologic smear and the slide packaging process. (A) Smear preparation process using the material collected from the ectocervix; (B) Smear preparation process using the material collected from the endocervix; (C) Smear fixation; (D) Slide packaging. Source: Authors' files.

3.4 Anal cytology

Unlike the cervical cancer screening, the cytologic examination for anal cancer screening purposes remains little adopted in the clinical practice. Although anal sample collections have been cited or described in some studies [20, 30-31], there are no guidelines focused on sampling procedures for anal cancer screening purposes.

Therefore, the collection technique presented in the current study was based on literature descriptions and the practices adopted in teaching and research activities developed in the Cytology Laboratory at Cruz Alta University. Thus, we herein understand the use of simulators in knowledge acquisition and training processes focused on sample collection for anal cytology examination purposes as a differentiating factor in professional training. Simulators enable the correct identification of anatomical structures, allow performing the collection procedure in the correct sequence, as well as identifying and reasoning about possible mistakes or intercurrences before applying the technique to real patients. The theoretical contextualization of the anal canal histology and anatomy, as well as of the step-by-step collection procedure, precedes the practice with the aid of simulators in our teaching practice.

The anal canal, or anus, (Figure 5) is known as the terminal portion of the rectum; it passes through the posterior perineum and ends in the anoperineal line [32, 33]. It is approximately 4 cm long and shorter in women [34]. In histological terms, it comprises the columnar epithelium (located in the upper part of the anal canal) and the transitional epithelium; it is formed by the squamous epithelium and the non-keratinized

epithelium (located in the lower part of the anal canal, approximately 4 to 5 mm from the anoperineal line). The squamocolumnar junction (SCJ) is located in the dashed line. Like the uterine cervix, the anal canal has an epithelium Transformation Zone (TZ); HPV infections may also happen in this area or just in the squamous epithelium [32].

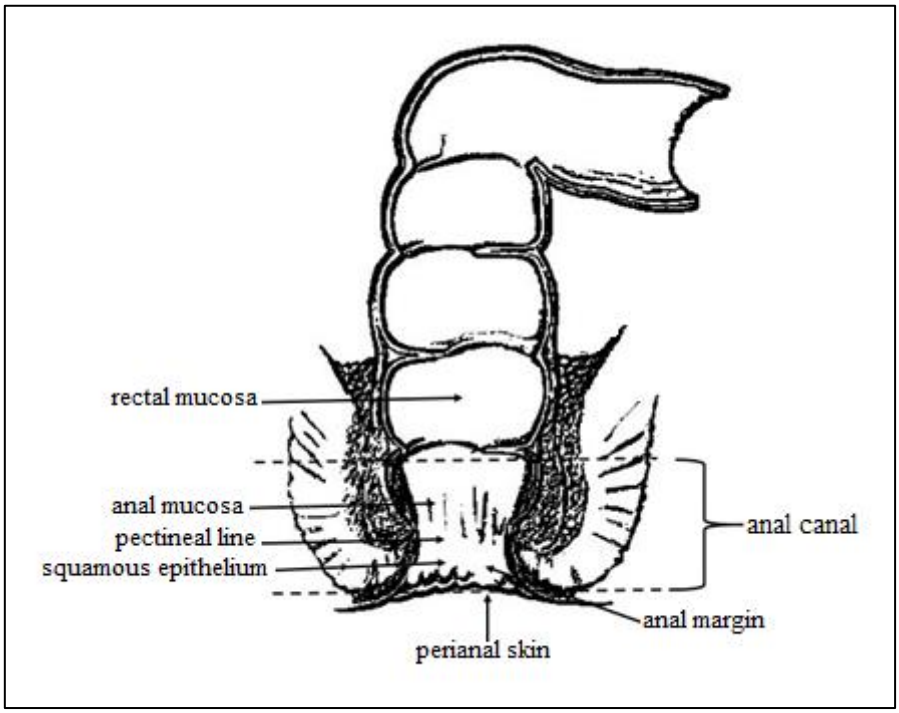


Figure 5. Anal canal anatomy. Source: Own authorship

Patients shall be lying in Sims' position, i.e., in left lateral decubitus, with their right lower limb flexed and their left lower limb slightly flexed at the time to collect the sample. This position makes the collection process easier because it relaxes the anal sphincters and the perineum, as well as provides greater comfort to patients [35,36]. The left lateral decubitus is the position of choice adopted in research projects developed by our Research Group since it shows good acceptance by patients.

Similar to what happens in cervical cytology, patients shall be instructed before the examination because there are important recommendations to be followed to allow collecting optimal samples. Enemas and receptive anal intercourse shall be avoided 24 hours before the procedure, and the rectum shall be emptied before the sample collection [35].

Samples shall be collected in the anal canal and its margin, with the aid of a brush used for endocervical collection to assure better quality and preservation of cellular samples [35, 37]. The brush shall be moistened in 0.9% Physiological Serum introduced into the rectum (approximately 3 to 4 cm deep) and withdrawn in a spiral motion to allow sampling the anal canal TZ [38,39,40].

According to Nadal et al. (2009), the deeper the brush is inserted, the more effective the test will be [37]. Darragh and Winkler (2012) also recommend inserting the brush as deep as possible, usually 5-7 cm (2-3 inches) until finding resistance [35]. The endocervical brush adopted in our practice has two cm-long bristles (approximately 0.7 cm diameter); therefore, the entire length of the bristles shall be introduced into

the anal orifice to assure proper material collection (Figure 6).

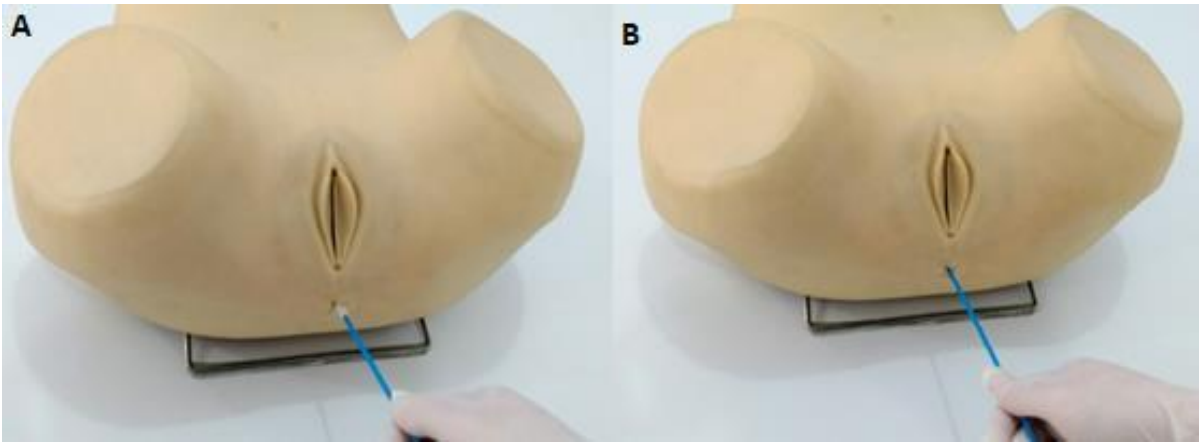


Figure 6. Sample collection for anal cytology examination purposes. (A) Brush positioning; (B) Total brush insertion 3 to 4 cm deep into the anal canal. Source: Authors' files.

The collected material is smeared on a glass slide through rotational, zig-zag or longitudinal movements [38] and immediately fixed with the aid of a cytological fixative agent positioned approximately 20 cm from the slide (as in the cervical cytology examination - see Figure 4C) [28]. We adopt the rotational movement longitudinally applied to the slide in our practice (Figure 7) since it allows homogeneously distributing the collected material and enables good cell preservation.

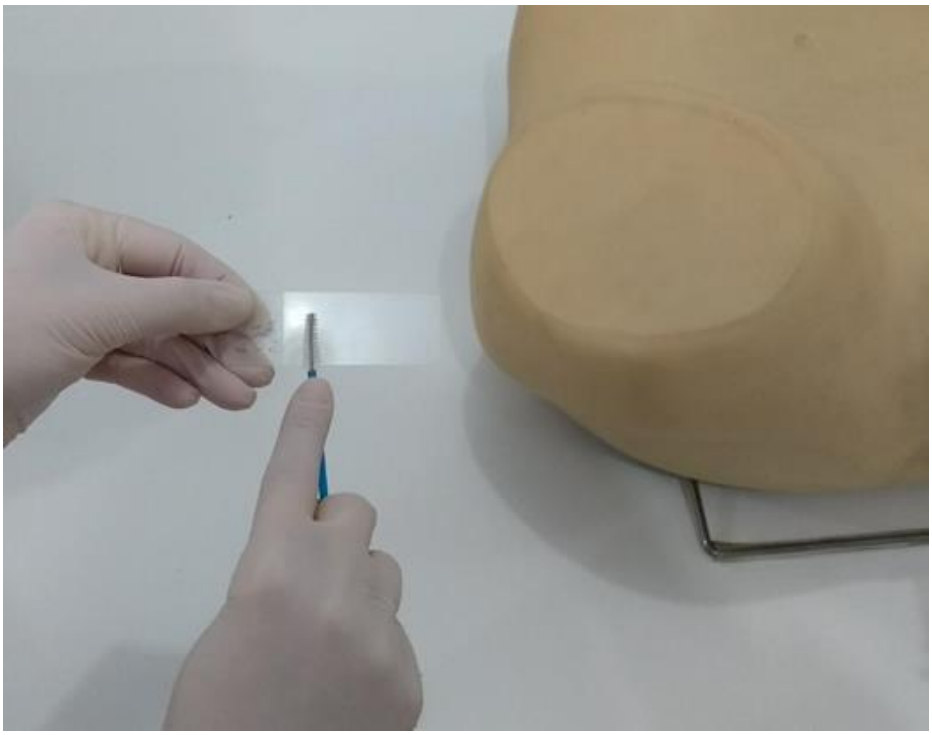


Figure 7. Simulation is showing the anal cytological smear preparation. Source: Authors' files.

The sample embedded in an appropriate medium (e.g., cervical cytology - see figure 4D) shall be referred to the laboratory, where it will be processed according to the Papanicolaou technique and analyzed in an ophthalmic microscope by the cytologist in charge [40]. Similar to the cervical cytology, anal cytology results are classified according to the Bethesda System [41]. The TBS, which is a system developed by a group of cytologists, histologists and oncology therapists, introduced the classification of results, as well as the criteria to be applied to the smear quality analysis conducted in the cytopathological examination by taking into account the components found in the sample [41].

Studies indicate sensitivity ranging from 47% and 90% and specificity ranging from 16% to 92% [42]. Some methodological limitations can make the sample unsatisfactory, among them: smearing presenting acellular or hypocellular material (cells in less than 10% of the smear), contamination with fecal material in more than 75% of the smear, and anucleated cells in more than 75% of the smear [38].

The sampling collection stage is essential to avoid these limitations; therefore, the procedure shall constantly be trained and improved during its application. We recommend some precautions to be taken in order to help get good-quality samples, namely: I) preventing the brush from touching the external region of the anus aiming at reducing the possibility of contaminating the smear with anucleated cells; II) properly fixing the smear in order to cover the entire slide and prevent the sample from drying; and III) inserting the brush up to 4 cm deep into the anal canal by making rotational movements to make sure of getting samples of cellular representativeness.

5. Conclusion

It is recommended using gynecological simulators as complementary instruments in teaching-learning scenarios focused on cervical and anal cytology examinations. Simulations based on the herein described procedures may contribute to the qualification of this important examination, which helps screening neoplasms presenting high morbidity and mortality rates.

7. References

1. Goff BA. Best Practice & Research Clinical Obstetrics and Gynaecology Training and assessment in gynaecologic surgery: the role of simulation. Best Pract Res Clin Obstet Gynaecol. 2010;24(6):759-66.
2. Souza CDF, Antonelli AB, Oliveira DJ. Metodologias ativas de ensino aprendizagem na formação de profissionais da saúde. Revista da Universidade Vale do Rio Verde. 2016;14(2):659-77.
3. Gaba DM. The Future Vision of Simulation in Healthcare. Simul Healthcare. 2007;2(2): 126-35.
4. Gaba DM. Do As We Say, Not As You Do: Using Simulation to Investigate Clinical Behavior in Action. Simul Healthcare. 2009;4(2):67-9.
5. Oliveira SND, Prado MLD, Kempfer SS. Utilização da simulação no ensino da enfermagem: revisão integrativa. Rev Min Enf. 2014; 18(2), 487-504.
6. Silveira MS, Cogo ALP. Contribuições das tecnologias educacionais digitais ensino de habilidades de enfermagem: revisão integrativa. Am. J. Surgery. 2017; 38(2):e66204.
7. Kohn LT, Corrigan JM, Donaldson MS. To err is human: building a safer health system. Washington, DC: National Academy Press; 2000.
8. Pugh CM, Salud LH. Fear of missing a lesion: use of simulated breast models to decrease student anxiety when learning clinical breast examinations. Am. J. Surgery. 2007;193(6):766-70.
9. Varga CRR, Almeida VC, Germano CMR, Melo DG, Chachá SGF, Souto BGA, Fontanella BJB, Lima VV. Relato de Experiência: o Uso de Simulações no Processo de Ensino-aprendizagem em Medicina. Rev Bras Educ Med. 2009;33(2):291-7.
10. Brandão CF, Collares CF, Marin HF. A simulação realística como ferramenta educacional para estudantes de medicina. Sci Med. 2014;24(2):187-92.
11. Mccaughey CS, Traynor MK. Nurse Education Today The role of simulation in nurse education. Nurse Educ Today. 2010;30(8):827-32.
12. Mbbs TD, Wadey V, Archibald D, et al. Cognitive and Psychomotor Entrustable Professional Activities : Can Simulators Help Assess Competency in Trainees ? Clin Orthop Relat Res. 2016;474(4):926-34.
13. World Health Organization - WHO. Cancer control: knowledge into action: WHO guide for efective pogrammes [Internet]. Switzerland; 2007 [cited 2017 September 29]. Available from: http://www.who.int/cancer/modules/Prevention%20Module.pdf
14. Buffon A. Anatomia, Histologia e Citologia Normal do Trato Genital Feminino. In: Consolaro MEL, Maria-Engler SS, organizers. Citologia Clínica Cérvico-vaginal - Texto e Atlas. [Reprint.]. São Paulo: Roca; 2012. p. 1-14.
15. Inca. Instituto Nacional de Câncer José Alencar Gomes da Silva. Coordenação de Prevenção e

Vigilância. Divisão de Detecção Precoce e Apoio à Organização de Rede. Diretrizes Brasileiras para Rastreamento do Câncer do Colo do Útero [Internet]. 2ª ed. Rio de Janeiro; 2016 [cited 2017 September 29]. Available from: http://colposcopia.org.br/files/consensos/diretrizesparaorastreamentodocancerdocolodoutero2016corrigido-1448538996.pdf

16. Albuquerque KM de, Frias PG, Andrade CLT de, Aquino EML, Menezes G, Szwarcwald CL. Cobertura do teste de Papanicolaou e fatores associados à não-realização: um olhar sobre o Programa de Prevenção do Câncer do Colo do Útero em Pernambuco, Brasil. Cad Saude Publica. 2009;25:s301-s309.

17. Falcão GB, Ibiapina FLP, Feitosa HN, Feitosa TS, Lacerda PD de, Braga JU, Carvalho FHC. Fatores associados à realização de citologia para prevenção de câncer do colo uterino em uma comunidade urbana de baixa renda. Cad Saúde Coletiva. 2014;22(2):165-72.

18. Amaral AF, Araújo ES, Magalhães JC, Silveira ÉA, Tavares SBDN, Amaral RG. Impacto da capacitação dos profissionais de saúde sobre o rastreamento do câncer do colo do útero em unidades básicas de saúde. Rev Bras Ginecol e Obs. 2014;36(4):182-87.

19. Godfrey C, Firnhaber CS, D'Souza G, Heard I. Anal dysplasia in HIV-infected women: a commentary on the field. Int J STD AIDS. 2015;1-7.

20. Elorza G, Saralegui Y, Enríquez-Navascués JM, Placer C, Velaz L. Anal intraepitelial neoplasia: A narrative review. Rev Esp Enferm Dig. 2016;108(1):31-9.

21. Aguiar MTM, Bosso NCC, Leal CBQS, Lira CF, Cabral LAO, Silva AMTC et al. Clinicopathological aspects and prevalence of human papillomavirus in anal cancer. J Coloproctol. 2014;34(2):76-82.

22. Patel J, Salit IE, Berry MJ, Pokomandy A, Nathan M, Fishman F et al. Environmental scan of anal cancer screening practices: worldwide survey results. Cancer Med. 2014;3(4):1052-61.

23. Diefenthäler VL, Cardoso MAC, Zanella JFP, Moreira PR, Coser J. Lesão anal por papilomavírus humano em mulher vivendo com HIV/aids. Sci Med. 2017;27(3):1-5.

24. Martins JCA, Mazzo A, Baptista RCN, Coutinho VRD, Godoy S de, Mendes IAC, Trevizan MA. A experiência clínica simulada no ensino de enfermagem: retrospectiva histórica. Acta Paul Enf. 2012;25(4):619-25.

25. Quilici AP, Abrao K, Timerman S, Gutierrez F. Simulação clínica: do conceito a aplicabilidade. São Paulo: Atheneu; 2012.

26. Oliveira NC, Moura ERF, Diógenes MAR. Desempenho de enfermeiras na coleta de material cervicouterino para exame de Papanicolaou. Acta Paul Enferm. 2010;23(3):385-91.

27. Inca. Instituto Nacional de Câncer José Alencar Gomes da Silva. Coordenação de Prevenção e Vigilância. Divisão de Detecção Precoce e Apoio à Organização de Rede. Manual de gestão da qualidade para laboratório de citopatologia [Internet]. 2ª ed. Rio de Janeiro; 2016 [cited 2017 September 29]. Available from: http://www1.inca.gov.br/inca/Arquivos/livro_completo_manual_citopatologia.pdf

28. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Controle dos cânceres do colo do útero e da mama [Internet]. 2ª ed. Brasília; Editora do Ministério da Saúde, 2013 [cited 2017 September 28]. Available from: http://bvsms.saude.gov.br/bvs/publicacoes/controle_canceres_colo_utero_2013.pdf

29. Fonseca AJ Da, Murari RSW, Moraes IS, Rocha RF, Ferreira LCDL. Acurácia dos exames citológicos cervicovaginais em Estado de elevada incidência de câncer de colo de útero. Rev Bras Ginecol e Obs. 2014;36(8):347-52.
30. Nadal SR, Calore EE, Nadal LRM, Horta SHC, Manzione CRM. Citologia anal para rastreamento de lesões pré-neoplásicas. Rev Assoc Med Bras. 2007;53(2):147-51.
31. Nobre MS, Jacyntho CM, Eleutério Jr J, Giraldo PC, Gonçalves AK. Abnormal anal cytology risk in women with known genital squamous intraepithelial lesion. Braz J Infect Dis. 2016;20(3):294-7.
32. Mindel A, Carmody C. Região anal e perianal: diagnóstico e tratamento: lesões perianais e anais em adultos. In: Gross GE, Barrasso R. Infecção por papilomavírus humano: atlas clínico de HPV. Porto Alegre: Editora Artes Médicas Sul Ltda., 1999.
33. Maluf FC, Buzaid AC, Varella D. Vencer o câncer. São Paulo: Dendrix; 2014.
34. Sinnatamby CS. Last's anatomy: regional and applied. 10th ed. Edinburgh: Churchill Livingstone; 1999.
35. Darragh TM, Winkler B. Screening for anal neoplasia: anal cytology – sampling, processing and reporting. Sexual Health. 2012;9:556-61.
36. Oliveira RG. Blackbook Enfermagem. 1 ed. Belo Horizonte: Blackbook Editora, 2016.
37. Nadal SR, Horta SHC, Calore EE, Nadal LRM, Manzione CR. Quanto a escova deve ser introduzida no canal anal para avaliação citológica mais eficaz? Rev Assoc Med Bras. 2009;55(6):749-51.
38. Heráclio AS, Pinto FRG, Cahen K, Katz L, Souza ASR. Anal cytology in women with cervical intraepithelial or invasive cancer: interobserver agrément. J Bras Patol Med Lab. 2015;51(5):315-22.
39. Smyczek P, Singh AE, Romanowski B. Anal intraepithelial neoplasia: review and recommendations for screening and management. Int J STD AIDS. 2013;24(11):843-51.
40. Roberts JR, Siekas LL, Kaz AM. Anal intraepithelial neoplasia: A review of diagnosis and management. World J Gastrointest Oncol. 2017;9(2):50-61.
41. Solomon D, Nayar R. Sistema Bethesda para Citopatologia Cervicovaginal – Definições, Critérios e Notas Explicativas. Rio de Janeiro: Revinter; 2005.
42. Long KC, Menos R, Bastawrous A, Billingham R. Screening, Surveillance, and Treatment of Anal Intraepithelial Neoplasia. Clin Colon Rectal Surg, 2016;29:57-64.

Copyright Disclaimer
Copyright for this article is retained by the author(s) with first publication rights granted to the journal.
This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).

Redesigning an economics course to achieve more reflexivity

Is blended learning a curse or a blessing for mid-career MPA students and teacher?

Peter Koenraad Marks
Erasmus University Rotterdarm
Netherland

Abstract

A recurring issue in (mid-career) master programs Public Administration is to get students to become (more) reflexive (conf. e.g., special issue of Teaching Public Administration 2013). As academic graduates, they should not merely apply public administration theories and methods in standardized ways but always think critically about what they do and why. Moreover, they should be able to make sensible, situated connections between 'theory' and 'praxis' and critically and creatively derive new modes of professional action from these. To achieve this student should approach their study with the main intention to develop personal understanding (e.g., Marton & Säljö, 1976; Trigwell, 2010). In this article, the redesign of a course in a two-year mid-career master program from a traditional instructional mode to blended learning will be discussed and analyzed to see if the redesign attributed to more reflexive working methods in the course and a more reflexive attitude in students.

Keywords: Reflexivity, blended learning, deep learning approach, mid-career program, public administration

1. Introduction

Working – public – professionals wanting to study Public Administration can follow a mid-career Master of Public Administration (MPA) program at the Erasmus University Rotterdam, the Netherlands. Even though hardly any student following a master program will choose an academic career, they still need to be educated at an academic level because the complexity of their professional contexts requires this, as do jobs they want to acquire. Hence, as graduates of an academic program, they not only have to 'know' relevant PA academic theories and methods but also to 'use' these in sensible ways in their professional practice (Quinn, 2013). In other words, students should not merely apply public administration theories and methods in standardized ways but always think critically about what they do and why. Moreover, they should be able to make sensible, situated connections between 'theory' and 'praxis' and critically and creatively derive new modes of professional action from these (Van der Meer & Marks, 2013).

The teaching staff of the program feels that for many students it is difficult to meet these standards. Some students seem to use methods, models, and theories quite instrumentally and without reflection. It may be

that students do not expect this reflection as a core task and hence adopt a Surface Approach to learning, which means that students' main intention to learning is to satisfy assessment requirements. Routine, unreflective memorization and procedural problem solving are associated strategies. Whilst a more reflexive attitude requires that students adopt a Deep Approach to learning, which means that students main intention in learning is to develop personal understanding, and is associated with an intention to comprehend, to active conceptual analysis and result in a deep level of understanding (Marton & Sälj 1976; Meer, van der, et al. 2013; Struyven, *et al.*, 2006; Trigwell, 2010).

To get students to become (more) reflexive (see the special issue of Teaching Public Administration 2013 on this subject) means that their study approach needs to be more in line with the Deep Approach. However, the study approach of students needs to fit into a curriculum that offers ample opportunity to practice this reflexive nature. Even though courses in the MPA program use several methods to enhance reflection, it is still underdeveloped (Van der Meer & Marks, 2013). Several factors contribute to this underdeveloped reflective practice; e.g., teachers experience little time to devote attention to reflection, teachers focus on knowledge transfer, attitudes of students are quite instrumental, the number of students (45-70) makes it difficult to engage all of them in reflective discussions actively, structure of the curriculum, and requirements for papers and exams (for extensive overview see Van der Meer & Marks, 2013). Curriculum level changes have been implemented to strengthen reflective working methods, e.g., management of expectations, developing staff vision and commitment.

However, improving or introducing reflective working methods at course level could also provide the opportunity for students to strengthen their reflexive capacity. Options at course level are amongst others introducing blended learning to create different face-to-face contact, giving less structured exercises and assignments. One of the courses in the MPA curriculum is 'Government and Economic Policy (GEP)' (*Overheid en Economisch Beleid*). In this course, the didactical method changed from traditional instruction to blended learning. The idea is that blended learning will create the opportunity to use class time and study time in different manners to open up more opportunities for more reflective working methods during class hours.

Hence the question central in this paper is *How can blended learning create preconditions for implementation of reflective working methods in the Government and economic policy course of the MPA program at the Erasmus University Rotterdam, the Netherlands?*

In the next section, the workings of the course as it used to be will be explained as well as perceived pitfalls. In the third section blended learning will be explained, what it can contribute and how. Based on this theoretical argument it will be argued how it can contribute to the tackling the pitfalls of the GEP course. In section 4 the didactical format for the course will be explained, which will then be evaluated in section 5. Conclusion and a discussion will end the paper.

2. MPA & Government and economic policy

Since 2003 the Erasmus University Rotterdam, Department of Public Administration and Sociology has a two-year MPA program. It consists of 9 consecutive modules (60 ECTS) in the first year and five consecutive modules (45 ECTS) and a thesis (15 ECTS) in the second year. Each week there are two classes from 18.45-22.00 hours on Monday and Thursday in the first year, and on Tuesday and Thursday in the second year. Students have at least two and on average five or six years of relevant professional experience and have completed a higher vocational training. Each year around 50 students starts with the program and about 45 graduate. The program is specifically designed for practitioners (Van der Meer & Ringeling, 2010).

The GEP course is the fifth course in the first year and consists of eight classes followed by an exam. The goal of the course is to familiarize students how to analyze societal effects due to governmental actions and vice versa from an economics perspective. This perspective means: individuals have to make choices as due to scarcity individuals cannot fulfill all their wishes. These choice problems manifest themselves for consumers, producers, politicians, civil servants, et cetera and on a group level for lobby groups, local and national governments, et cetera. Students should learn how to analyze the behavior from this scarcity perspective. In the course two mainstream economic theories are dealt with by two different teachers; one teaches microeconomics and the other macro-economics / public finance. Mandatory literature is two economics textbooks. The table below shows what topics are dealt with during the course.

The assessment is split into two elements: 1) a short paper and presentation on a case study, and 2) a written exam. The students have to form groups of three and choose one case study out of seven subjects for their paper. During the last class, the total student population is split into two groups, in such a way that all seven case studies will be presented in one group. The subjects of the papers are mostly not on clear-cut economic cases, but on policy fields like environmental planning, traffic management, health care, et cetera. There are three micro-economic cases and four public finance cases. The case studies should trigger students to search and make a selection of concepts, approaches, and theories that are new to them. Since the policy field is most often not their policy field students are confronted with both relatively new policy fields, but also with new economic concepts. When applying the economic concepts, students are looking for answers they hadn't thought of before they started. Even when it is the policy field of one of the members of the group it turns out that with the economic concepts it creates new insights, sometimes contrasting their expectations. Presentation their case study to other students helps students learn to transfer relatively new concepts to an audience. That student audience then actively gives comments using the economic concepts hence applying them to a policy field (that was not their subject for the exercise). Through this exercise, students should open up for alternative approaches and actively learn to apply them in different contexts.

The papers and presentations, graded by the two teachers, can maximally add up to 30 points. The exam consists of 40 multiple choice questions, 17 on micro-economics and 23 on public finance, and one open question on microeconomics and one on public finance, which in total add up to 70 points. Students must have 55 points or more to pass the course.

Table 1. Course schedule and content

	Class	Literature	Time	Topics
Microeconomics	Monday	Ch 1-3, 6 & 9	18.45 – 19.45	Introduction, consumer theory
			20.00 – 21.00	Producer theory
			21.15 – 22.00	Supply and demand, and price elasticity
	Wednesday	Ch 3, 12-15	18.45 – 19.45	Price elasticity and governmental intervention
			20.00 – 21.00	Different markets
			21.15 – 22.00	Government and markets
	Monday	Ch 19, 20	18.45 – 19.45	(New) welfare economics
			20.00 – 21.00	Market failure, externalities, and public goods
			21.15 – 22.00	Q&A
Public finance	Wednesday	Ch 1-3	18.45 – 19.45	Role of the government
			20.00 – 21.00	Collective sector
			21.15 – 22.00	Political economics
	Monday	Ch 4-8	18.45 – 19.45	Rational decision-making
			20.00 – 21.00	Budgeting
			21.15 – 22.00	Norms for public finance
	Wednesday	Ch 9-13	18.45 – 19.45	Social security
			20.00 – 21.00	Health economics
			21.15 – 22.00	Taxes and income division
	Monday	Ch 14, 15	18.45 – 19.45	Levels of government
			20.00 – 21.00	Monetary policy and the European Union
			21.15 – 22.00	Q&A
	Wednesday		18.45 – 22.00	Group presentations
	Monday		18.30 – 21.30	Exam

The quality of the course is evaluated through several means:

1. The student fills out course evaluation forms during the first class of the following course. In this evaluation students rank things on a scale from 1 to 5, ranging from quality of the teacher to quality of textbook, as well as ranging from how well the course fits into the MPA-program to how well the digital support was organized. Also, they are asked to answer the following open questions:
    a. what they missed or appreciated in the digital support
    b. which aspects of the course they would like to see changed
    c. which aspects of the course they particularly appreciated
    d. suggestions/remarks about the exam.
2. A focus group consisting of six or seven students openly discussing strengths and weaknesses of the course with the management of the MPA-program and the respective teachers. These discussion and comments have sometimes led to minor adjustments.

3. Before the start of the course, the management of the MPA-program discusses with the teachers which didactical elements the teacher could pay more attention to or what elements of the didactical formula of the program should be present in the course, but also how the management can assist the teachers in improving the course.
4. Adaptation initiated by the two teachers. This is also based on many bilateral discussions between teachers and students during the course.

Over the years it turns out that a substantial part of the students had no previous economic training, which makes them somewhat anxious and insecure about the course. The teachers do want to instruct as much as possible to the students without deterring the anxious and insecure students. Hence they stick to the textbook and explain, mostly graphically, what the economic principles and mechanisms are and how to explain economic behavior. According to the students that never had any economic education, the explanation goes quite rapidly. The students that did have economics in their high school tell that they have forgotten most and that the classes help in restoring this knowledge, but also that they miss more in-depth discussions on both the fundamentals of the theory as well as the applicability of the theory. Where the first group of students is playing catch up when trying to apply the economic principles the latter group thinks it is not going deep enough. In other words, the strategy to explain everything and only spend a small amount of time on application demotivates the more eager (Deep Approach) students because of superficiality and at the same time do not reach the inexperienced group of students because it is going (too) fast.

From the surveys and focus groups, it also is clear that students find it difficult to understand the value added of micro-economics if their case study was a macroeconomic/public finance topic, and vice versa. They admitted that if their paper was on public finance that they focused on the macroeconomic/public finance classes during the course and that the microeconomic theory disappeared to the background, and vice versa. Due to this one-sided theoretical focus of the students, the teachers feel that they cannot adequately assess whether the students reach all goals set out for the course.

Part of the MPA didactical formula is that students should be able to apply the economic principles to their daily working practice and case study. However, due to instructing theory and how this theory works, the working background of students is hardly ever utilized to help them grasp the economic argumentation. This makes it harder for students to connect the material to their daily practice, which they also state in the survey or during a discussion with the focus group. Teachers feel a dilemma, as they want more discussions on theory and how to relate them to the daily practice of the student while at the same time feeling students' needs of extra instructions of the material to meet the goals of the course.
That is, the teachers feel a need reflexivity needs developing in this course, both in course design and assessment. To reach this, the teachers see blended learning as an opportunity to use class time and study time differently opening up to open up more opportunities to have debates about the theory, discuss different applications to cases as well as the students' working practices.

3. MPA & Government and economic policy

Simply put, blended learning is nothing more than the mixing of different learning and teaching methods. However, mostly "blended learning refers to all combinations of FTF (face-to-face) learning with technology-based learning: traditional education can be enriched with the use of technology and learning with technology can profit from FTF meetings." (Kerres & Witt, 2003: 101; see also Graham, 2005; Heinze & Procter, 2004). However, blended learning is more than the simple combination of FTF and technology-mediated learning as it also has to match didactical parameters like learning goals and objectives, characteristics of the content, the target group and situational/institutional demands (Kerres & De Witt, 2003: 111).

One of the reasons for blending is that technology-mediated environments help change from a more instructive setting to a more interactive version (Graham, 2005). That is, in the FTF meetings less time can be spent on frontal lecturing because that will be technology-mediated, creating time, e.g., for discussions, exercises in the face-to-face setting. Another reason for technology-mediated learning is that students have more flexibility and convenience of studying during their times. At the same time many students do not want to sacrifice the social interaction and human touch they are used to in FTF settings. Also in the FTF setting discussions and other forms of exchange between students, and between students and teacher helps the learning process of the students. Blended learning holds the possibilities to mix the best of both worlds. The idea is to create more effective training settings than classroom training alone, with higher learner value and impact.

Blending may occur at many different levels, i.e., at the activity level, course level, program level and institutional level. Course level blending is most common which means a combination of clear face-to-face and technology-mediated activities between students, teachers and learning resources. One major drawback of technology-mediated activities is that they mostly support only part of the learning processes students engage in. Proper blended learning is then a means to combine multiple delivery media designed to complement each other and promote meaningful learning (Bliuc, Goodyear & Ellis et al. 2007: 233). This means that no blended learning designs are the same, as a blended learning design needs a fundamental reconceptualization and reorganization of the teaching and learning dynamic (Garrison & Kanuka, 2004: 97). Although it seems that in many classrooms face-to-face interaction remains favored, many different forms of technology-mediated activities are introduced (Fleck, 2012). An important aspect to keep in mind when introducing blended learning in any course is that "with the limited results of higher education in facilitating critical thinking, and the need for these abilities in our information age, it is becoming clear that it is essential we do better at facilitating critical, creative, and complex thinking skills. Blended learning offers possibilities to create transformative environments that can effectively facilitate these skills." (Garrison & Kanuka, 2004: 99)

The question is how blended learning will create more critical and reflexive students in the Government and Economic Policy course? What elements of blended learning can help tackle the restraining conditions

mentioned in the previous section?

- *Speed and superficiality*
  Instruction of the 'simpler' theoretical notions and workings of the theory can be shifted from classroom instructions to internet movies and instruction. This will help the students that have no economic background to get a grasp of the basic notions in their own pace and their protected environment, while at the same time will it help students that have had economics in refreshing the material in their own pace. This also creates more time during FTF contact hours which will enable the next three elements.
- *Connection with professional working background of the students*
  Besides having the basics instructed through technology, students will be able to make a short test in which the results are promptly shown to the student. These test results will be observed by the teacher, making it obvious where the students have more difficulty with the economic notions or workings of the theory. The teacher can focus its instruction time on these manifested difficult notions and workings as well as openly discuss these notions and workings with the students and relate them to their working practice.
- *Time shortage to actively discuss and reflect on theory*
  By being able to focus on the more difficult subjects of the theory, to connect the theory to the professional working backgrounds and to the application in case studies the teachers can actively discuss and reflect on the theory. This means no standard format or answer can be given, but it should make students aware of the strengths and weaknesses of the theory and its' applicability.
- *Devotion of time due to assessment*
  FTF classroom time can be devoted to working on / discussing of / presenting the case studies to each other in separate groups or the whole class. Everybody can then reflect on these and learn from their comments to and from the other students, especially if they are all on similar subjects.

4. Blended learning and Government and economic policy

The introduction of blended learning has an impact on what the new course will look like, without abandoning the course goals. The number of classes will be four on micro-economics and three on macro-economics / public finance. The macro-economics / public finance part of the course will be slightly adjusted. The teacher chose not to reduce the compulsory literature, but to teach the same literature in fewer classes. Of course, the microeconomics part of the course will be majorly adjusted, which will be focused on in this section.

The assessment will remain split into two elements, i.e., a paper and presentation on a case study, and a written exam. Still, groups of three students will do one case study. The possible case studies are 1) maximum pricing for pre-masters at Dutch universities, 2) factory farming, 3) population decline (in rural areas), and 4) reduction of childcare allowance. The case studies will have to be analyzed from a micro-economic perspective covering the micro-economic course material, i.e., consumer behavior, producer behavior, markets, price elasticity, and welfare economics, of course always related to the public sector and

policy. The paper and presentation will count towards 50% of the final grade and the written exam for the remaining 50%. The exam will consist of 20 multiple choice questions (8 microeconomics and 12 public finance), and two open questions on macroeconomics / public finance, which in total add up to 50 points. The so-called BSKweb supports all courses at the MPA. This is a digital environment where we can communicate with students, put sheets, tasks, and other learning material online. Here we will provide the students a list of embedded short movies from www.Khanacademy.org and www.OSacademie.nl for instructions on the basic microeconomic notions and mechanisms. Also, a short quiz covering the material of the following class will be in the BSKweb (www.bskweb.nl). Students that do this quiz will get the correct answer, and the teacher will get the aggregate and thus sees how many percents answered which question (in)correctly. This provides input for the FTF class.

The four micro-economics classes will be roughly following the following structure:

Time	Topics
18.45 – 19.45	• Prepared instruction on specific difficult notions or mechanisms (due to missing explanation in movies or translation issues from English to Dutch) • Prepared (extra) explanation on experienced difficult notions and mechanisms based on quiz • On the fly (as student practices are not known upfront) discussions and illustrations of the notions and mechanisms related to students practices
20.00 – 21.00	• Groups are discussing the case study. Groups mingle over the different classes to be able to learn from different perspectives both theoretically and empirically • Teacher visits different groups to help structure the discussions
21.15 – 22.00	• General discussion and feedback on common problems and issues encountered in working on case studies • Analogous case study by teacher, i.e., HSR in the Netherlands

Both during group discussions as in the whole class discussions students will get ample opportunity to discuss their cases to get a better understanding of the micro-economic material they are applying to their case, i.e., they will get a better feeling on the working of the theory but also how theory helps to solve societal problems. The fifth class will be different, as the students will present their paper to the other groups with the same case study.

4.1 Assessment of results

Evaluation of the quality of the learning based on both FTF and online contexts and how the technology-mediated learning helps the FTF and vice versa may require adding new questionnaires to existing ones (see also Ginns & Ellis, 2007). Extra questions are added to the existing questionnaire using a Likert scale to get some idea of the students' impressions. The following questions have been added:

What is your opinion on (ranging from 'strongly disagree,' 'disagree,' 'neither agree nor disagree,' 'agree,' 'strongly agree':
1. For this part of the course, I had to work harder compared to the previous course
2. During this part of the course, I have learned to apply many microeconomic concepts
3. The movies on BSK-web have helped me preparing the classes
4. The discussion during class has helped me understand and apply the course material
5. The discussion of the case study in the second part of the class has helped me in my preparation for the final paper
6. The reflective discussions on the HSR-case during the third part of the classes have helped me understand how to apply the theoretical concepts to cases
7. Students could get a positive grade for the paper if they attended classes without preparation

The best insights whether blended learning helps in getting more critical reflective students is by observing how the students work with the theory, how they discuss it, how they apply it, and how they question and critique it. That is, it is successful if time is spent on reflexive exercises. Teacher observations are crucial for this evaluation. Blended learning will also be successful if students feel less anxious about the material, are better able to apply it to their real working experience and develop different insights on the same case studies even though applying the same theory. Results of this process will become visible through the student survey, the focus groups and discussions between students and the teacher

The implementation of blended learning may need fine-tuning during the course. The teacher asked a couple of students at the start of each class if they want to discuss with the teacher on what helps or blocks them in their learning process, both on cognition and reflection. It may be that certain elements in the course need more attention while less attention compared to other elements, or due to the movies being in English that more time needs to be devoted to the Dutch interpretation of words. An open dialogue with the students may help to make the pedagogical change to blended learning more successful. After each class, the teacher discussed and reflected with 4 to 5 different students on the short films, instructions, group discussions, the HSR-case reflection, and all other things that could pop up.

Lastly, a senior teaching trainer with a track record of doing surveys on deep learning vs. surface learning approaches has performed a double survey during the course. He asked the students in the first lecture after the micro-economics part, and he asked the same group of students at the last lecture before the exam (i.e., during the last public finance lecture) to fill out a questionnaire. The students were asked to give their opinion on the following questions, again based on a Likert scale ranging from 'completely disagree' to 'completely agree':

Approaches to Study Questionnaire:
1. I've often had trouble making sense of the things I have to remember.
2. I've been over the work I've done to check my reasoning and see that it makes sense.
3. I have usually set out to understand for myself the meaning of what we had to learn.
4. I have put a lot of effort into my studying.
5. Much of what I've learned seems no more than lots of unrelated bits and pieces in my mind.
6. In making sense of new ideas, I have often related them to practice or real-life contexts.
7. On the whole, I've been quite systematic and organized in my studying.
8. Ideas I've come across in my academic reading often set me off on long chains of thought.
9. I've looked at the evidence carefully to reach my conclusion about what I'm studying.
10. When I've been communicating ideas, I've thought about how well I've got my points across.
11. I've organized my study time carefully to make the best use of it.
12. It has been important for me to follow the argument, or to see the reasons behind things.
13. I've tended to take what we've been taught at face value without questioning it much.
14. I've tried to find better ways of tracking down relevant information on this subject.
15. Concentration has not usually been a problem for me unless I've been really tired.
16. In reading for this course, I've tried to find out for myself exactly what the author means.
17. I've just been going through the motions of studying without seeing where I'm going.
18. If I've not understood things well enough when studying, I've tried a different approach.

This questionnaire is based on a validated questionnaire of Richardson (2003; 2006) Richardson et al. (2005), Sun & Richardson (2012). The answers to these questions provide an overview of how students have a deep approach (questions 8, 9, 10, 12, 14 & 17), a surface approach (questions 1, 5, 6, 13 & 18), how they organized focused studying (questions 4, 7, 11, 15 & 16) and how they are in deep reasoning (questions 2 & 3).

5. Results

Overall the films are appreciated by the students. In the survey, the most common strong point of the course named by the students is the films, and then especially that they could watch these in their own time at their own pace. Quotes like “The films were helpful” or “The availability of the instruction films was excellent” prove this point.

It turned out that only half of the student population filled out the online quiz on Mondays and about 15% filled out the quizzes for the Wednesday lectures. This created a problem for the teacher not having a proper image of what the students understood or not. Hence, during this hour the teacher made and used an online quiz program, called Socrative (www.socrative.com), to test the knowledge of the students on the spot. The results per question are immediately shown in class. This created the opportunity to discuss in class what

the reasoning behind the wrong answers and of course the correct answer is. This helped the students in understanding certain micro-economic notions or mechanisms. The students backed this result during the reflection discussions after the lecture. However, this also showed a major problem, which was also addressed by many students in the reflection but also in the student survey; i.e., time issues. These boil down to: a) amount of material and films and b) time between classes.

Ad a) For each class students had to read the material, roughly about 60 pages each time. Then they watch about six films per class, each about 10 to 15 minutes. In the weekend students could cope with the amount of time needed. However, as some students said, the time to let the material sink in was too short. So they filled out the quiz after only reading and watching once. Or as one student said: "I filled out the quiz in the hope to recognize some of the material I had just read, instead of testing whether I understand it."
Ad b) As can be deducted from a) students do not have a lot of time to process the material. This was even worse considering that students arrive home on Monday evening at about 22.30 or later. The next days they have to work. This means that they only have the Tuesday evening to study the material and watch all the films and do the quiz. Most students indicated that this was impossible for them to perform. They were happy if they had completely read the material and sometimes could have watched a film, let alone take the quiz. In other words, the fact that the next class is on Wednesday evening gave them too little time to read, watch, process the material and take the quiz.

The questionnaire to show the difference between surface approach and deep learning approach encountered several problems. First of all, there were 42 students who filled out the course the first time the questionnaire was handed out, but the second time only 28 students were present. In other words, the data to base the difference of behavior on has to be based on 28 respondents. This *n* is quite low making it difficult to see whether the blended learning technique triggered different behavior by the students compared to the traditional teaching style during the public finance part of the course. Notwithstanding the small *n*, two things stand out: 1) the students showed deep reasoning during the micro-economics part dropping significantly during the public finance part.

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Deep Reasoning	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Deep Reasoning	Linear	11,655	1	11,655	12,045	,002	,301
Error	Linear	27,095	28	,968			

Also, students are more organized focused studying in the micro-economics part than in the public finance part. This may point in the direction that students are more focused on performing well in the micro-economics part and have less tendency to go for the higher grade in the public finance part of the course

(i.e., a strategic approach to studying, cf. Richardson, 2006). This can be related to the fact that in the first part students are explicitly taken along a path to reading, watch films and talk about it during lecture times, while in the second part of the course the teacher is instructing the material in class with less interaction and less demand of the students. In other words, the students could relax a bit more and learn whenever they wanted instead of being in a straitjacket.

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Organized Focused Studying	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Organized Focused Studying	Linear	1,335	1	1,335	8,849	,006	,240
Error	Linear	4,225	28	,151			

For the other two relations, no significant correlation can be deducted. Both relations do suggest that it may be (careful definition) that students adopt a more surface approach attitude in the second part and a more deep learning approach in the first. To be able to prove this possible relation *n* must be much larger. In other words, more students have to fill out both questionnaires in a similar setting to be able to test whether there is a correlation for Dutch mid-career students in the public administration master program at the Erasmus University Rotterdam.

5. Conclusion

In this paper, the possibilities of blended learning in the Government and Economic Policy course have been explored. Blended learning offers opportunities to make students study course material in another manner than only reading textbooks and getting frontal instruction lectures. That is, blended learning makes the student more accountable for his learning, i.e., they can autonomously and at their own pace study the basics by combining the textbook with explanatory movies on the internet. Students having different backgrounds both in working experience and economics training and thus different learning curves are better met, i.e., it will facilitate students that find the material difficult and it won't deter students that only need to refresh the material.

The internet quiz will both help the students in seeing their own 'weaknesses' in understanding the course material, and it will help the teacher in seeing the course material problems that the student population is dealing with and can focus FTF class time on these. However, as has become clear during the course students did not have enough time to let the material be digested to fill out the quiz. Also, there was not enough time between classes to be able to cope with all the material.

Due to having part of FTF class time transferred to technology-mediated activities part of the class time can now be devoted to discussing the material with the students to get them to reflect on the course material as well as on their working practice. This helped students get a better grasp on the material and their daily practice. However, the aim of using the diversity of backgrounds and applicability to make them more aware of shortcomings, the meaning of assumptions, et cetera, i.e., more reflection, turned out to be too much. As mentioned before, students didn't have enough time. A remark of one student makes this absolutely clear: 'I am trying to survive this period to get all things done demanded of me.' One of the lessons from this and the time above problems is that the whole MPA program has changed its lecture days from Monday and Wednesday to Monday and Thursday. For all courses, hence also for the economics course, this creates more time between the lecture giving students more time to study the material, but more importantly to process it and reflect on it. The students of the following cohort were asked if they can process and reflect on the material. The overall view is that it is quite some work to read the material, watch the movies but that most of them could reasonably well apply it to their case and own practice, but that critical discussion about the underlying assumptions was a bridge too far.

Even though blended learning created the conditions to use face-to-face classroom time more effectively for reflective working methods, there is no conclusive evidence that students are more reflective. More research and a larger population might reject the hypothesis that it may lead to more reflective students, but it may also corroborate it. No matter what the future may bring, from the survey and discussions with the students the interactive manner and the diversity in teaching methods were appreciated. E.g. "The interactive teaching through means of films, quizzes, and Socrative added to my understanding of the material."

6. References

Bliuc, A., Goodyear, P., & Ellis, R. A. (2007). Research focus and methodological choices in studies into students' experiences of blended learning in higher education. *The Internet and Higher Education, 10*(4), 231-244.

Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education, 7*(2), 95-105.

Graham, C. R. (2005). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk, & C. R. Graham (Eds.), *The handbook of blended learning: Global perspectives, local designs* (pp. 3-21) John Wiley & Sons, Inc.

Ginns, P., & Ellis, R. (2007). Quality in blended learning: Exploring the relationships between on-line and face-to-face teaching and learning. *The Internet and Higher Education, 10*(1), 53-64.

Heinze, A., & Procter, C. (2004). Reflections on the use of blended learning.

Kerres, M., & Witt, C. D. (2003). A didactical framework for the design of blended learning arrangements. *Journal of Educational Media, 28*(2-3), 101-113.

Marton, F., & Sälj R. (1976). On Qualitative Differences in Learning: I—Outcome and process. *British journal of educational psychology*, *46*(1), 4-11.

Meer, F.B. van der, Marks, P. K., Linde, C. v. d., & Fenger, M. (2013). Reflection and academic attitude: How to teach and learn it in initial bachelor and master programs in public administration?

Meer, F.B. van der, & Marks, P.K. (2013). Teaching and learning reflection in MPA programs towards a strategy. *Teaching Public Administration, 31*(1), 42-54.

Meer, F.B. van der, & Ringeling, A. (2010). An education strategy for practitioners in public administration master's programs. *Journal of Public Affairs Education*, 77-93.

Richardson, J.T.E. (2003). Approaches to studying and perceptions of academic quality in a short web-based course. *Britisch Journal of Education Technology, 34*(*4*), 433-442.

Richardson, J.T.E. (2006). Investigating the relationship between variations in students'perceptions of their academic environment and variations in study behavior in distance education. *Britisch Journal of Education Psychology, 76*, 867-893.

Richardson, J.T.E., Gambord, G. & Hammerberg, G. (2005). Perceived academic quality and approaches to studying at Danish schools of occupational therapy. *Scandinavian Journal of Occupational Therapy, 12*, 110-117.

Struyven, K., Dochy, F., Janssens, S., & Gielen, S. (2006). On the dynamics of students' approaches to learning: The effects of the teaching/learning environment. *Learning and Instruction, 16*(4), 279-294.

Sun, H. & Richardson, J.T.E. (2012).Perceptions of quality and approaches studying in higher education: a comparative study of Chinese and British postgraduate students at six British business schools. *Higher Education, 63*, 299-316.

Trigwell, K. (2010). Promoting effective student learning in higher education.

Copyright Disclaimer

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).