INTERNATIONAL JOURNAL FOR INNOVATION EDUCATION AND RESEARCH

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

INTERNATIONAL EDUCATIVE RESEARCH FOUNDATION AND PUBLISHER (IERFP)

Volume- 6 Number- 8

August 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

Edition: August 2018

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-6, ISSUE-8 of IJIER*** which is scheduled to be published on **31st August 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

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STRATEGIC ALIGNMENT: MANAGEMENT MODELS AND OTHER ORGANIZATIONAL POSSIBILITIES

Ilka Maria Escaliante Bianchini
Federal Institute of Sergipe
Federal University of Sergipe

Suzana Leitão Russo
Federal University of Sergipe

Robelius De Bortoli
Federal University of Sergipe

Liária Nunes da Silva
Federal Institute of Piauí
Federal University of Sergipe

José Augusto Andrade Filho
Federal Institute of Sergipe

Abstract

Strategic alignment is a term used since the 1940s, in recent decades it has also been used in the management area. The objective of this study was to analyze several approaches of different researchers on the strategic alignment concept and its use in companies. For this, a bibliometric research was carried out followed by bibliographical analysis, using the journal base Web Of Science. The bibliometric research provided parameters and systematized article selection related to the subject, as well as helped in organizing data. The bibliographic analysis allowed to identify strategic alignment concepts and its applications in the most diverse sectors and business situations and how they can be used by all types of companies today.

Keywords: Strategic alignment; Management; Models; Bibliometric analysis.

1. Introduction

In the last fifty years the world has had its economy globalized and technology and innovation in the productive means have become decisive factors in the survival of the companies. In order to stay alive in this increasingly competitive scenario, companies are looking to innovate and to be aware of market changes, as well as making decisions much faster and more frequently than before.

Strategic alignment is seen as a management model that seeks to align the organization's objectives with the objectives of the market. Sátyro et al. (2014) argue that strategic alignment occurs when the structure, considering all its aspects and strategies, must be aligned within an organization so that it can act coherently towards its objectives.

In this article the theme Strategic Alignment is seen through scientific articles and considered only in a conceptual way, in the sequence it is also seen through practices, mainly as how companies use strategic alignment as a management model or strategy and its impact on objectives and results of the organization. The objective of this study was initially to collect quantitative information on the subject, and then to identify and relate scientific articles with reports of application, results and techniques of management models geared towards strategic alignment with the various focuses of industry or services. For this, a bibliometric research was carried out in the Web of Science electronic database, with scientific articles in english, from 1940 to 2017, followed by a bibliographical analysis of the final selected articles.

It is considered that bibliometrics refers to publication or citation count found in scientific and academic publications (Coates et al., 2001). For Yoshida (2010, p.58) the focus of this method is on the number of times that certain terms appear in the publications or the number of publications containing the terms that are tracked. It identifies if the evolution of the subject in the academic environment allied to good management practices and research results will be used in doctoral thesis.

2. Strategic Alignment

A number of related terms or synonyms of strategic alignment have been related by Sátyro et al., (2014) in their research, being structure alignment, strategic contingency, strategic coalignment, adjustment strategic fit, strategic consistency, congruence model, and strategy alignment, all of which are terms for management. Focusing on Information Technology Henderson and Venkatraman (1993) were among the first to address strategic alignment and involve two dimensions of organizations: strategic adjustment and functional integration, with strategic adjustment recognizing the need to make choices that position the firm in a market, and also choose the best structure of the company's internal arrangements to achieve this strategic market positioning, in what they call a functional integration.

The contributions of Bergeron et al. (2004) in strategic alignment focus on the adjustment of understanding how organizations can translate their information technology (IT) deployment into real increases in performance. For these authors, organizations must adjust their IT structures and strategies. According to the authors, the notion of strategic alignment is that organizational performance is the consequence of the adjustment between two or more factors such as strategy, structure, technology, culture and environment, keeping the focus on IT.

Following the information technology research line, initiated with Henderson and Venkatraman (1993), a model of strategic alignment was created by Diaz (2011) to align economic development and sustainability in Peruvian cities in order to fill the gap in terms of objectives, competencies and culture among business and IT professionals. Diaz (2011) proposes a new framework to represent alignment so that multiple strategies and paths can be recognized, favoring dialogue and coordination, adapting the model to economic development and environmental sustainability.

Very close to information technology, Chenhall (2005) puts strategic alignment through the proposal of its Strategic Performance Measurement System - SPMS works on integrative information to help managers achieve positive strategic results. It proposes a system that encompasses three interrelated dimensions: the extent to which systems provide the integration between strategy and operations and the integration between elements of the value chain, the second attribute, customer orientation, and the third dimension, vendor orientation.

Strategic alignment is often used with focus on people or people management and leadership, Papke-Shields and Malhotra (2001) address the issue of whether or not the people involved in production are involved in the strategic planning and decision-making of the organization. For these authors the improvement of business performance is a strategic alignment between the direction of the organization, the executive sector and manufacturing operations. The authors consider that this is the alignment that really affects the performance of the business.

Combining elements of management as a motivation for mid-level managers, Decoene and Bruggeman (2006) work on strategic alignment focused on relationship, motivation and organizational performance in a balanced scorecard (BSC) - a comprehensive system of strategically aligned performance measures. Similarly, people-oriented management Souba (2001) works on leadership as a competitive advantage, pointing out that there are problems in dealing with change, responding to it rather than seeing it as an opportunity for professional and personal growth.

Another author who deals with the topic strategic alignment, people management and change, Beer (2005) states that to operate effectively, organizations need to align their environment, strategies, capabilities and leadership skills. To do this, it has developed an integrated and disciplined leadership platform that a senior management team can use to create an open conversation about adjusting your organization to strategy and the environment as well as your own leadership, allowing teams to conduct a systemic diagnosis of organizational problems based on valid data and identify the organizational and leadership barriers that prevent change.

Also considering strategic alignment and people management, and which organizations are formed by them, Kolehmainen (2010) argues that strategic alignment, job training and strategic performance measurement systems is a combination of management practices that may be required to achieve a business balance. Similarly, and addressing strategic alignment and organizational development, Joshi, Kathuria and Porth (2003) argue that the focus is on aligning organizational priorities, which is presumed to contribute, to improve performance, as well as misalignment is expected to undermine performance. For these authors, organizational performance should be part of the alignment, together with the performance of the organization as a whole, without the excessive focus on production or the financial sector.

With a different focus on strategic alignment and people management Cäker and Siverbo (2014) holistically address issues to explore the role and interaction between organizational structure, socio-ideological control, and confirms the essential role of people management in assurance strategic alignment. Decentralization and technocratic controls in a simultaneous process of supporting empowerment and monitoring of strategic alignment allow managers to follow in detail what happens at local levels. In the view of Cäker and Siverbo (2014), decentralization and empowerment have become important ideas in

contemporary management discourse.

Singh and Hu (2008) drew and organized the tacit knowledge of organizations at large events and thereby discovered major strategic alignment issues between the planning and marketing domains of destination, and proposed a conceptual system for future managers of major events. The authors describe alignment as a working partnership that reflects long-term commitment, a sense of mutual cooperation, sharing of risks and benefits.

They point out that strategic alignment is primarily concerned with inherently dynamic adjustments between the two domains of business, both internal and external, and with technology to improve organizational performance. For these authors, the concept of strategic alignment can help in understanding the nature and patterns of inter-relationships between the destination and organization marketing domains, recognizing the need for any strategy of considering external and internal environments.

Some authors work on strategic alignment in service organizations such as Schneider et al. (2003) and Silvestro and Silvestro (2003), which address the concept of alignment in service organizations and how the service strategy looks, how they feel the employees, the human side of the strategy being treated as important components of the strategy. The authors seek strategic alignment in services through an analysis of the service concept itself, the operational objectives, the design of systems and characteristics and variety in companies that provide services.

3. Methodological procedures

A bibliometric survey was carried out through a database of previously selected scientific journals. It was used the term Strategic Alignment for the survey and to verify how it has been applied in organizations. The chosen journal base was the Web of Science, since it contemplates collections in the human and social areas.

Access was through the portal of the Commission for the Improvement of Higher Education Personnel - CAPES, through a subscription of Thomson Reuters Scientific, the database allowed a bibliometric survey of the subject, as it covers approximately 12,000 periodicals, with the possibility of consultation with 5 Science Citation Index Expanded (SCI-EXPANDED), Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index (A & HCI), Conference Proceedings Citation Index Science (CPCI-S and Conference Proceedings Citation Index - Social Science & Humanities (CPCI-SSH), the availability of access varies from 1945 to the present.

The technological prospection was carried out between the last half of May and the first half of June 2017 and used as a search strategy the insertion of keywords in Portuguese and English in the fields related to the "Title" and "Topic" of said database. The research began with the search for the term strategic alignment in the title in Portuguese and then in the topic and in both cases nothing was found in the base of periodicals. By using the English term strategic aligmenmt in the title were found 258 articles in Web of Science with date of publication from 1990 to 2017, being this the universe of the research.

From this raw database, we began the necessary filtering, which consists in the selection of the available articles, with more relation with the topic of research and of significant relevance. Next, other necessary filters were applied to reach the final bibliographic portfolio.

The first filter used was applied to the raw articles database with 258 initially selected. The articles were categorized, excluding articles related to non-research areas, such as: geology, information technology, agronomy, engineering, applied psychology, biology, biotechnology, telecommunications, sports, chemistry, geography , automation, pharmacology and medicine. After the application of this filter, 189 articles were excluded, only the work on business, management, planning, education, work psychology, public management, humanities, economics and social sciences. Although linked to other themes, the main focus of the articles sought was management, considered more adequate to the need and objective of the work. This filter resulted in 96 articles, with publication dates ranging from 1992 to 2017.

Table 1: First filter - Search category axes

AXLE OF CATEGORIES	
Geology, Information Technology, Agronomy, Engineering, Applied Psychology, Biology, Biotechnology, Telecommunications, Sports, Chemistry, Geography, Automation, Pharmacology, Medicine	Business, Management, Planning, Education, Work Psychology, Public Management, Humanities, Economics, Social Sciences
189	96

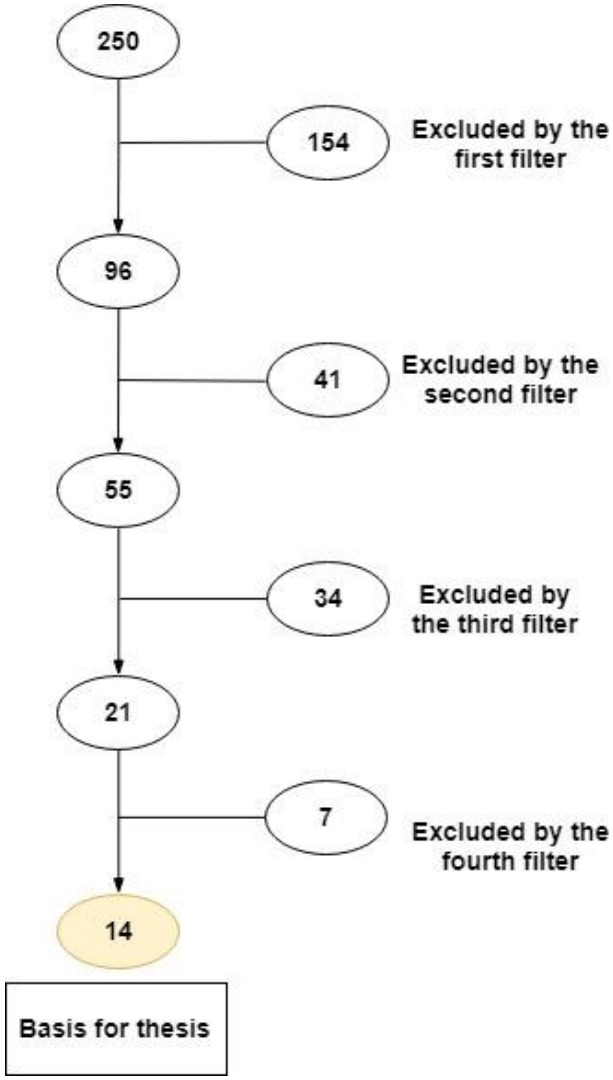
Source: Result of the research (2017), prepared by the authors.

The second filter was the removal and deletion of book files and event summaries. This filter was necessary, because only scientific articles were sought, and not all fit within this publication model. The result of this filter was the exclusion of 41 files that did not fit the search, resulting in 55 articles. Of the 55 resulting articles, the periodic impact factor was investigated.

The third filter applied was in relation to the availability of articles for reading. It was necessary to verify their availability, that is, if the documents whose access is necessary does not require acquisition and is free of fees or affiliations. In this filter articles were excluded without access to the full text of the editor or editorial material, deriving now in 21 articles.

In the final step of the process, from these 21 preselected articles, it was still applied a fourth filter, the files that were repeated, did not approach or had no relation with the area of interest of the work were observed and after a thorough reading of the articles verified, it was pointed out that only 14 articles were effectively relevant to the area of management and to the topic investigated, with publication date from 2001 to 2016. After the bibliometric survey, the results were tabulated and analyzed, a bibliographic evaluation was performed, generating statistical data that show the evolution of the publication of the articles with the analyzed topic, as well as a scale of periodicals that publish them. This research is also characterized as an exploratory research, seeking a greater familiarity with the theme of strategic alignment in organizations.

Figure 1: Methodological flow of selection of Articles on Strategic Alignment



Source: Prepared by the authors

4. Results and discussions

It was identified that strategic alignment can be understood as the ordering of the internal structures of the company as its procedural, human, organizational, information, structure, financial, among others systems in order to facilitate the achievement of organization's objectives, or the business strategy, focusing on the market where it is inserted.

Among the selected articles, we can see a diversity of approaches and application of management models and strategic alignment, also using organizations of different sizes, foci and structures. The approaches range from people, structure and market, going through leadership, motivation, productivity, production, competition, marketing, among others.

It was noticed through the search in the article database that the theme strategic alignment is approached since 1940, initially focusing on information technology, but starting in the 1990's the management area also started to use the theme, as well as several other areas and organizational situations, covering organizations in all their aspects and sectors. Production evolved according to Table 2.

Table 2: Number of articles produced with strategic alignment in the title.

Período	Number of articles	Cumulative total
1990 - 1995	05	05
1996 - 2000	06	11
2001 - 2005	11	22
2006 - 2010	22	44
2011 - 2015	40	84
2016 - 2017	12	96

Source: Web of Science database. Prepared by the authors.

The impact factor of the journals that published the articles ranged from 0.12 to 6.360. There is still a greater number of articles published in journals with impact factor between 0 and 1.99. However, it was observed that the subject has become relevant for many authors, also arousing the interest of researchers and journals of greater impact, not only with a focus on management, but also other segments.

Table 3: Impact Factor Table of Periodicals with Articles with strategic alignment in the title.

Order	Periodicals	Impact Factor
1	STRATEGIC MANAGEMENT JOURNAL	6,36
2	JOURNAL OF INTERNATIONAL BUSINESS STUDIES	6,04
3	JOURNAL OF ORGANIZATIONAL BEHAVIOR	5,87
4	JOURNAL OF OPERATIONS MANAGEMENT	5,67
5	INTERNATIONAL JOURNAL OF INFORMATION MANAGEMENT	5,36
6	LONG RANGE PLANNING	4,74
7	TOURISM MANGEMENT	4,70
8	JOURNAL OF INTELLECTUAL CAPITAL	4,57
9	INFORMATION SYSTEMS RESEARCH	4,45
10	JOURNAL OF SUPPLY CHAIN MANAGEMENT	4,29
11	GOVERNMENT INFORMATION QUARTERLY	4,04
12	ACCOUNTING ORGANIZATIONS AND SOCIETY	3,94
13	STRATEGIC ORGANIZATION	3,71
14	JOURNAL OF MARKETING RESEARCH	3,37
15	INTERNATIONAL JOURNAL OF OPERATIONS & PRODUCTION MANAGEMENT	3,33
16	MIT PRESS	2,52
17	JOURNAL OF EXPERIMENTAL PSYCHOLOGY-HUMAN PERCEPTION AND PERFORMANCE	2,28
18	PROJECT MANAGEMENT JOURNAL	2,28
19	PUBLIC ADMINISTRATION	2,26

20	CALIFORNIA MANAGEMENT REVIEW	2,25
21	FUTURES	1,80
22	SCANDINAVIAN JOURNAL OF MANAGEMENT	1,74
23	MIS QUARTERLY EXECUTIVE	1,60
24	JOURNAL OF BUSINESS & INDUSTRIAL MARKETING	1,59
25	SERVICE INDUSTRIES JOURNAL	1,36
26	INFORMATION TECHNOLOGY & MANAGEMENT	1,19
27	INTERNATIONAL INTERACTIONS	1,16
28	EUROPEAN JOURNAL OF MARKETING	1,14
29	SUSTAINABILITY ACCOUNTING MANAGEMENT AND POLICY JOURNAL	1,14
30	JOURNAL OF MODELLING IN MANAGEMENT	1,03
31	ORGANIZATIONAL DYNAMICS	0,99
32	DECISION SCIENCES	0,92
33	AUSTRALASIAN JOURNAL OF EARLY CHILDHOOD	0,82
34	ASIAN JOURNAL OF TECHNOLOGY INNOVATION	0,70
35	IBM SYSTEMS JOURNAL	0,68
36	R & D MANAGEMENT	0,67
37	INFORMATION RESOURCES MANAGEMENT JOURNAL	0,64
38	JOURNAL OF GLOBAL INFORMATION MANAGEMENT	0,63
39	CANADIAN JOURNAL OF ADMINISTRATIVE SCIENCES-REVUE CANADIENNE DES SCIENCES DE L ADMINISTRATION	0,45
40	ACADEMIA-REVISTA LATINOAMERICANA DE ADMINISTRACION	0,41
41	SOUTHEAST EUROPEAN AND BLACK SEA STUDIES	0,40
42	WORLD JOURNAL OF ENTREPRENEURSHIP MANAGEMENT AND SUSTAINABLE DEVELOPMENT	0,36
43	PACIFIC AFFAIRS	0,16
44	REFERENCE & USER SERVICES QUARTERLY	0,16
45	ACTUAL PROBLEMS OF ECONOMICS	0,12

Source: Web of Science database. Prepared by the authors.

To better study and visualize the relationship between journals and the impact factor, intervals were established to collect and to demonstrate the number of journals and their referred impact factor. This led to a distribution in categories. It was noticed a much larger number of journals with an impact factor varying from 0 to 1.9 representing more than 55% of the totality. About 40% range from 2 to 5.9 and about 4% above 6.

Table 4: Periodical Percentage and impact factor table.

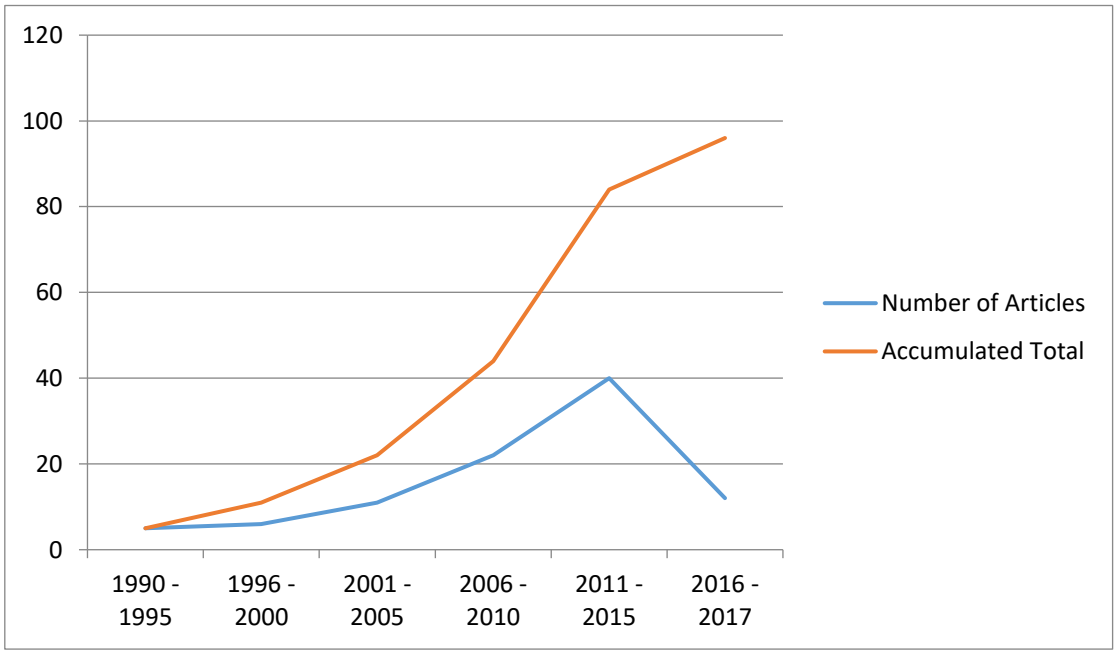
Number of journals versus impact factor	Amount	%
From 0,0 to 1,9	25	55,56%
From 2,0 to 3,9	9	20,00%
From 4,00 to 5,9	9	20,00%
Over 6,0	2	4,44%
Total	**45**	**100%**

Source: Web of Science database. Prepared by the authors.

As the term Strategic Alignment aimed at management is a relatively new subject and the impact factor is related to the number of citations, the fact that 40% of journals fit into journals with impact factor between 2 and 5.9 show that interest in the subject is growing. Likewise, even though only 4% of journals have an impact factor above 6, this may be a very relevant number for such a recent topic.

It was noticed an increase in the number of publications, mainly from 2001, after the publication of two articles on Strategic Alignment in journals with greater impact factor, such as the Journal of Operations Management and Strategic Management Journal, being the article by Papke-Shields and Malhotra (2001), selected for the bibliographic portfolio, one of those published in this journal.

Figure 2: Number of articles produced on Strategic Alignment



Source: Web of Science database. Prepared by the authors.

At the end of the selection of the articles considered most relevant to the research, and after the various filters already mentioned, one can notice the diversity of subjects related to the strategic alignment topic. Journals with a focus on engineering, planning, tourism, technology, medicine, production, management, among others, have published articles on the theme in line with the transversality of other areas.

In relation to the number of citations of the authors selected in the portfolio and analysed based on Google Scholar results, it was identified that the article of Information Technology of Henderson and Venkatraman (1993) was the most cited. As previously mentioned, these authors were one of the first to approach the term strategic alignment, being cited and used as a model to date.

Table 5: Bibliographic portfolio on citation evaluation

	AUTHOR	TITLE	JOURNAL	YEAR	QUOTES
1	HENDERSON, J. C.; VENKATRAMAN, H.	Strategic alignment: Leveraging information technology for transforming organizations	*IBM systems journal*	1993	4795
2	CHENHALL, R. H.	Integrative strategic performance measurement systems, strategic alignment of manufacturing, learning and strategic outcomes: an exploratory study	*Accounting, Organizations and Society*	2005	1006
3	BERGERON, F.; RAYMOND, L.; RIVARD, S.	Ideal patterns of strategic alignment and business performance	*Information Tecnology & management*	2004	575
4	BEER, M. *et al*	Strategic management as organizational learning: Developing fit and alignment through a disciplined process	*Long Range Planning*	2005	278
5	JOSHI, M. P.; KATHURIA, R.; PORTH, S. J.	Alignment of strategic priorities and performance: an integration of operations and strategic management perspectives	*Journal of Operations Management*	2003	272
6	PAPKE-SHIELDS, K. E.; MALHOTRA, M. K.	Assessing the impact of the manufacturing executive's role on business performance through strategic alignment.	*Journal of Operations Management*	2001	149
7	DECOENE, V.; BRUGGEMAN, W.	Strategic alignment and middle-level managers' motivation in a balanced scorecard setting	*International Journal of Operations & Production Management*	2006	137
8	SINGH, N.; HU, C.	Understanding strategic alignment for destination marketing and the 2004 Athens Olympic Games: Implications from extracted tacit knowledge	*Tourism*	2008	86
9	SCHNEIDER, B. *et al*	The Human Side of Strategy: Employee Experiences of Strategic Alignment in a Service Organization	*Organizational Dynamics*	2003	76
10	KOLEHMAINEN, K.	Dynamic strategic performance measurement systems: balancing empowerment and alignment.	*Long Range Planning*	2010	64
11	SILVESTRO, R.; SILVESTRO, C.	New service design in the NHS: an evaluation of the strategic alignment of NHS Direct	*International Journal of Operations & Production Management*	2003	39
12	CÄKER, M.; SIVERBO, S.	Strategic alignment in decentralized organizations–The case of Svenska Handelsbanken	*Scandinavian Journal of Management*	2014	21
13	SOUBA, W. W.	Leadership and strategic alignment—Getting people on board and engaged	*Journal of Surgical Research*	2001	15

14	DIAZ, R. A.	Planning for sustainable development: Strategic alignment in Peruvian regions and cities	*Futures*	2011	3

Source: Web of Science database. Prepared by the authors.

Of the 14 effectively selected articles that directly address the strategic issue alignment under the management focus we can report that focus ranges from alignment of business performance, people, technology, motivation, planning, leadership, performance measurement, service analysis medical, sustainable development, organizational structure, service alignment and commitment.

A survey of the key words was carried out in the 14 selected articles and approximately 160 keywords were identified. Some terms are repeated, but the diversity of subjects involving strategic alignment, management and the many business sectors are present.

Figure 3: Keyword cloud of selected articles.

Source: Web of Science database. Prepared by the authors.

5. Final considerations

Considering the subjectivity and necessity of each author, the systematization of the documents contributes to simplify the research. The data organization allows the systematic visualization, facilitating searches, generating gains besides saving time. One element that this study had enabled was the survey of the keywords used in the portfolio articles, showing the diversity of relationships between the central theme and other areas.

From the obtained results, authors with more prominence were identified, being considered of extreme

relevance the reading of them and initial reference for the research in the area. Distinguishing the journals that publish the most on the subject of research shows paths for future publications, in addition, it also indicates the current relevance and the different relationships and lines being researched.

It is worth noting that strategic alignment is used both as a model and to evaluate product and service situations as the standard for decision-making and planning. The various authors use the term both to explain situations and problems and to suggest corrective actions and improvements in processes and products.

Management models can help understanding and solving problems and challenges that managers face every day. Strategic alignment is flexible enough to be used in different situations, with different types and sizes of organizations, whether public or private, but the great diversity of types and forms can confuse users and no single model guarantees efficiency and total effectiveness in their functions, but serve as a guide to business choices.

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Evaluation of the Quality of Learning Objects in the Health Care Area: Evidence of Validity and Internal

CAROLINA STURM TRINDADE, Sérgio Kakuta Kato, Otavio Pereira Davila, Ana Célia da Silva Siqueira, Roberto Nunes Umpierre, Ana Paula Borngraber Correa, Alessandra Dahmer, Caroline Tozzi Reppold

Federal University of Health Sciences of Porto Alegre (UFCSPA- Universidade Federal de Ciências da Saúde de Porto Alegre

Brazil

Abstract

In Brazil, distance education plays an important role in the training of human resources in the health area. In this context, learning objects, understood as modular digital resources used to support learning, are widely used tools in the process of knowledge construction, although not all are valid resources. To date, the literature does not have a specific instrument in Portuguese to evaluate the quality of learning objects in the health area. In order to fill this gap, this paper describes the search for evidence of validity of internal structure and convergent validity of Equalis-OAS: Scale to evaluate the quality of learning objects in the health area. For the study, Equalis-OAS was applied to professionals and undergraduate students from the different areas of Health Sciences, all participants taking a continuing education health course about Food and Nutrition in Primary Health Care. One thousand and sixty-nine volunteers participated in the study. An Exploratory Factor Analysis revealed that the instrument, which has as its construct "Quality of learning objects for the health area", covers three dimensions: "Intrinsic Concepts of Learning Objects in the Health Area", "Educational Characteristics" and "Presentation". The final instrument consisted of 41 items, which explained 66.8% of the total variance of the scores. The scale had excellent internal consistency indexes (overall scale: α = 0.979; "Intrinsic Concepts of Learning Objects": α = 0.927; "Educational": α = 0.947; "Presentation": α = 0.977). Regarding convergent validation, Pearson's correlation indicated that Equalis-OAS had a moderate correlation (r=0.59, p<0.01) with LORI version 2.0, translated into Portuguese, an instrument for the evaluation of learning objects in general (i.e., not specific to the health area). These results indicate that Equalis-OAS is an instrument that presents good evidence of validity, indicating its use in the context of health education and research.

Keywords: Teaching Materials; Distance Education; Health Education; Validation Studies; Psychometrics.

1. Introduction

Continuing Education refers to the acquisition, strengthening and maintenance of knowledge, skills and attitudes of professionals. In the field of health, it has a great importance in updating work practices,

enabling the training of professionals in order to face real demands that are renewed every day, incorporating knowledge and experiences based on reality and, ultimately, the transformation of professional practices and of the organization of work in the health area (Brasil, 2007).

One of the most widely used resources for Continuing Education in health are distance education practices (Tomaz, Mariano, Fonseca, Cavalcante and Nogueira, 2004; Silva, Santos, Cortez and Cordeiro, 2015; França, Rabelo, Oliveira, Dahmer, Pinto and Tubelo, 2016). A number of experiences at the national and international levels have demonstrated the validity of the use of this teaching strategy to promote initial and professional training (Laraia, et al., 2008; Viguier et al., 2015; Reeves, Fletcher, McLoughlin, Yim and Patel, 2017; Mattos, Dahmer and Magalháes, 2015; Oliveira et al., 2015; Cunha et al., 2016; Dahmer, Tubelo, Pinheiro, Costa and Pinto, 2016; Harzheim et al., 2016; Cezar, Costa and Magalhães, 2017). In this context, the use of Learning Objects (LO) is an important strategy and tool to help the construction of knowledge in Distance Education.

Learning objects (LO) are elements of a new type of structuring of teaching, based on the computer and on the internet, founded on the paradigm of object orientation, originating from Computer Science. One of the first definitions for LO came from the Learning Technology Standards Committee (LTSC) of the Institute of Electrical and Electronics Engineers (IEEE), which describes that "a learning object is as any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning" (IEEE, LTSC, 2007). LO may be understood as small educational components, "self-sufficient", or as "block-cells", which may be combined with each other, forming, thus, new educational objects. They may be used an indefinite number of times, by several people and in different circumstances, in order to support learning. This segmentation characteristic of LO makes it possible to use it in different learning contexts, such as face-to-face classes, online courses, computer-based training, tutorial development, lesson topics, courses, assessments, and more. LO may be presented in different forms - exercise, simulations, sounds, videos, questionnaire, diagram, figure, plot, textual narration, wording of a question, etc. - in order to promote learning activities for a student or a group of students (Wiley, 2000; Rozados, 2009; Munhoz, 2013).

However, in order to be effective, learning objects need to present evidence of quality and relevance, which involves a complex evaluation process that considers, among other aspects, the content addressed, storage and retrieval strategies (Amador, Arteaga and Rodriguez, 2007), in addition to user characteristics, pedagogical aspects and aspects of the context in which these objects were produced (Gonzáles, Artega and Rodrigues 2007; Campos, Martins and Nunes, 2008; Reategui, Boff and Finco, 2010). The researches that offer criteria to evaluate the quality of LO available on the internet are still incipient (Vargo, Nesbir, Belfer and Archambault, 2003; Gama, 2007; Kay and Knaack, 2007; Blake, 2010), and in the health area the same occurs (Krauss and Ally, 2005). Thus, one of the main challenges in evaluation is to obtain accurate, reliable and valid measurements (Coluci, Alexandre and Milani, 2015), which may be possible through the use of psychometric techniques. This is an area of Psychology that assumes postulates of the theory of scientific measurement and establishes technical norms for the construction and validation of assessment instruments (Pasquali, 2009).

With the above in mind, considering the existence of a high number of LO evaluation tools developed and

validated inappropriately or not validated (Coluci, Alexandre and Milani, 2015; Trindade, Dahmer and Reppold, 2014), this article presents a study to find evidence of validity of internal structure and convergent validity of Equalis-OAS (Scale to evaluate the quality of learning objects in the health area). In previous research, the scale presented evidence of content validity and positive evidence for validation of internal structure in a pilot sample (Trindade, 2016).

2. Method

The present study obtained a favorable opinion from the Research Ethics Committee of a Brazilian university specialized in the health area - Federal University of Health Sciences of Porto Alegre (CEP-UFCSPA, under identification CAAE 70497317.6.0000.5345 and opinion 2.316.097). All individuals who were invited to collaborate voluntarily with the research received the Informed Consent Term (ICT) of the study, being guaranteed the anonymity of the answers and the possibility of quitting participating in the study without any onus.

2.1 About the population

The study involved a population represented by a convenience sample, formed by professionals with higher education, working in Primary Health Care (PHC) and/ or undergraduate students from the various areas of Health Sciences, all participants in a lifelong learning course conducted in the distance modality on Food and Nutrition in PHC, proposed by the Nucleus of Technical-Scientific Telehealth of Rio Grande do Sul (TelessaúdeRS-UFRGS), in 2017. Data from the 1069 students who accepted to participate in the study show that 84% had already undertaken distance education, 92% were female, with an average age of 30 years old and a standard deviation of 8.23 (minimum age of 17 and maximum age of 65), the training area was: Nutrition (72%); Nursing (10%); Medicine (6%); Dentistry (3%); Pharmacy (2%); others (7% - Physical Education, Physical Therapy, Psychology, Social Work, Biomedicine). Of these, 51% had completed at least one specialization course, 8% were masters and 2% were doctors.

2.2 About the course Food and Nutrition in PHC

The distance learning course of Nutrition in PHC aims to contribute to the qualification of the feeding guidelines provided in the scope of PHC, offering strategies for the management of feeding in response to the most frequent demands in PHC. It aims at informing and updating the PHC professionals about the care and general guidelines of feeding and nutrition that constitute routine situations in the PHC, based on the best scientific evidence available. At the end of the course, participants are expected to feel more confident in providing feeding guidelines based on current literature. The course is self-instructional and was planned in order that the content is self-explanatory. In this format, no tutors were present. With a total of 60 hours schedule, it was composed of 12 units, described as follows: (a) a setting unit, with course syllabus, tutorial for Moodle TelessaúdeRS use, presentation video, register, news forum and pretest. (b) ten units, which are available on a weekly basis (1- Encouraging healthy eating; 2- Myths and truths about feeding and nutrition; 3- Maternal and child nutrition; 4- Food allergies and intolerance; 5- Dietary care and guidelines: obesity;

6- Dietary care and guidelines: diabetes; 7- Dietary care and guidelines: hypertension; 8- Dietary care and guidelines: chronic kidney disease; 9- Dietary care and guidelines: eating disorders; 10- Dietary care and guidelines: home enteral nutrition therapy). These units included mandatory activities - texts, videos and questionnaires - and complementary activities - such as games, quizzes, and supplementary readings. Finally, there was a unit of final evaluation and course satisfaction.

2.3 About the Scales

Those students who agreed to collaborate with the research had access to an online questionnaire divided into 4 parts: (1) presentation of the research; (2) demographic profile characterization questions; (3) Equalis-OAS and (4) LORI (Nesbit, Belfer and Leacock, 2009). The evaluated learning object corresponded to the unit referring to home enteral nutrition therapy.

Regarding Equalis-OAS, a study conducted by Trindade (2016) describes the process of developing the instrument and the initial results of the process of searching evidence of it. According to these evidences, the scale consists of 41 items, which contemplate three dimensions: Concepts Intrinsic to LO (11 items); Educational (13 items); Presentation (17 items), answered by an ordinal 5-point Likert scale. For each item, the respondent should indicate one of the following response options: “totally disagree”, “disagree”, “neither agree nor disagree”, “agree” or “totally agree” (Trindade, 2016).

The Lori instrument was created to assist users in the choice of learning objects made available on the internet. It has eight aspects: 1) content quality; 2) learning goals alignment; 3) feedback and adaptation; 4) motivation; 5) presentation design; 6) interaction usability; 7) accessibility; 8) standards compliance. For each item, the quality is evaluated on a scale ranging from 1 to 5, in which: 1 indicates low (the evaluated learning object has little or none of the described characteristics); 5 indicates high (the evaluated learning object strongly presents the described characteristics). It also has the option “not applicable” if the reviewer deems it unfit to perform the evaluation (Nesbit, Belfer and Leacock, 2009).

2.4 Psychometric analyses

The online database was exported to the Excel format, where it was adapted for further analysis using the statistical software package SPSS (Statistical Package for the Social Sciences) version 24.0.

The search for evidence of internal structure validity was performed through Exploratory Factor Analysis (EFA), using extraction by main components with Varimax Rotation to the Equali-OAS items. By means of this statistical test, the objective is to identify if the items present statistical relevance in relation to the evaluated construct. To evaluate the accuracy of the instrument, the Cronbach’s Alpha Coefficient was used, which is a statistical tool that reflects the level of covariance among the items, thus serving as an indicator of the instrument’s internal consistency (Pasquali, 2003). In order to evaluate the convergent validity of Equalis-OAS, the scores obtained from this instrument were correlated, using the Pearson’s Correlation with LORI scores (Nesbit, Belfer and Leacock, 2009), a correlated and validated instrument for local context, which evaluates learning objects developed for general use, not specific to the health area.

3. Results

3.1 Evidence of internal structure validity

For the 41 items of Equalis-OAS, the Exploratory Factor Analysis was carried out with a reduction for 3 factors, through the extraction by Principal Component Analysis and Varimax rotation with Kaiser normalization. The Rotation converged in six interactions. They were retained in the analyzes with factors with eigenvalue higher than 1. Table 1 shows the explained variation of the instrument, specifying the values of each factor and of an accumulated form. In Table 2, the items that compose each factor and their respective factor loadings are presented.

Table 1: Total explained variation

Component*	Total	Percentage of total explained variation	Accumulated percentage of total explained variation
1	12.119	29.56	29.56
2	7.750	18.90	48.46
3	7.537	18.38	66.84

*Component 1: Presentation (17 items); Component 2: Educational (13 items); Component 3: Concepts Intrinsic to LO (11 items).

Table 2: Distribution of items by factor with their respective loadings

Item number	Item description (of Equalis-OAS)	Factor		
		1	2	3
41	Apresenta título claro que se relacione com o tema.	0,791		
34	A estrutura do texto apresenta organização do conteúdo de forma lógica e ordem compreensível.	0,790		
36	A quantidade de texto (conteúdo) apresentada por tela está adequada.	0,784		
40	Há identificação clara de títulos, cabeçalhos e colunas.	0,771		
33	A estrutura do texto apresenta identificação de cabeçalhos, e outros elementos estruturais.	0,770		
32	O texto utiliza uma linguagem em estilo de escrita e terminologia condizente com o nível do conteúdo.	0,770		
30	O texto utiliza uma linguagem concisa e direta.	0,765		
35	A estrutura do texto apresenta hierarquia de tópicos e enumeração.	0,752		
29	O texto utiliza uma linguagem clara e simples.	0,745		
27	A relação entre nomes e siglas dos comandos e suas funções está adequada.	0,740		
37	O uso de imagens estáticas, tais como fotos, diagramas,	0,723		

	tabelas, gráficos e botões, de um modo geral, está contextualizado e adequado.			
26	A relação entre ícone (desenhos, setas) e sua função está adequada.	0,714		
31	O texto utiliza uma linguagem pontuada adequadamente, para a percepção dos leitores de tela.	0,711		
28	Existe um padrão com relação aos comandos utilizados nas telas.	0,698		
25	As instruções apresentadas estão compreensíveis.	0,698		
38	O uso de áudio, de um modo geral, está adequado.	0,652		
39	O uso de vídeos ou animações, de um modo geral, está adequado.	0,647		
20	O conteúdo apresentado é suficiente para permitir que o público-alvo atinja os objetivos propostos.		0,750	
21	As atividades e/ou avaliações incluídas no objeto de aprendizagem são suficientes para permitir que o público-alvo atinja os objetivos propostos.		0,738	
22	As atividades propostas pelo objeto de aprendizagem são diversificadas.		0,711	
15	O conteúdo do objeto de aprendizagem enfatiza os pontos-chaves, com nível de detalhe adequado		0,707	
18	Os objetivos educacionais propostos no objeto de aprendizagem estão adequados ao público-alvo.		0,658	
19	As atividades e/ou avaliações propostas/fornecidas pelo objeto de aprendizagem estão em consonância com o objetivo apresentado.		0,655	
14	conteúdo do objeto de aprendizagem está atualizado.		0,607	
24	O uso do objeto de aprendizagem pelos estudantes/profissionais da saúde estimula o aprendizado de novos conceitos.		0,602	
23	As mensagens emitidas pelo objeto de aprendizagem apresentam uma linguagem apropriada ao público-alvo.		0,592	
16	O conteúdo do objeto de aprendizagem respeita as diferenças de grupos culturais e étnicas.		0,589	
13	O conteúdo do objeto de aprendizagem é apoiado por evidências científicas.		0,588	
17	Os objetivos educacionais são facilmente identificados no objeto de aprendizagem.		0,561	
12	O conteúdo do objeto de aprendizagem não induz ao erro.		0,530	
7	O programa necessário para acessar/utilizar o objeto é facilmente identificado.			0,738
5	O nome dado ao objeto de aprendizagem está facilmente identificado no catálogo.			0,734
6	Os pré-requisitos para a utilização do objeto de			0,719

	aprendizagem são facilmente identificados em seu catálogo.			
8	O público-alvo do objeto de aprendizagem está facilmente identificado no catálogo.			0,688
9	O catálogo descreve o tipo de recurso que caracteriza o objeto de aprendizagem (Animação, Áudio, Imagem, Material Interativo, Material Multimídia, Slide/Apresentação, Texto, Vídeo).			0,684
11	As palavras-chaves que constam no catálogo do objeto de aprendizagem são encontradas em dicionários/glossários da área da saúde.			0,672
10	A descrição textual do conteúdo do objeto de aprendizagem está condizente com o conteúdo apresentado.			0,672
3	Recomendaria a utilização do objeto de aprendizagem em outro curso/disciplina/lição da área da saúde.			0,623
4	Recomendaria a utilização do objeto de aprendizagem a outro profissional de saúde.			0,613
1	O objeto de aprendizagem pode ser utilizado, sem prejuízo de suas funcionalidades, em vários hardwares, sistemas operacionais e navegadores de internet.			0,603
2	O objeto de aprendizagem pode ser reutilizado por várias vezes em diversos ambientes virtuais de aprendizagem, sem necessidade de modificação.			0,518

3.2 Precision Measurement Test

The level of internal consistency was evaluated by the Cronbach's Alpha coefficient. The total instrument obtained an alpha value of 0.980, being considered excellent (Maroco et al., 2006). Table 3 shows Cronbach's Alpha values for each extracted component, as well as the means, standard deviation and values corresponding to 25, 50 and 75 percentiles.

Table 3– Distribution of internal consistency by dimension

Dimension	No. of items	Alpha (α)	Mean	Standard deviation	Percentile 25	Percentile 50	Percentile 75
1	17	0.977	4.45	0.52	4.00	4.47	5.00
2	13	0.947	4.33	0.54	4.00	4.23	4.47
3	11	0.927	4.44	0.50	4.00	4.45	5.00
Total	41	0.980	4.41	0.48	4.00	4.41	4.90

*Component 1: Presentation (17 items); Component 2: Educational (13 items); Component 3: Concepts Intrinsic to Learning Objects (11 items).

3.3 Convergent validation

As a form of evaluating the validity based on external variables, a simultaneous application of Equalis-OAS and LORI was performed, an instrument for the evaluation of learning objects. The results, which

demonstrate evidence of convergent validity, are presented in Table 4.

Table 4: Correlations between results of LORI and Equalis-OAS

	LORI	Equalis-OAS – overall score	Equalis-OAS – Factor 1	Equalis-OAS – Factor 2
Equalis-OAS – overall score	0.590*	-		
Equalis-OAS – Factor 1	0.571*	0.887*	-	
Equalis-OAS – Factor 2	0.584*	0.928*	0.758*	-
Equalis-OAS – Factor 3	0.533*	0.945*	0.756*	0.809*

5. Discussion and Conclusion

The present research was originated from the observation of the fragility generally observed in the processes of evaluation of didactic resources used for teaching in the health area in Brazil, especially with regard to learning objects used in lifelong learning in the distance modality. In order to provide an instrument with evidence of validity based on the precepts of Psychometrics, this study was developed to investigate evidence of validity based on the internal structure and on the external variable of Equalis-OAS, a Portuguese-language scale created by Trindade (Trindade, 2016) to measure the quality of learning objects in the health area.

The population that participates in the process of searching for evidence of validity of Equalis-OAS differs from some validation studies for evaluation of learning objects, differentiating the created scale, a specific instrument for evaluating learning objects focused on the health area. Akpinar (2008) conducted a study for the validation of LORI 1.5 using a sample of students and their teachers of primary and secondary education. The same is observed in a study carried out by Kay and Knaack (2008), who composed a sample of high school students to validate LOEM, both instruments constructed to evaluate generalist learning objects.

The validation process of Equalis-OAS went through two stages. The first one, focused on the construction of the items and the pilot study, had the participation of teachers, technicians, tutors and students of a Specialization Course in Family Health promoted by the Open University of SUS UFCSPA, conducted in the distance modality (Trindade, 2016). The second stage, presented in this article, also included professionals and students from the health area, all participants taking a lifelong learning course of the distance modality conducted by TelessaúdeRS-UFRGS. In this second stage, it was possible to describe evidence of validity based on the internal structure of the instrument (factor analysis) and on the external variable (correlation with LORI), as well as to verify the internal consistency of the proposed instrument.

The analyzes performed to investigate the evidence of validity of the instrument demonstrated that it has good metric properties. The Exploratory Factor Analysis (EFA) indicated the existence of three factors, as the pilot study had already indicated (Trindade, 2016), which explained, overall, 66.8% of the variance of the responses. All 41 items of the scale were retained in the factor analysis and most items had a high factor loading. The items were allocated to the factors that theoretically would be expected. The first factor,

"Presentation" refers to the accessibility and usability characteristics of the learning object. The second factor, "Educational", focuses on pedagogical characteristics, covering content quality, compliance with learning goals, feedback, adaptation and motivation. The third factor, "Intrinsic Concepts to learning objects in the health area", endorse the inherent characteristics of the definition of learning objects, such as interoperability, reusability, durability and availability.

The scale presented excellent indexes of accuracy, both in the evaluation of the total measurement (α 0.980) and in the evaluation of isolated factors (Presentation: α = 0.977; Educational: α = 0.9479; Concepts Intrinsic to LO: α = 0.927). These indexes were higher than those found in the study conducted by Kay and Knaack (2008), α = 0.75, e.g., which investigated the internal consistency of LOEM, another instrument to evaluate learning objects in general. In the study carried out by Vargo, Nesbit, Belfer and Archambault, (2003), the reliability of the instrument was obtained through the application of a collaborative model, called the Convergent Participation Model, resulting in a Cronbach's alpha equal to or higher than 0.8 among the evaluators.

Differently from the current study, in the pilot study in which evidence of validity based on the internal structure for Equalis-OAS (Trinity 2016) was sought, a specific learning object was not used. The respondents could adopt, by individual choice, any of the learning objects that were made available in the course they were taking in the distance modality. Thus, this method was identified as "masking" regarding the selection of the learning object, and it was considered positive, since the analysis of the data was exempt from any biased notation or decision. In addition, the results suggested that Equalis-OAS may be applied to different learning objects in the health area. However, this characteristic differed from studies conducted by Kay and Knaack (2008) and Akpinar (2008) or those from Trindade, Dahmer and Reppold (2014), in which specific learning objects were chosen or developed to validate the instrument. Thus, for the present study, a specific learning object was used, making the entire Equalis-OAS application refer to the same learning object.

From the findings presented, it is considered as a positive aspect the fact that the created instrument may be used to support the process of creating several learning objects in the health area, helping the work of developers, designers and/or people who make the content. The scale, once validated, may be used for professionals working with continuing education courses in health in the distance modality in Brazil, such as UNASUS (Granville, Souza, Calabró and Martins, 2017; Dahmer et al., 2017) and TelessaúdeRS-UFRGS (Harzheim et al., 2016). It may also be used by teachers when they research and select in digital repositories learning objects to compose their didactic activities. Finally, make the instrument (Equalis-OAS) available to students and final users (e.g., patients) could favor the educational process of this public on accessibility and interoperability (Krauss & Ally 2005), in addition to making them more aware and critical regarding the educational material provided to them or even searched on the internet.

Although many authors relate the use of learning objects and/or their quality with results related to knowledge and learning testing (Vollmar, Schürer-Maly, Frahne, Lelgemann and Butzlaff, 2006; Bucarey and Alvarez, 2006; Lymn, Bath-Hextal and Wharrad, 2008; Henkel, 2010; Bath-Hextal, Wharrad and Leonardi-Bee, 2011; Windle, McCormick, Dandrea, and Wharrad, 2011), it is known that the use of these resources alone does not guarantee learning (Akpinar 2008), even though the criterion of validity of the

instruments is a basic premise for their choice. Thus, in order for learning to provide the reconstruction of previously established concepts, from the personal experiences and the subject's own intention to understand the meaning of what is studied, methods that stimulate the student's initiative and responsibility in relation to their own learning must be proposed, especially in the health area, in which updating content is of vital importance to the training of professionals (Trindade, Dahmer and Reppold, 2014).

It is known that the evaluation process is not a trivial task, considering the multiplicity of technical and educational factors involved, especially in this case, in which the focus of evaluation were learning objects. The literature presents several studies that report the use of instruments to evaluate learning objects developed for general evaluation, favoring the internal validity of the study, however, making it difficult to compare results and evaluate the efficiency of the use of learning objects in a specific area (Trindade, Dahmer and Reppold, 2014). In this sense, we believe to have collaborated for the discussions that involve the process of evaluation and quality of learning objects developed specifically for the scope of health teaching, considering the precepts of Psychometrics, which served to guide the construction process and validation of the created instrument.

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Spatial variability in the physical properties of an Oxisol under coffee cultivation in the Brazilian Cerrado

Danilo Ferreira Mendes
Universidade Federal de Uberlândia
Instituto de Ciências Agrárias – ICIAG
Brazil

Cinara Xavier Almeida
Universidade Federal de Uberlândia
Instituto de Ciências Agrárias - ICIAG
Brazil

Ricardo Falqueto Jorge
Universidade Federal de Uberlândia
Instituto de Ciências Agrárias – ICIAG
Brazil

George Deroco Martins
Universidade Federal de Uberlândia
Faculdade de Engenharia Civil - FECIV
Brazil

Juliano Marques Pinto
Universidade Federal de Uberlândia
Instituto de Ciências Agrárias – ICIAG
Brazil

Arthur Almeida Moraes
Universidade Federal de Uberlândia
Faculdade de Engenharia Civil - FECIV
Brazil

Abstract

The physical properties of the soil are limiting factors for coffee cultivation and yields. Therefore, we analyzed spatial variability in the physical properties of a clayey Oxisol under coffee cultivation. The experiment was carried out on 14-hectares of a coffee (*Coffea arabica*) plantation in the city of Monte Carmelo, in the Brazilian state of Minas Gerais. Soil samples were collected from two layers (0 - 0.1 m and

0.1 - 0.2 m) at 61 grid-points spaced at 50 x 50 meters. These samples were saturated to determine total porosity and soil bulk density. Soil resistance readings were also taken from the same grid points and layers using an impact penetrometer. Descriptive statistics were used to evaluate all variables. Additionally, geostatistics were used to model spatial variability within the soil physical properties. Variographic analysis was performed using semivariograms. We found that density, total porosity and soil resistance to penetration varied throughout the study area, which demonstrates that management type can alter soil physical properties and that maps generated by geostatistics can help coffee growers make decisions related to soil management.

Keywords: *Coffea arabica* L., soil physical quality, geostatistics.

1. Introduction

Coffee production plays a significant role in the agribusiness sector and overall economy of Brazil. In 2016, Brazil produced over 51 million bags of coffee and was the largest exporter in the world (Conab 2016). The Cerrado region in the Brazilian state of Minas Gerais has great potential for coffee production and possesses the soils and climatic conditions needed to produce high-quality coffees (Alves *et al.* 2011) that are certified and economically competitive.

Spatial and temporal variations in the soil result from processes that are controlled by various interrelationships among physical, chemical, and biological properties. Thus, changes to the soil can directly alter the structure and biological activity of the soil, affecting fertility, the agroecosystem (Brookes 1995) and crop yields.

Thus, intensive agriculture and inappropriate management practices can degrade soil physical properties and favor processes that reduce porosity and increase soil density, which, in turn, hinder root development and may reduce crop yields.

Soil resistance to penetration, as measured by a penetrometer, is the relationship between the force exerted to penetrate the ground by a rod with a metallic cone at one end, and its basal area, which is constant and known. This method is quick, simple and well correlated with root development (Bengough *et al.* 2001). Soil resistance to penetration has also been used to identify compacted layers and changes in soil physical properties within horizons (Reichert *et al.* 2010).

Soil density is defined as mass per unit volume of dry soil. This volume includes both solid particles and porous space (Brady and Weil 2013). Therefore, conditions that influence the arrangement of soil particles will directly affect soil density values (Ferreira 2010). These conditions include organic matter content, soil structure (mineralogical composition), soil depth and conservation practices.

Total porosity encompasses both macropores and micropores. These pores are essential for plant development because they contain water and air that can be absorbed by roots for plant hydration and respiration. Soil is a three-phase system. Thus, determining total porosity is essential for optimizing management practices, since the system is closely linked to the dynamics of solute storage and transport and gas circulation, which are, in turn, essential to biochemical processes, especially those related to plant productivity (Epstein and Bloom 2006).

Soil physical properties may vary within a cultivated area because of several factors that include management practices (Silva *et al.* 2010), especially those practices related to soil compaction.
Understanding variations in physical properties within a cultivated area is important for soil surveying, soil management, soil sampling and managing agricultural practices (Silva *et al.* 2010). Thus, it is important to determine the extent and intensity of spatial variations, either alone or in conjunction with other variables (Gandah *et al.* 2000) such as soil density, structure, resistance to penetration and porosity.
These properties determine whether the soil is adequate for plant development and the maintenance of a diverse population of soil organisms (Doran and Parkin 1994) that directly affect crop yield. Precision agriculture can also contribute to the long-term sustainability of agriculture (Bongiovanni and Lowenberg-Deboer 2004). Consequently, the objective of this study was to analyze the spatial variability of the physical properties of a clayey Oxisol under coffee cultivation.

2. Material and methods

The experiment was conducted at a coffee plantation (18 ° 42'28.9 "S 47 ° 33'27.0" W) with a clayey Oxisol (Embrapa 2013). The area had been cultivated with *Coffea arabica* for several years and was replanted in January 2012 at a spacing of 3.8 x 0.7 m. Starting in March 2015, a 14-ha area was sampled at 61 grid points, spaced at 50 x 50 m (Figure 1).
A Global Navigation Satellite System (GNSS) receiver (Hipper double-frequency L1 / L2) was used to determine the coordinates of the grid points. One of the receivers was used as a basis for GNSS screening, providing relative static positioning. The data were then evaluated using Topcon Tools 8.2.3 software and two reference stations from the Brazilian continuous-monitoring network (*Rede Brasileira de Monitoramento Contínuo* - RBMC) located in Uberlandia and Rio Paranaiba in the state of Minas Gerais.
Given the varying relief of the site, soil samples were taken from two layers (0 - 0.1 m and 0.1 - 0.2 m) at all grid points. These samples were used to determine the soil physical properties.
Soil resistance to penetration was determined at both layers (0-0.1 and 0.1-0.2 m) using an impact penetrometer (Stolf 1991). Simultaneously, soil gravimetric water content was also evaluated (Embrapa 2011).
Undisturbed soil samples were also collected using cylinders (length = 0.03 m, diameter = 0.048 m, volume = 53.16 10^{-6} m^3) at the 0 to 0.1 m and 0.1 to 0.2 m layers. These samples were then saturated to determine total porosity and soil density (Embrapa 2011).

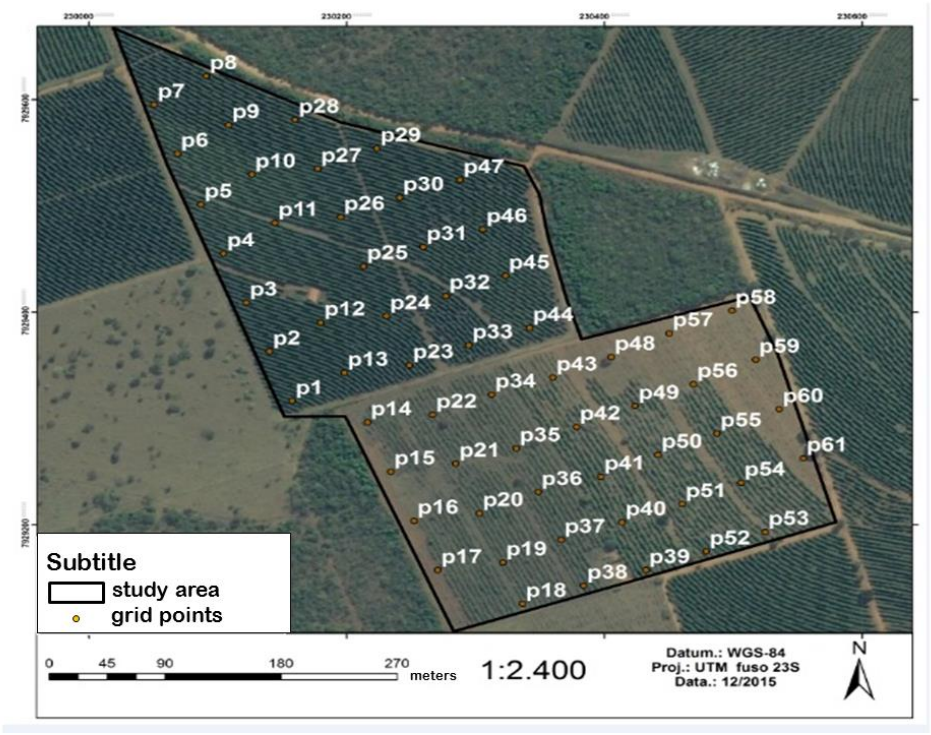

Figure 1. Study area - Monte Carmelo, Minas Gerais, Brazil

Descriptive statistics (mean, variance, coefficient of variation, asymmetry coefficient, and kurtosis coefficient) were obtained for each variable to determine the distribution and variation of the data. Minimum, maximum and amplitude values of the data were also analyzed.

Geostatistics were used to define the spatial variability model of the soil physical properties. Radiographic analysis was performed using semivariograms and semivariance was determined for each variable. Afterwards, semivariance γ(h) versus distance (h) was graphed and used to adjust the semivariogram model to the experimental data. Semivariance and the semivariogram model were calculated using GS+ geostatistics software (Robertson 1998).

After defining the semivariogram model, spatial distribution maps were generated for each of the variables using interpolation via the kriging method. A cross-semivariogram was also used to determine spatial correlation among properties.

The mathematical models were fit to semivariograms using the"*Jack-knifing*" validation method, where the mean and variance of the reduced errors were evaluated (Souza *et al.* 1997) considering spherical, exponential, linear and Gaussian models.

3. Results and discussion

3.1 Analysis of statistical variability

We classified variation (CV) in our descriptive statistics using the system proposed by Warrick and Nielsen (1980), where CV < 12% is considered low, 12% < CV < 60% is average and CV > 60% is high. Thus, Table 1 shows that the soil density, total porosity and soil water content variables presented low CV in both

layers, and could be considered homogeneous, while the CV of soil resistance to penetration was average in both layers. Note that the soil resistance variable was more heterogenous than the other variables.

Table 1. Descriptive statistics for soil bulk density (Ds, in g cm^3), total porosity (Pt, in m^3 m^{-3}), soil water content (U in kg^1 kg^{-1}) and soil resistance to penetration (RSP, in MPa), in different layers

Variable	Descriptive statistics							
	Min	Max	Amp	M	Var	As	CV	Kurt
Ds 0-0,10m	1,04	1,42	0,38	1,23	0,005	-0,13	6,07	0,039
Ds 0,10-0,20m	1,05	1,37	0,31	1,23	0,006	-0,21	6,40	-0,60
Pt 0-0,10m	0,44	0,59	0,15	0,50	0,001	0,59	7,03	-0,14
Pt 0,10-0,20m	0,41	0,58	0,16	0,49	0,001	0,12	6,75	0,33
U 0-0,20m	0,22	0,347	0,12	0,26	0,0006	0,519	0,09	0,50
RSP 0-0,10m	2,63	6,87	4,24	4,14	0,57	1,07	18,29	2,02
RSP 0,10-0,20m	5,47	13,08	7,60	7,74	2,21	1,39	19,23	2,28

*Min: Minimum value; Max: Maximum value; M: Mean; Var: Variance; As: Asymmetry; CV: coefficient of variation; Kurt: Kurtosis coefficient.

Variation was low (asymmetry values near zero) for of all the soil physical properties (mean values) except soil resistance to penetration.

Mean soil density was the same and total porosity nearly the same in both layers, while soil resistance to penetration was higher in the 0.1-0.2 m layer.

While these conclusions are useful, maps and semivariograms are needed to better understand variations in these physical properties.

3.2 Semivariogram analysis

Geostatistics showed that all the soil indicators were spatially dependent. Thus, none of the variables demonstrated a random distribution within the study area (Table 2).

Table 2. Adjusted semivariogram parameters for soil density (Ds, in g cm^{-3}), total porosity (Pt, in m^3 m^{-3}), soil water content (U, in kg^1 kg^{-1}) and soil resistance to penetration (RSP, in MPa)

Indicator	Parameters					
	Model	Co	Co+C1	Co/(Co+C1)	r	R^2
Ds 0-0,10m	Exponential	0,00101	0,00637	15,85	43,00	0,640
Ds 0,10-0,20m	Spherical	0,00116	0,00641	18,10	159,10	0,969
Pt 0-0,10m	Gaussian	0,00010	0,00126	7,936	45,70	0,431
Pt 0,10-0,20m	Linear	0,00054	0,00108	50,00	270,35	0,942
U 0-0,20m	Exponential	0,00002	0,00067	2,985	55,20	0,781
RSP 0-0,10m	Exponential	0,35100	0,89800	39,08	445,60	0,677
RSP 0,10-0,20m	Exponential	0,60800	2,93400	20,72	142,80	0,822

*Co: 'pepita' effect; Co+C1: baseline; Co/(Co+C1): Degree of spatial dependence in percentage, being classified in: < 25% = strong; between 25 and 75% = moderate and > 75% = poor (Cambardella *et al*., 1994); r: range.

Soil density (in both layers), total porosity (in the upper layer), soil water content and soil resistance to penetration (in the 0.1-0.2 m layer) showed a high degree of spatial dependence. However, total porosity (0.1-0.2 m layer) and soil resistance to penetration (0-0.1 m layer) showed moderate spatial dependence (Cambardella *et al.* 1994). These results clearly show that properties at a given geo-referenced point are more closely related to the values at neighboring points than to those at other points throughout the site, thus demonstrating the importance of this study.

The models that best fit the soil density property were exponential and spherical at the 0-0.10m and 0.1-0.2m layers, respectively. The Gaussian and linear models provide the best fit for total porosity in the 0-0.10 m and 0.1-0.2 m layers, respectively, while the exponential model provided the best fit for soil resistance to penetration in both layers.

This variation shows that there is distance among the results from each soil layer and for each property. Soil resistance to penetration in the upper layer showed the greatest distance (445.6 m) while soil density in the 0-0.10 m layer showed the shortest distance (43 m).

3.3 Spatial distribution of soil physical parameters

Figures 2a and 2b show that the lowest density values were found in the lower left of the map (lowest value = 1.09 Mg m^{-3}) while the highest values were found both in the upper sector and in longitudinal bands spanning the center of the map. Carvalho *et al*. (2013) evaluated soil density under coffee cultivation and found similar values that varied between 1.0 and 1.16 Mg m^{-3}. Sites with less soil mobilization may have higher soil density values. This circumstance is very common in coffee cultivation since it is a perennial monoculture where weeds are only removed from between rows. Thus, the soil is only exposed during the harvest when traffic from agriculture machinery is high, which increases soil density.

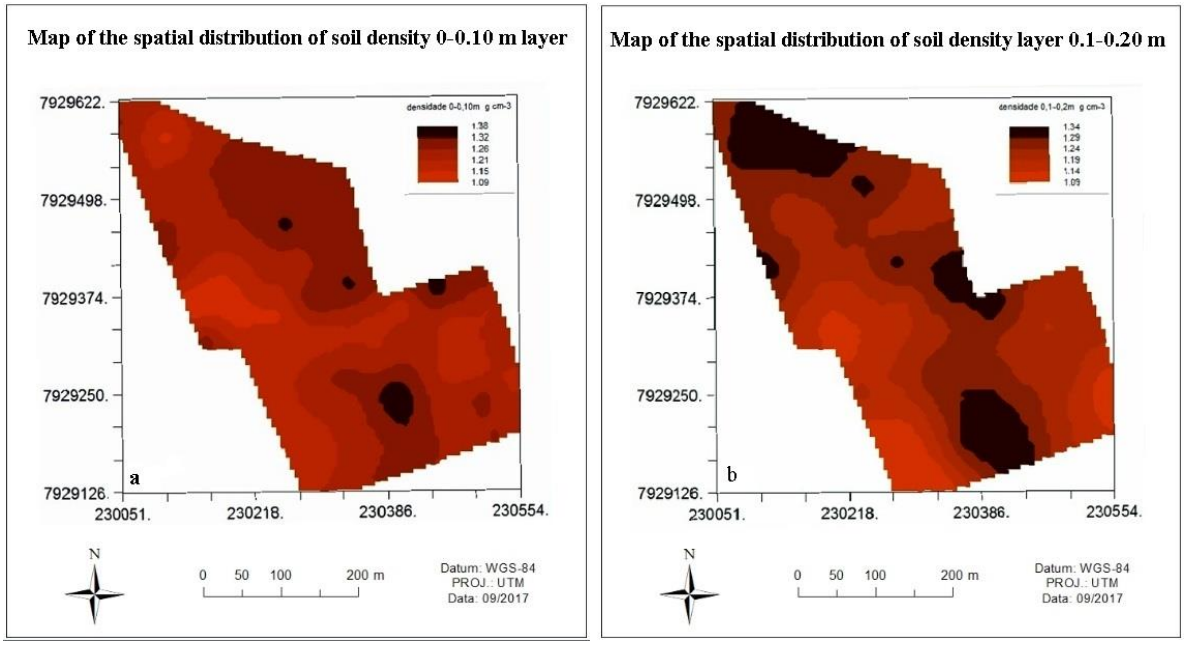

Figure 2. Spatial distribution of density in a clayey Oxisol at 0-0.10 m (2.a) and 0.1-0.20 m (2.b). Monte Carmelo-MG-Brazil.

However, soil density also varies due to differences in soil texture, topography and management type. Goedert *et al.* (2002) noted that the research community has not reached a consensus on a specific soil density value that defines whether a given soil is compact or not.

Matiello *et al.* (2005) studied young plants of arabica coffee and found that the roots could penetrate soil layers with densities of up to 1.2 g cm^{-3}, whereas root development was quite limited in soil with densities of 1.20 to 1.35 g cm^{-3}.

The mean values for total porosity (Table 1) were 0.50 and 0.49 $m^3 m^{-3}$ for the 0-0.1 and 0.1-0.2 m layers, respectively. The maps produced by ordinary kriging (Figures 3.a and 3.b) show that the values were distributed from 0.59 to 0.44 $m^3 m^{-3}$. Porosity was lower in the 0.1-0.2 m layer where soil density was higher. This condition expels air from the pores, which leads to particle rearrangement and denser, more compacted soil (Dias Júnior and Pierce 1996).

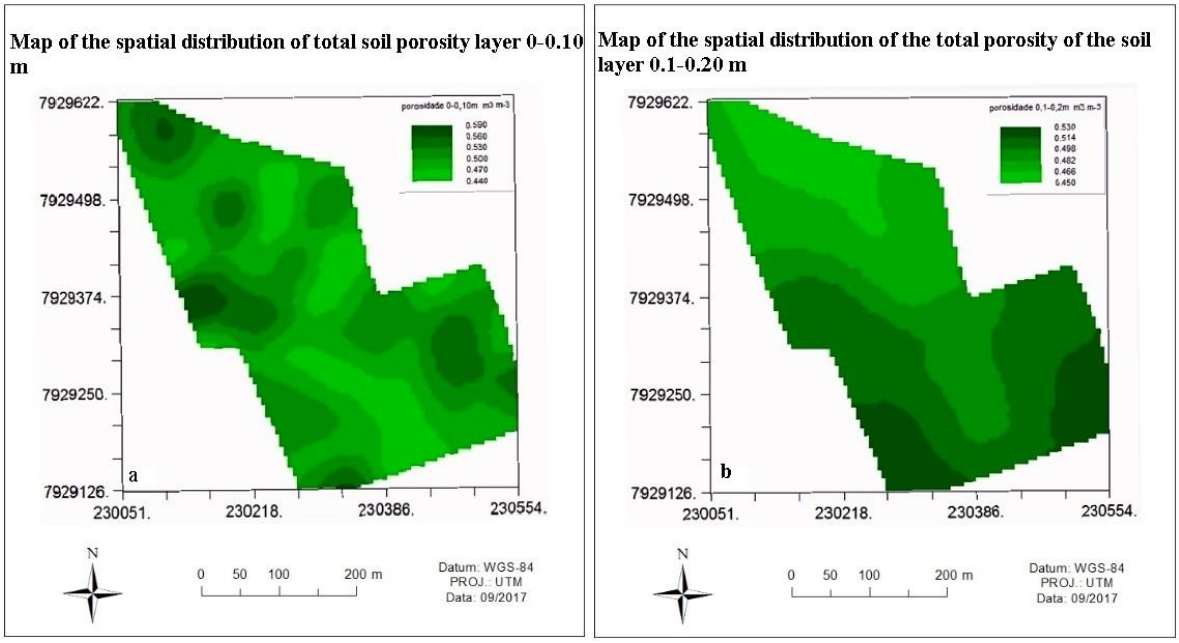

Figure 3. Spatial distribution of the clayey Oxisol total porosity, in the layers 0-0.10 m (3.a) and 0.1-0.20 m (3.b). Monte Carmelo-MG-Brazil.

Camargo and Alleoni (1997) stated that an ideal soil should have 0.5 $m^3 m^{-3}$ of total pore volume, but noted that this percentage varies considerably from soil to soil where pedogenetic factors and crop management practices are significant.

Vomocil and Flocker (1996) consider that a macropore volume of 0.1 $m^3 m^{-3}$ is the critical limit needed for satisfactory gas exchange and drainage. Thus, based on this criterion, most of our study area is favorable for coffee cultivation.

The roots of coffee plants are extremely sensitive to soil aeration that in turn depends on soil structure and the quantity and ratio of macropores and micropores (Guimarães and Lopes 1986). Matiello *et al.* (2002) stated that exposed, excessively clayey soils hinder the development of coffee roots because raindrops hitting the soil surface tend to disintegrate, remove and translocate particles, which causes pore clogging.

The mean values of soil resistance to penetration (Table 2) were 4.14 and 7.74 MPa, in the 0-0.1 and 0.1-0.2 m layers, respectively. The geostatistical maps in Figures 4a and 4b show that there was no pattern between the layers. In other words, soil resistance at any given grid point differed by layer, map and location.

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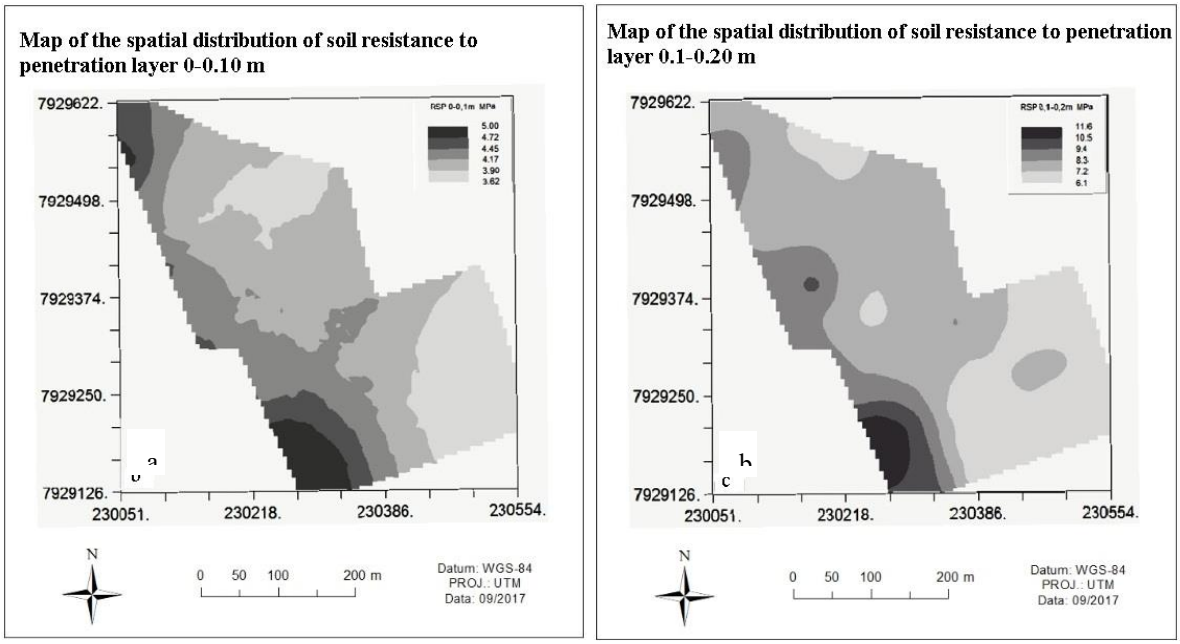

Figure 4. Spatial distribution of soil resistance to penetration in a clayey Oxisol at 0-0.10 m (4.a) and 0.1-0.20 m (4.b). Monte Carmelo- MG-Brazil.

Carmo *et al*. (2011) found that soil resistance to penetration values were higher between the rows, where agricultural equipment passes, than under the canopy and added that these values were higher under mechanized coffee cultivation than under non-mechanized coffee cultivation or native forest.

In the current study, the highest soil resistance to penetration values (Figures 4a and 4b) were found in areas with the lowest soil water content (Figure 5). According to Almeida *et al*. (2012), soil resistance to penetration is strongly influenced by soil water content at an exponentially decreasing rate (i.e., the lower the soil water content, the exponentially higher the soil resistance to penetration). Bergamin *et al*. (2010) studied a direct sowing system and found differences in soil resistance to penetration down to 0.1 m under mechanized traffic. In the current study, soil resistance to penetration was higher in the 0.1-0.2 m layer.

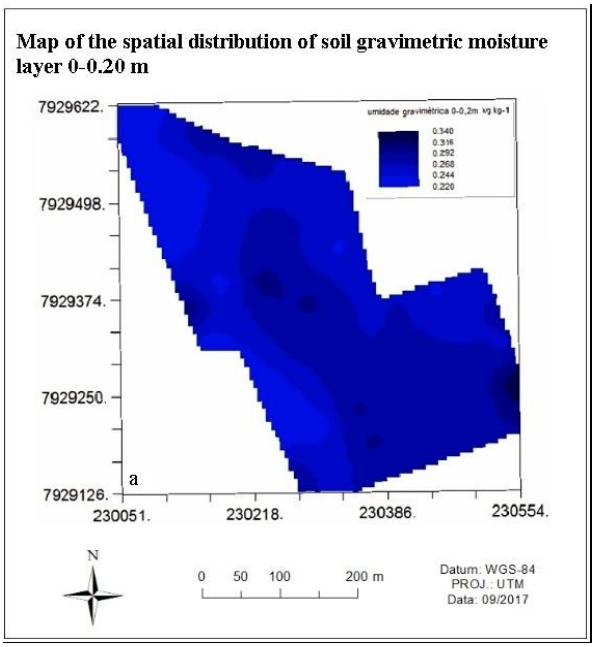

Figure 5. Spatial distribution of soil gravimetric water content in a clayey Oxisol (0-0.20 m layer). Monte Carmelo, MG, Brazil.

The soil just outside of the canopy in coffee plantations is not only where most mechanized traffic occurs but also where most water and nutrient-absorbing roots are located. Given this observation and that all the physical properties measured in the current study presented a degree of dependence, we conclude that geostatistics is an important tool for making decisions related to soil management in coffee plantations, which underlines the need to monitor soil physical properties in this region.

4. Conclusions

Our analysis of the spatial variability of physical indicators showed that geostatistics and mapping could be useful in making decisions related to soil management in coffee plantations and especially regarding soil sustainability.

We also found that the evaluated variables showed a strong or moderate degree of spatial dependence, demonstrating that these variables did not behave randomly within the study area.

5. Acknowledgement

To Fazenda Juliana for the support of the research.

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Protection of Users: An Analysis from Product and Process Patents

Washington Sales do Monte
Doutorando em Ciência da Propriedade Intelectual (UFS). Mestre em Ambiente, Tecnologia e Sociedade (UFERSA). Especialista em Docência do Ensino Superior e Consultoria Empresarial, Graduado em Marketing (UnP). Pesquisador do Laboratório de Pesquisa do Conhecimento Cognitivo Humano (LADEC). wsalesmkt@gmail.com

Robelius De-Bortoli
Licenciado em Educação Física (UFRGS). Especialista em Futebol Administração e Marketing (UGF). Professor de Universidade Federal de Sergipe (UFS) do Departamento de Educação Física (DEF) e do Programa de Pós-Graduação em Ciência da Propriedade Intelectual (PPGPI). Coordenador do Laboratório de Pesquisa do Conhecimento Cognitivo Humano (LADEC). robelius@yahoo.com.br

Sadraque Eneas de Figueiredo Lucena
Universidade Federal de Sergipe, Departamento de Estatística e Ciências Atuariais, Programa de Pós-Graduação em Ciência da Propriedade Intelectual (PPGPI). Doutor em Estatística e Mestrado em Estatística (UFPE). Graduado em Estatística (UFPB) sadraquelucena@gmail.com.

Abstract

This research seeks to describe the differences in patent filing of products and processes and the protection of the user. The research is characterized as descriptive exploratory of applied nature, with qualitative approach, having as method the technique of documentary research and documentary analysis. Normative Instructions 30 and 31 of the INPI and Law 9.279/96 were used. In the analysis it can be observed that process patents have a greater size than product patents, the state of the art is one of the main points of the writing of patents, drawings, flowcharts, organization charts and diagrams are present in process patents. It is concluded that the article raises a discussion about the importance of registration of patent processes, especially regarding the issues related to the user.

Keywords: Product patent; Process patent; Copywriting; User protection.

1. Introduction

According to Kotler and Armstrong[1], product is something that can be offered to a consumer market, it can be for a mass market, segmented, niche or customized, in order to be acquired to satisfy the need or desire of a certain consumer individual or business. These products can be divided into basic ones that have simple functions and have a lower price, and higher products that are more sophisticated and more expensive[2].

Prior to the fifteenth century the products were manufactured by artisans who were also holders of the production techniques, being passed on from generation to generation, having as main characteristic the personalization. Questions about commercial law and exploration of invention began to emerge with the development of the bourgeoisie, during that period, patent exploration issues became more evident and also Commercial Maritime Expansion, with the search for the opening of new markets[3].

The process of developing a product is not a very easy task and requires a series of activities, such as: resource transformation and information management, so management is becoming increasingly complex for organizations, for factors such as globalization of markets, improvement of manufacturing Technologies [4].

Product development is a major activity for any organization. Is considered one of the essential processes for the success, survival and renewal of the company, particularly for those of accelerated or competitive rhythms[5]. In this way it understands that the success of the product in the market is related to the system of planning (internal), understanding of the market, development, implementation and support. Authors defend that product development is a step considered as spiral (cycles) where quality reveals the user's needs and are discovered through field research[6].

Another ready to be discussed within this context is the 'process' related to product development, it comprises a set of activities in which the organization seeks to transform data on market opportunities in possibilities and techniques into goods and information for the manufacture of a product commercial. This process covers the sectors of organizations ranging from marketing, product engineering, production[7].

"[...] The future will belong to companies that can exploit the potential of centralization in processes"[8], in his article The New Challenges of the Company of the Future. What Gonçalves presents is that the process definition goes beyond the concept presented by engineering, that is, it goes beyond the concept of transforming inputs into output, it also describes endpoints, transformations, feedback and receptivity. The author also defines what process is interdisciplinary in the use of his word that in addition to administration we find other sciences such as sociology, psychology, biology, architecture, engineering and politics, all with similar use within different subjects[9].

Understanding the importance of products and processes and a need for organizations, protecting these products and processes, makes them gain a competitive advantage. The field of science that has been developing to guarantee the right of inventors/organizations is Intellectual Property. The term "intellectual property" was first used in a judicial case in the United States in 1845, after which it was mainly used in that medium to contemplate copyrights, patents and trademarks[10].

In general Intellectual Property is the right that an author/inventor has about his invention (patentes/processos) or work that can be expressed by any means: literary works, films, music, arrangements, scores, software, graphic models, drawings, recordings sound, photographs, paintings, etc. (Right of the Author) [10], this right gives the applicant a protected term for his work.

According to the National Institute of Intellectual Property – INPI, here are two types of patents: Patents of Invention (PI) and Patents of Utility Models (PMU). PI's correspond to inventions of a technical nature and seek solutions to problems in the specific technological area, either product or process. As PMU visam melhorar o uso do objeto existente, diferenciar um do outro de uma maneira melhor, a funcionalidade das

IPs pode ser vista e a PMU como melhoria e não podem ser consideradas patentes de processos[11].
This research seeks to describe the differences in the writing of patent offices of products and processes and highlights the points regarding the protection of the user. For analysis, the following information was considered: title, abstract, claims, descriptive report and drawings based on INPI Standards 30 and 31[12] and Law No. 9,279 of May 14, 1996 - Industrial Property Law[13].

2. Material and Method

Based on the established objective, the research had as a starting point the identification of the patent banks to carry out the search for deposited orders. The bases of CANADA, ESPACENET, USPTO and INPI were chosen for this purpose, according to Table 1, the criterion for choosing these patent banks was to have a sample of two types of documents, with access by electronic means.

Frame 1. Patent Banks.

COUNTRY	ADDRESS OF ACCESS TO PATENT BANKS
CANADA	http://www.ic.gc.ca/eic/site/icgc.nsf/eng/home
ESPACENET	https://www.epo.org/index.html
USPTO	https://www.uspto.gov/
INPI	http://www.inpi.gov.br/

Frane of patent application databases.

The research can be characterized as descriptive exploratory research of an applied nature, with qualitative approach, having as method the documentary research and documentary analysis[14;15;16].
As the work is part of a qualitative approach, it was decided to analyze 6 (six) patents of computer gaming products and 6 (six) gamification pantalones (process) of each patent bank. For the searches used the keywords: computer games and gamification, was considered the option of presence of these words in the title and in the abstract, the Bolivian operator "*" was used to expand the patent searches, the research was carried out in the period of December 2017.
The criteria for including sample patents was to select the patents closest to the objectives of this research proposal, the standard recommendations recommended by the World Intellectual Property Organization - WIPO: Cover Sheet, Descriptive Report, Complaints; Designs and summary of patent and normative instructions 30 and 31 of INPI[12] and Law 9,279 of May 14, 1996 - Industrial Property Law[13].

3. Results and Discussions

The search in the patent banks that presented a more relevant number of registrations was ESPACENET, followed by USPTO and third of INPI and later of CANADA, according to table 1. At the base of ESPACENET was found the largest number of possible deposits using the keywords in the title 381, also using the keywords in the summary were found 4,250 possibilities. We use the idea of "possible", since the

keywords "Computer games *" are quite common in describing many technology-based applications involving games.

Table 2. Computer Games

PATENT BASE	QUANTITY OF ORDERS	
	Title	Abstract
USPTO	71	651
ESPACENET	381	4.250
CANADA	3	22
INPI	21	76

Table of the amount of patents found by keywords computer games.

The descriptors or keywords are important so that other researchers can use in case of future technological prospection and research for State of the Art for new applications. The two words used for research are quite common and can be used in various contexts, both for games and components linked to the development of games.

In addition to requests placed on games, the results obtained with the keywords "computer games" on all platforms correspond to devices, equipment, physical elements such as memory cards, consoles, boards designed to be docked in existing products.

The second part of the researched research was the search for patents and processes of the type "gamified", that word can be a popular neologism to highlight proposals that use the concepts of gamification, as described in the methodology researched through the word "Gamification *", both in the title as the summary, I make the data in table 2.

Table 2. Gamification

PATENT BASE	QUANTITY OF ORDERS	
	Title	Abstract
ESPACENET	105	185
USPTO	16	18
CANADA	4	3
INPI	-	-

Table of the amount of patents found by keywords gamification.

The result is quite different in relation to the first search of the research because the gamification is a process still under construction and its actions are being cataloged and mapped, it is interpreted by some authors as the use of elements of game of user engagement[17]. Thus, gamification does not mean the creation or development of games, but rather the thinking of game mechanics in non-game context[18]. The study of gamification has been growing every year and becoming popular in the academic environment[19].

Gamification can be considered as an emergent phenomenon, derived from the popularization of games, mainly the intrinsic capacity to motivate action, solve problems, enhance learning or other actions involving individuals[20].

3.1 General Analysis of Selected Gaming Patents (Product)

We analyzed the applications found and selected in accordance with the research the patents in the database of Canada and INPI. No order deposits were found in the ESPACENET and USPTO banks, it is worth remembering that the games were ordered as a product and not as components and elements of technicians such as: boards, consoles, adapters, memory cards, among others, all of these were found in all the patent bases.

Frame 2. Product Patent Summary

PATENT: COMPUTER GAME	
CLASSIFICATION	A63F 3/02
CRITERIA ANALYZED	COMMENTS
BRIEF DESCRIPTION	The invention relates to a type of board game connected to the computer. Can be player for up to 4 players actions are triggered by a touch-sensitive screen The application has a design in the form of a floor plan.
WHAT IS THE NATURE OF THE INVENTION?	( ) MU- Utility Model (x) PI - Invention Patent
OPINION	The game can be characterized as a digitized board game that can which presents as differential an interaction by means of a touch screen.
PATENTE: GAME OF SKILL OR CHANCE PLAYYABLE BY SEVERAL PARTICIPANTES REMOTE FROM EACH OTHER IN CONJUNCTION WITH A COMMON EVENT	
CLASSIFICATION	G06F 15/44
CRITERIA ANALYZED	COMMENTS
BRIEF DESCRIPTION	The request describes with a playable skills (odds) game among various participants, the game events can be a computer game. This patent differs from others that do not require a game cartridge, or the diskette displays a type of frequency-type telephone connection to each player's personal computer. According to the description, the game may resemble a casino game played by several participants at different points.
WHAT IS THE NATURE OF THE INVENTION?	( ) MU- Utility Model (x) PI - Invention Patent
OPINION	The fart is the 90's, considered similar to a series of digital games that can be played as the online games are very common today.

Criteria for analysis of product patents.

The patent Computer game draws attention because it is a patent reqest for gaming in the year 1996, when personal computers began to become popular with their connections in networks, that is, people began to deal with various types of machines which contained some kind of computer in the form of microprocessors including electronic games[21].

With the development of information and communication technologies, the processes of human-machine interaction began to become the object of study of many scientists. With the evolution of technological resources the 'tactility' as presented by[22] "has become an essential element for communication in applications installed on these mobile devices, which use the touchscreen or touchscreen feature".

The haptic interfaces correspond to a search for interactive technological devices that allow a process of interaction with virtual systems in a sensorial way and similar to the interactions present in the physical world, to the ideas of these studies can be evidenced from the creation of the mouse to the joystick as human interaction objects -machine. The patent application becomes innovative for its proposal of interaction with sensitive screen for the requested period, later technologies like Wii (Wii-remote) in game only to be released in 2006 by Nintendo, revolutionizing at the time the market of games as well as play[23].

Today's online games are played by hundreds of thousands of people around the world. The patent application under analysis corresponds to the type of games that can be multiplayer players at the same time, this type of game is known as MMOGs (Massively Multiplayer Online Games), a type of game that connects several players in a digital world to solve the many types of challenges, in many cases players develop their own character[24].

What makes the difference in this type of game is what they seem to consider, the shared experience, the collaborative nature of the activities (for the most part), and which the authors consider more important, is that the reward system is socialized among the community of players and acquiring a reputation among them[25].

Frame 3. Product Patent Summary

PATENT: VIDEO GAMES INTERATIVOS	
CLASSIFICATION	A63F 13/40
CRITERIA ANALYZED	COMMENTS
BRIEF DESCRIPTION	Request is an interactive game that can be played on a mobile device. The game deals with a half-screen calibration interaction, where a character can perform various actions by moving the mouth. The game is designed to work in conjunction with marketing actions. On request it has a basic game design, also has game image besides the code used for the development of the attached game.
WHAT IS THE NATURE OF THE INVENTION?	( ) MU- Utility Model (x) PI - Invention Patent
OPINION	The game becomes interesting because of the synchronization of the player with the interactor to perform the actions.

PATENT: JOGOS INTERATIVOS PARA INTERNET, VÍDEO GAMES E COMPUTADORES COM UTILIZAÇÃO DE IMAGEM DE PESSOAS FAMOSAS.	
CLASSIFICATION	A63F 13/00
CRITERIA ANALYZED	COMMENTS
BRIEF DESCRIPTION	This request presents a proposal of game with famous people (artistic and communication as: musicians, actors and actresses, other professionals tooth), but does not make clear what kind of game, can be played internet platform, video games and computers. The idea is to be marketed, but it has a social character where parts of the profit will be donated to social projects.
WHAT IS THE NATURE OF THE INVENTION?	( ) MU- Utility Model (x) PI - Invention Patent
OPINION	The description and the reports are very simple, leaving little understanding with the request, not being made the cartoon.

Criteria for analysis of product patents.

While the request does not make it clear, by the means of the patent claims, he can be classified in a game category known as 'advergames', games of this type are developed especially for brand promotion, the idea is not written solely by the fact brand in a game and yes the game developed especially for this purpose, mostly online games where brand or product is the center of advertising[26;27].

3.2 General Analysis of Patents of The Gamification Type Selected (Processes)

The process patents were analyzed, in the same way as those of products, considering their abstract, their description and claims, this information was organized in a Quaro abstract, patent title, classification and nature, an opinion was also organized as an overview. are shown in Tables 4, 5 and 6.

Frame 4. Process Patent Summary

PATENTE: GAMIFICATION OF ACTIONS IN PHYSICAL SPACE	
CLASSIFICATION	A63F 13/428
CRITERIA ANALYZED	COMMENTS
BRIEF DESCRIPTION	The patent request corresponds to the gamified system of a physical space. The idea is to provide a systems and methodologies that progress the actions taken within the physical space to allow a person's physical activity to be organized in an experience where with the help of technology the steps have meaning based on stories, rewards, statistics or feedback .
WHAT IS THE NATURE	( ) MU- Utility Model

OF THE INVENTION?	(x) PI - Invention Patent
OPINION	The request is well written, the claims are well detailed, it presents as support a software coupled to the room promoting interaction, besides having processes of organization of charts, maps and schemes.
PATENT: INTENERT GAME APPLICATION OF A MARKETING AND LIFESTYLE ENHACEMENT PROCESS WITH A PROFESSIONAL AN NON PROFESSIONAL SERVICE PROVIDER IN SALES INSDUSTRY	
CLASSIFICATION	G06Q 30/02
CRITERIA ANALYZED	COMMENTS
BRIEF DESCRIPTION	The patent is a request for the development of a decision-making system that can be applied to an organization or team distributed in a city, state or country.
WHAT IS THE NATURE OF THE INVENTION?	( ) MU- Utility Model (x) PI - Invention Patent
OPINION	An idea is very simple and without many changes in relation to the content development process. The drawing is not just an organized scheme like steps it details well all the processes.

Criteria for analysis of process patents.

The two analyzed applications of CANADA bank and patents, presented in Table 1, are different requests regarding the processes, making it evident how much gamification can be applied in various contexts. While the first application as a physical space to allow physical activity, the second seeks to engage person for decision-making with integration with teams.

Argue that gamification has gained popularity as a technique capable of increasing user involvement, but the authors make it clear who has few studies as to their impact on the life of an individual or society that may involve different side effects and in some way unexpected[28].

> Such consequences are rarely taken into account in the current gamification debate, which gives for granted a number of assumptions related to games, enjoyment, and behavior change, that actually should be discussed in deep[28].

It is interesting that the authors raise this discussion. There are implicit objectives in the patent applications of analyzed processes, one of the main objectives that involve gamification is the change of behavior, in this way the user can be directed to other objectives than the ones intended by the user.

When we analyze a patente Intenert Game Application of a Marketing and Lifestyle Enhacement Process With a Professional an non Professional Service Provider in Sales Insdustry, gamification We understand that it is a process considered a trend in service marketing, this type of strategy is one of the main areas where the concept is present, and can be defined as "[...] a process of providing affordances for gameful experiences which support the customers' overall value creation [...]"[29].

The author further argues that the simple inclusion of elements of the game into activities (processes) may

not necessarily guarantee a successful gamification, this is a popularized view that adding the mechanics of games in services, for example, can make it more attractive and retaining the customer needs to be well organized and planned.

Frame 5. Process Patent Summary

PATENT: SYSTEMS AND METHODS FOR GAMIFICATION A PROBLEM	
CLASSIFICATION	A63F 9/18
CRITERIA ANALYZED	COMMENTS
BRIEF DESCRIPTION	The invention presents a proposed method of gamification to solve scientific problems by means of information exchange between users (players), to support a computer system so that more than one user can exchange information.
WHAT IS THE NATURE OF THE INVENTION?	( ) MU- Utility Model (x) PI - Invention Patent
OPINION	The patent is well written, having as complement of information, scheme, organization chart, process flow diagram.
PATENT: TOLL IMAGE REVIEW GAMIFICATION	
CLASSIFICATION	A63F 13/46 - A63F 13/798 - A63F 13/50 - A63F 13/80 G0K 9/32 - G0Q 50/30 - G08G 1/017
CRITERIA ANALYZED	COMMENTS
BRIEF DESCRIPTION	The patent corresponds to a method of expediting a toll tracking process with vehicle license plate images which identifies a certain region of interest of the image which represents an identifier of the vehicle, ie after the generation of the first image a series of other images are generated. It is not a game, but a computer implemented method to gamify an image review process.
WHAT IS THE NATURE OF THE INVENTION?	( ) MU- Utility Model (x) PI - Invention Patent
OPINION	This request consists of evaluating that gamification can be used in any type of process to improve its performance. As it is a job that requires the monitoring of a very repetitive user and must be thinking of motivating the visualization of the images of the boards and optimize the time of the operator. The patent has a scheme for the process in images of screens of the system where the place happens the activities.

Criteria for analysis of process patents

The patents selected in the ESPACENT database also have two different proposals, the first has contributions to problem solving and the second to the system of improvement of repetitive processes of

an activity of a function.

Gamification studies are new and used to improve services through motivational resources that invoke game experiences, there still exist in the view of the authors a space for a wide variety of studies that could be framed as gamification, currently the most implementations are being in the context of education and learning. Within this perspective, in the teaching and learning process, studies show an increase in motivation and engagement in learning tasks, as well as pleasure in tasks[19].

After some successes of services on digital platforms of games, social media and geolocation services, some companies have applied gamification in various activities (processes) and mainly in non-game contexts, gamification is applied in several areas, promotion, loyalty, health in other actions[29;30].

Frame 6. Process Patent Summary

PATENT: SYSTEM AND METHOD FOR HANDLING FAMIFICATION FRAUD	
CLASSIFICATION	G06Q 30/00 - G06Q 30/02 - G06Q 30/0225
CRITERIA ANALYZED	COMMENTS
BRIEF DESCRIPTION	The patent corresponds to the system method for dealing with fraud, corresponding to a data processing technique that seeks to detect fraudulent activities by users. Detecting scam fraud, at the initial time is included some kind of time delay before a user is allowed, the time delay allows review of the stock history if there is evidence of fraud between a first user and a second user.
WHAT IS THE NATURE OF THE INVENTION?	( ) MU- Utility Model (x) PI - Invention Patent
OPINION	The request corresponds to an uncle and very sophisticated invention for the processing of scandals. Made to run on various types of platform. The resquest has a drawing, a schematic, a flowchart that details the entire process of the patent.
PATENT: GAMIFIED EXERCISE APPARATUS SYSTEM AND METHOD	
CLASSIFICATION	A63B 24/00 - G03G 15/00
CRITERIA ANALYZED	COMMENTS
BRIEF DESCRIPTION	The patent is an individual physical management system that can be monitored by platforms in the form of subsystems. Basically, the exercise system is similar to a set of activities, used by an individual to perform repetitions of one or more limbs, which allow the user to perform low level exercises. You can download online.
WHAT IS THE NATURE OF THE INVENTION?	( ) MU- Utility Model (x) PI - Invention Patent
OPINION	The patent application is well written, the concept of gamification is used for user interaction, having only as a complement a scheme as a drawing.

Criteria for analysis of process patents.

In the previous patent banks, the resquests selected at the USPO also present very different proposals, one involving an activity very similar to ESPACENET Toll Image Review Gamification and another with a process related to physical exercises such as CANADA Gamification of Actions in Physical Space, this reforms the idea of the possibilities of application of the concept of gamification for process improvement. To a certain extent there are many works and research carried out with gamification highlighting their positive points regarding motivation and employee involvement, however[30], raises that the negative questions regarding the use of gamification is neglected, for the authors when it is badly applied it can be detrimental to social and mental well-being in the workplace.

3.2 Overview of the Education of Product and Process Patents

The following is an overview of patent offices in accordance with INPI's normative Instructions 30 and 31[12] and Law No. 9,279 of May 14, 1996 - Industrial Property Law[13].

The patent titles of both products and processes are written in a clear and objective manner, with an average of nine words in each request. The abstracts were analyzed according to art. 7 IN 30 and art. 22 IN 31 INPI, presented the invention and the sector to which they are inserted, being possible to understand the request during the reading, for the process requests (gamification) the summaries presented more information than the product requests mainly in the descriptions of the involved methods.

As for the description report was analyzed according to art. 2 of INPI's Normative Instruction 30, all presented only the description of the invention, the paragraphs were numbered, they presented the state of the art, at that point their presentation for the process patents was important to understand the application of the process that was being patented. They also presented the problem, solution and objectives of the invention, the drawings were duly identified and numbered.

The Claims were based on art. 3 and 4 IN 30 INPI, all were numbered, based on the descriptive report, when the application with drawings mainly in the cases of patents of processes, the technical characteristics, were identified in numerical order in parentheses, making reference to the indications with drawings.

For the drawings, they were considered art. 8 ° IN 30 INPI and art. 18 IN 31 INPI, the numbered pages, easy-to-read legible designs, process diagrams, block diagrams, flowcharts and graphs were presented, these elements were more present than in the patents of products, their most readable with reference and guidelines.

Given the importance of the description and the information presented in the patent sessions, none was presented to the session on user protection, especially in process patents presented by the authors, which show that gamification can change positive/negative behavior change[29;30].

4. Final Considerations

Product development is fundamental for companies to remain competitive in the market. In the same way, its processes have been gaining prominence in the context of innovation and technology, within this

scenario, the writing of patent applications becomes a challenge for organizations and inventors who wish to write their claims for protection of their inventions (products/processes), they must observe the rules and laws for this writing to be in accordance with established standards for the granting of patents.

In the course of the analysis, the main aspects related to the patent applications of products in relation to the processes is that the latter has a rigor of details in the writing of its description and claims, a point of similarity between the two projects in question is the state of art, considered important for product patents, at process patents can be detached: Drawings, diagrams and flowcharts are components of process patents. Another point that became evident is that both the writing of a product patent document and the process by means of a title and summary keywords are crucial for patent seeking in both national and international patent banks.

Finally, it should be pointed out that the article may raise a discussion about the importance of patent filing of proceedings, especially with regard to user issues, since none of the requests raised concerns about this point. What should be evaluated with discretion is that when granted a certificate of an application for it to be marketed in the market, individuals and society need to be aware of the positives and negatives only what are highlighted in the patent reaction are strengths. It is necessary that inventors and companies, can observe the crucial points of their products and processes and their relation with the protection to the users.

In view of these considerations, it is concluded that user protection in the design of request should be in line with ethical principles, especially safety, as such principle, when described in the writing of the patent application, may have an ineligible contribution for user protection, allowing the user to consciously enjoy products and services.

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Purpose of the use of technologies in the contemporary models of Corporate University

Solange Maria da Silva, PhD
Universidade Federal de Santa Catarina
Brazil

Gertrudes A. Dandolini, PhD
Federal University of Santa Catarina
Brazil

Patricia de Sá Freire, PhD
Federal University of Santa Catarina
Brazil

João Artur de Souza, PhD
Federal University of Santa Catarina
Brazil

Willian Rochadel, PhD
Student, Federal University of Santa Catarina
Brazil

Aline de Brittos Valdati
Student, Federal University of Santa Catarina
Brazil

Abstract

This paper aims to identify the purpose of the use of technologies in the contemporary models of corporate university: Stakeholder University (SU) and Networked Corporate University (NCU). To accomplish it, we carried out a systematic search in the main electronic bases of scientific documents, categorizing the studies by means of the revised Bloom's Taxonomy. This search enabled to distinguish the purpose of the use of technologies in corporate universities, such as the purpose of integration between different stakeholders in relation to knowledge. The research highlights the Corporate University in addition to an environment of education; but an area of innovation in which the integration of stakeholders, university and organization constitutes an important interaction and sharing networks. By identifying the technological characteristics and tools, it points out new approaches of technological integration in the mediation between stakeholders in order to promote networked learning. That is, to remember,

understand, apply, analyze, evaluate, and create (Bloom's Taxonomy), but, especially, to generate value from these relationships. The conclusion is that the distance education technologies, the knowledge media, and the engineering and knowledge management tools arise as enablers of the purpose of creating technologies to generate shared knowledge and stakeholder interaction, according to the models of SU and NCU.

Keywords: Corporate University. Stakeholder University. Networked Corporate University. Technologies. Knowledge Management.

Introduction

The discussions for a corporate education system aligned to organizational strategy led to the setting of models called corporate universities. These models meet the competitive requirements imposed by the knowledge society (Yeh, Huang, & Yeh, 2011) with regard to educational and social interactions of the participants of the organizational value chain (Narasimharao, 2009).

The Corporate University is regarded by Meister (1998, p. 8) as a "strategic umbrella for the development and education of employees, customers and suppliers, seeking to optimize the organizational strategies, in addition to a learning ". For Meister (1998, p. 15), a model of networked learning reinforces that "the decisive competitive differential lies in the level of training [...] of its employees, suppliers, customers, and even members of the communities where they operate ".

Margherita and Secundo (2009) support with this line of thought, pointing out that the contemporary format of a Corporate University requires strategic alignment beyond the limits of the Organization, since the extended operation established by the globalization of business imposes the provision of networked learning. In this new social characterization, the permeability of knowledge permeates organizational borders under the purpose to reach all parties involved and concerned, namely, the so-called stakeholders.

Thus, it is necessary the implementation of new corporate education systems recognize and integrate the stakeholders to the educational process, not only as production partners, but mainly in the development of a learning network. To this end, to define the educational programs and related courses, one should consider dynamic networked learning spaces, including employees, suppliers and customers, but also, that are recognized academic universities, and the participants of the productive and social arrangements of the organizational ecosystem (Freire, Dandolini, Sharma, Trierweiller, Silva, Sell, & Steil, 2016).

One of the most recent documents on the corporate University theme registered in the Scopus database is the article by Freire et al. (2016A). The article builds the identity model of the Networked Corporate University (NCU), from the Stakeholder University model of Margherita and second (2009), considering the guidelines for the deployment of authors such as Allen (2002), Dealtry and Rademakers (2005), Abel and Li (2012), Freire et al. (2016), Pacheco et al. (2015), and, finally, Antonelli, Cappiello and Pedrini (2013).

Among points that are still to be explored by science, for the best configuration of a networked corporate university model, one can point to a specific challenge related to the network learning

characteristics required by the Knowledge Society, which is the recognition and inclusion of stakeholders in the educational process of corporate universities. So how to create this learning network by promoting the inclusion of stakeholders in the educational process of corporate universities?

It is known that the effective inclusion of geographically dispersed individuals and groups depends on the use of technologies. The technologies play a key role (Cifuentes, 2016) and are decisive for the consolidation of an inclusive system, for its inexhaustible possibilities of building resources that facilitate access to information, curriculum content and Knowledge in general, on the part of the diversity of people interested (Giron, Poker, & Omote, 2012) in creating a Collaborative Learning Network (Fu & Hwang, 2018).

Following this line of thought, it can be considered that the new models of corporate university, such as SU and NCU, who want to offer educational programs to individuals and groups internal and external to the organization, are directly dependent on tools that facilitate the effective approximation of all the participants of the organizational ecosystem for the formation of the network learning. Or rather, they are dependent on inclusive, integral and interactive technologies as strategic drivers of the intermediation of dialogue between the corporate university and the stakeholders of the organization of which they are part (Freire et al., 2016a).

It is in this context of advancing approaches on the corporate education system that the purposes of using new technologies by corporate University models should be investigated. Therefore, this article aims to identify the purpose of the use of technologies by the contemporary models of corporate University: Stakeholder University (SU) and the Networked Corporate University (NCU).

To do this, a systematic search is done on the main electronic bases of scientific documents, categorizing studies from the revised Bloom's Taxonomy by Anderson, Krathwohl and Bloom (2001), which allows discerning the main purposes of use of technologies. Therefore, the relevance of this research is justified by the topicality of the discussion in addressing technologies as facilitating tools of one of the newest corporate education systems proposed by the scientific literature: Networked Corporate University (NCU), or, the Corporate University in Network (CUN) (Freire, 2017a; Freire, 2017b).

This paper is structured in sequential sections based initially on a theoretical reference, which includes the discussion of corporate learning and the Networked Corporate University (NCU). In the following, the methodological procedures of the systematic search are presented, considering the key terms and the research bases. Then two analyses are presented, one bibliometric and one descriptive. In the Bibliometric analysis the resulting portfolio highlights the initial perceptions about the main articles in the area. And in the descriptive analysis, the articles are discussed and characterized in a classification based on the objectives of the technologies for the corporate University. Thus, expectations are described in relation to the NCU theme and technologies, ending with the identification of the identified gaps.

Theoretical Reference

Corporate Network-based Learning

Today, the base generating the wealth of nations is made up of its social organization and its creator knowledge. In this environment, the Corporate University (CU) appears as a subject of interest, mainly in companies concerned with competitiveness (Eboli, 2010).

In this context, it is interesting to understand the evolution of corporate learning until the emergence of the CU concept. For this, Margherita and second (2009, p. 178) frame the models of corporate learning in three stages: (1) "Education and training; (2) Corporate education; and (3) network learning".

The first stage, according to the authors, begins in 1920 and has as characteristic the instruction of the employees as to the improvement of the skills to perform operational functions. Thus, considering this first stage as the origin of CU, it originates in the training and development centers (T&D).

Stage 2 begins to emerge in the late 1950, with the first corporate education centers of General Motors and McDonald's. In addition to the operational training, these centers had as main objective to align the operation of the business with the organizational strategy (Margherita & Secundo, 2009)

Still in these authors' view, the beginning of Stage 3 happens when, in the 1970s, the need to go beyond the T&D, developing capacities, skills and operational attitudes, tactics and strategic, emerge programs as Total quality, Development of leadership and professionalization of the supply chain. Thus, corporate education has evolved into the Corporate University configuration.

Since then, some models have been created and have evolved the terms of learning and corporate university. One of the most recent is precisely Margherita and Secundo's (2009), with the Stakeholder University (SU).

In their model (Figure 1), the authors bring the idea of four archetypes: 1) Department of Training; 2) e-learning platform; 3) Corporate University; and 4) Stakeholder University. Thus, learning evolves from a departmental level to the stakeholder University, where learning is networked and has as its main characteristic the high degree of interconnection and collaboration among stakeholders, establishing an environment conducive to Value creation. These stakeholders include the employees, suppliers, and all participants in their collaborative Learning Network (Fu & Hwang, 2018).

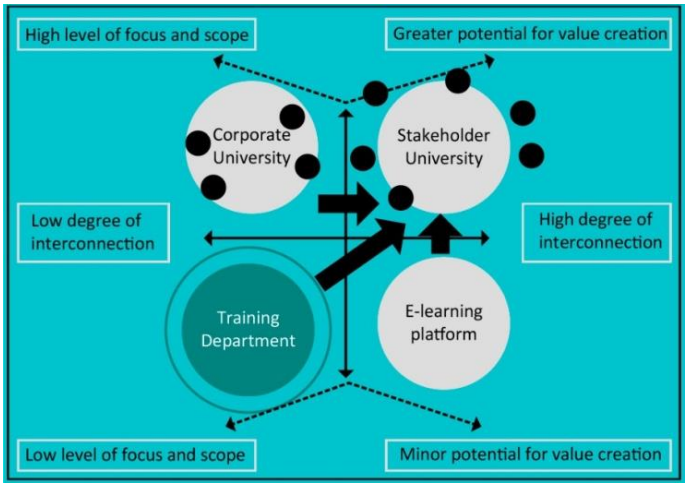

Figure 1 - Archetypes of corporate learning and value creation potential
Source: Margherita & Secundo (2009, p. 174).

The University Stakeholder therefore is characterized by three determinants (Margherita & Secundo, 2009; 2011):

1. Strategic alignment: strategic objectives of development of human capital, through a tight integration of research, skills development and knowledge management. As a result, the learning and development strategies should be constantly aligned to business strategy;
2. Extended Network: extended involvement of a wide range of stakeholders, recognizing the centrality of social capital development and inter-organizational relationships, in addition to human capital; and
3. Networked Learning: networked learning process, creation of knowledge and innovation based on relationships and interactions among stakeholders, through a new generation of collaborative technologies work and learning (Fu & Hwang, 2018).

Finally, for a CU to reach the Stakeholder University level (SU) it needs to build essential characteristics of its identity on networked learning, denouncing the demand for a Networked Corporate University (NCU) (Freire et Al., 2016). This model NCU aggregates to SU, two (02) other approaches of knowledge management, which were dealt with the perception of: (1) NCU as a memory-forming unit; and (2) knowledge engineering strategy for the exploitation of the NCU. This discussion is, though, detailed in the next section.

Networked Corporate University

With the significant change in relation to the outdated Training and Development Center (T&D), until attaining the Stakeholder University model of Margherita and Secundo (2009), the CU has reached a level of networked learning that is present through the plurality of involved entities. That way, each of the models offered by the academy, is thinking about the degree of cooperation that must build between

traditional and corporate universities (Freire et al., 2016a). Even more, according to EBOLI (2010), the organizations implementing the principles inherent in CU are creating a continuous learning system.

One of the latest approaches to the NCU (Freire et al., 2016a, Freire, Dandolini, Sharma, & Silva 2016b), that integrates with concept of networked learning, representing, in this way, the most advanced stage of corporate education system.

With the goal of strategic alignment between all stakeholders – internal and external participants and beneficiaries of productive and social clusters – of the organizational ecosystem, the NCU can be defined as an intelligent environment of continuing education, not necessarily in a physical environment, which manages and institutionalizes a networked learning culture. As such, its concept is based on the theories of the Social Constructivism (Vygotsky, 2007), Organizational Learning (Crossan, Lane, & White, 1999) and Andragogy (Knowles, 1973; 1990), using practices, techniques and tools of Knowledge Management and Engineering.

The NCU model includes in its programs all the involved in its collaborative network, pluralizing the actors concerning the acquisition, creation, transmission and sharing of knowledge in the different organizational levels: operational, tactical and strategic.

According to Freire et al. (2016a), the NCU advocates guidelines able to promote collective learning of knowledge essential to the success of the organizational strategy, in all its structural levels. NCU guidelines are:

1- Level Activities Involved (Allen, 2002);

2- The program's strategic focus (Dealtry & Rademakers, 2005);

3- Strategic focus of UC (Margherita & Secundo, 2009);

4- Archetype of UC (Margherita & Secundo, 2009);

5- UC factors (Abel & Li, 2012);

6- Comprehensiveness of the content Offered (Antonelli et al., 2013);

7- Knowledge management (Pacheco et al., 2015).

Among these, stands out the fourth guideline-Archetype of CU-derived of Margherita and Secundo (2009), which determines be you one of the drivers for the model reaches the high level of cooperation of the archetype Stekeholders University.

The first, the archetype of the "Personnel Department" has low use of collaboration technologies and, thus, is characterized by the lack of interconnection. Already the archetype "E-learning" is based on distance education technologies, with the aim of increasing the number of actors and the interaction between them, without impacting costs. Get greater flexibility and compatibility with work schedules, facilitating the training and the development of appropriate skills. The archetype "Corporate University" encompasses a range of supported learning initiatives at different levels of technologies; and some of the features the search for medium to high degree of interconnectivity, using knowledge management and distance education technology. The archetype "Stakeholder University" is characterized by high interconnection and embraces a wide range of stakeholders to use the "networked learning", based on engineering and media technologies of knowledge, which encourage collaboration in relationships and interactions of the authors.

With respect to the fifth guideline set by Freire et al. (2016a), based on Abel and Li (2012), among the priority factors for the CU, grouped by an empirical survey by the authors, the factor "technology to support learning" refers to programs to support learning through online technologies (EAD) and utilizes comprehensive learning management systems. Still on the search for Lui Abel and Li (2012), it was found that most of the CUs, for they surveyed, uses the technology in its operations. However, CU needs to identify the applicability of these processes to their own operations and in the context of its partner organizations.

According to Freire et al. (2016a), knowledge management (GC) adds two important focuses for NCU: first, the perception of NCU as a memory-forming unit; and, second, the knowledge engineering strategy for the exploitation of the NCU (Chu, Hwang, & Tsai, 2010). There are many terminologies relating to the organizational memory, specifically one as the notion of "repository", so the image memory store is widely accepted for literature of organizational memory systems, and also to the area of information systems. (Rowlinson, Booth, Clark, Delahaye, & Procter, 2009).

In this way, the guidelines brought by Freire et al. (2016A) also seek to form the memory of the Learning network. For this, it uses Knowledge Engineering (KE) tools for the instrumentalization of NCU.

The KE appeared in the 1960s with Artificial Intelligence, specifically with the development of specialist systems (Durkin & Durkin, 1998). Currently, it aims to provide methods and techniques to develop knowledge-based systems in a controllable and systematic manner (Schreiber, 2000; Studer, Decker, Fensel, & Staab, 2004).

Within the framework of NCU, Knowledge Engineering can be used with six objectives (Table 1):

Table 1 - Objectives of the Knowledge Engineering within a NCU

1	To guide the identification of the knowledge which is critical for the UC and the stakeholders that make up the organizational ecosystem.
2	To support the process of capturing, representing and structuring the knowledge which is critical for the CU and its network.
3	To define the strategies for the application of the technologies to support the activities of the CU and its stakeholders.
4	To guide the practices and techniques of intra- and inter-organizational communication for the sharing and dissemination of acquired knowledge.
5	To establish knowledge systems to support the processes of creating, sharing, structuring, disseminating and utilizing of knowledge in the organization and in the stakeholders that form the networked CU.
6	To support the implementation of the Knowledge Governance, which includes the Learning and Leadership Governance (Lui Abel & Li, 2012)

Source: Freire et al. (2016a).

According to Freire et al. (2016a), the KE proposes to meet the six objectives, depending on how strategically aligned the company is. For example, if the T&D area works as a training department, the KE

will only meet the objective of guiding the identification of the critical knowledge to be acquired. And the more the organization's corporate education system approaches the networked learning strategies, the more the KE will meet the six objectives described in Table 1.

In addition, Freire et al. (2016a) argue that by taking over the collective memory and knowledge engineering (Chu, Hwang, & Tsai, 2010) in the structure of elements of NCU, it is observed that the technology is related to the following guidelines of NCU: to form a computerized base with the expertise and knowledge produced by the stakeholders in the processes that permeate the organizational activities; and to align the application of the technologies according to the needs of the processes of knowledge management, at all levels of interaction between the stakeholders that form the NCU.

Finally, in Figure 2 the model proposed by Freire et al. (2016a) is presented which is structured in five levels. The first level, according to the authors, has the task of responding to the CU strategic issues that should be deployed and the task of defining the internal and external stakeholders. The second level refers to decision-making regarding all guidelines.

The third level requires the continuous check of the NCU operation as to: (1) The strategic alignment of promoted collective learning and the organizational strategy; (2) The development of social capital and interorganizational relationships; and (3) The offer of collaborative technologies of work and network Learning (Fu & Hwang, 2018). In the following, the fourth level gives attention to the demand of the Knowledge Society (Yeh, Huang, & Yeh, 2011) and at the fifth level there is the formulation of the identity of the NCU.

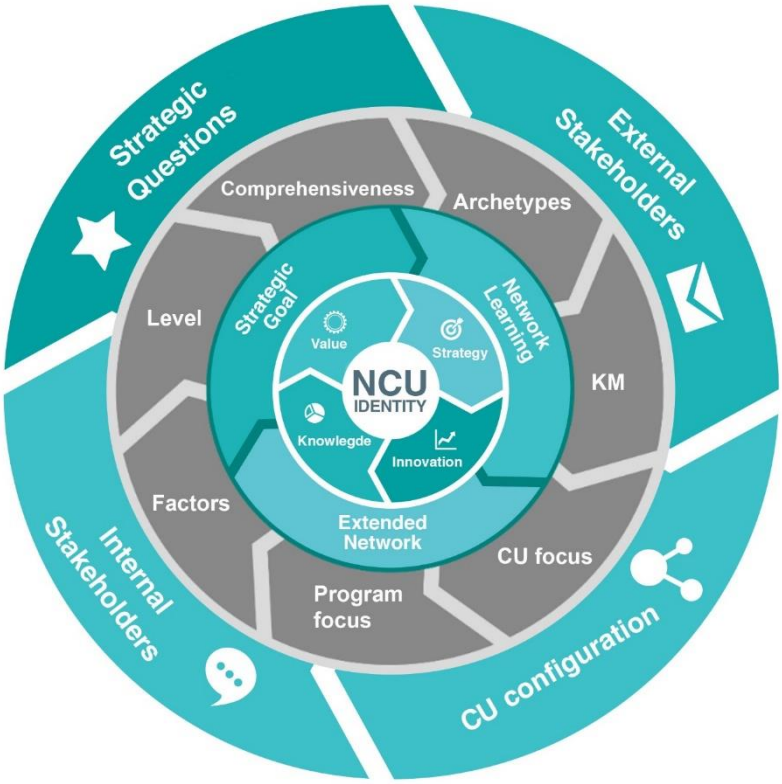

Figure 2 - Networked Corporate University Model Guidelines

Source: Freire et al. (2016a)

Methodological Procedures

To meet the goal of identifying the purpose of the use of technologies by contemporary models of corporate University (Stakeholder University and Networked Corporate University (NCU)) it was developed a descriptive exploratory research by using an integrative review (Beyea & Nicoll, 1998). The methodological approach is evident as quantitative Bibliometric analysis; and, also, qualitative, descriptive analysis on the goals and purposes of the documents raised.

Thus, the review carried out an analysis of existing scientific knowledge on the topics "Corporate University" and "technologies". The steps take place sequentially from the definition of the topic, elaboration of the research Question; search on electronic bases, based on sampling; criteria for categorization of studies, data filtering; the review included studies; discussion of the result; and, finally, the presentation of integrative review.

From the goals and key question, the English terms "corporate university" (or, in the plural, "corporate universities") were defined as search words, and the necessary filtering to approach the theme and goals set was carried out. The definitions of the search strategies were established in: (1) in the search fields; (2) filtering; and (3) previous results as described:

1) Search Fields: the survey was conducted on the basis of SCOPUS, the largest database of summary and citations of scientific papers (Falagas, Pitsouni, Malietzis, & Pappas, 2008). The search fields were the article title, abstract and keywords. The terms set out for the fields are key concepts for "Corporate University", establishing the search strategy: TITLE-ABS-KEY ("corporate universit *"), and 235 related articles were retrieved.

2) Filtragem: Não houve necessidade de filtragem durante a busca. A filtragem ocorreu apenas no gerenciador de bibliografias pela busca por: “tech*”, a fim de encontrar termos relacionados à tecnologia. 2) Filtering: there was no need for filtering during the search. The filtering occurred only in the bibliographies manager by the search for: "tech *", in order to find terms related to technology.

3) Previous results: in total, 235 articles were published between 1983 and 2016, – with an average over the number of published in 2007 – of which, 100 documents between 1983 and 2007; and 135 between 2007 and 2016, which highlights the timeliness of the topic, since, in the last decade, there are already more documents than in the 25 previous years.

The search portfolio documents were exported to the bibliographies software manager EndNote®.

Results Analysis

After the survey, the data of the documents of the portfolio were extracted for Bibliometric analysis and descriptive. The Bibliometric analysis was performed with use of software Science of Science (Sci ²), Gephi and Google Fusion. For the descriptive analysis were exported the data: title, author, year, and summary to a worksheet. The reading of the data was accompanied by the separation of the relevant data in the worksheet, whereas methodology and content. The content has been reviewed, in accordance with the goals set forth previously, being: purpose of the article, tools, purpose of use, technologies, concepts,

results, limitations and future works. After the separation of data and comparison of articles, generic findings were removed and treatment section-specific results.

The following are the results of the descriptive and bibliometric analyses.

Bibliometric Analysis

From the defined procedures, the portfolio resulting from the bibliographic survey obtained 235 documents, being: 132 articles, 32 revision documents, 29 conference articles, 24 book chapters and 10 books. The other documents: editorials (three documents), printed articles (two documents), notes (two documents) and questionnaires (one document) add up to eight documents, according to Figure 3.

In Figure 4, the subject areas are presented. The number of areas covered in the portfolio already shows the multidisciplinarity of the theme, Social Sciences having the largest number of documents (39.1%); followed by the area of Companies, Business and Accounting (21.3%). However, it is also possible to understand the interdisciplinarity of the themes, and the portfolio presents 235 documents and the sum of documents in all areas reaches 348. This is because some documents are suitable for two or more areas.

However, in the area of Computer Science only 5.7% documents about CU are included in this field. This data represents the research deficit that involves Computer Science and consequently computational technologies for Corporate Universities.

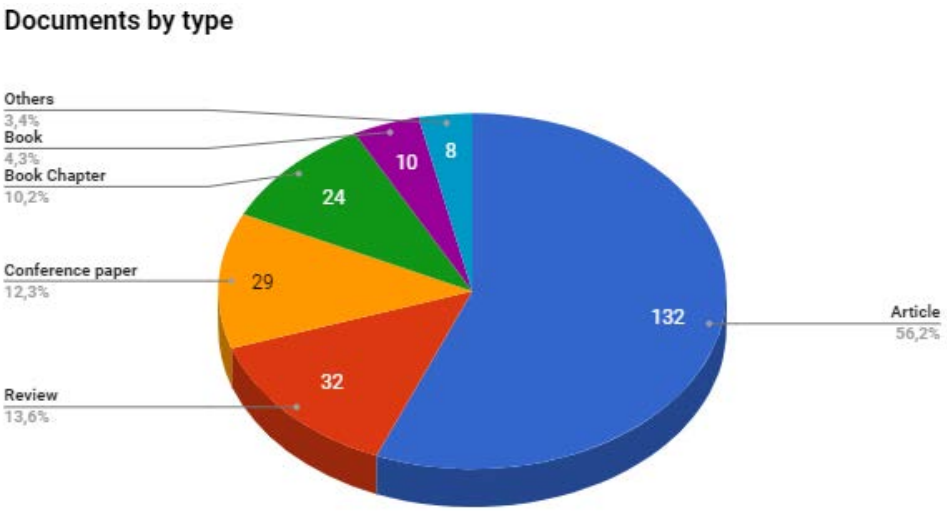

Figure 3 - Document by type

Source: Prepared by the authors, based on the research data.

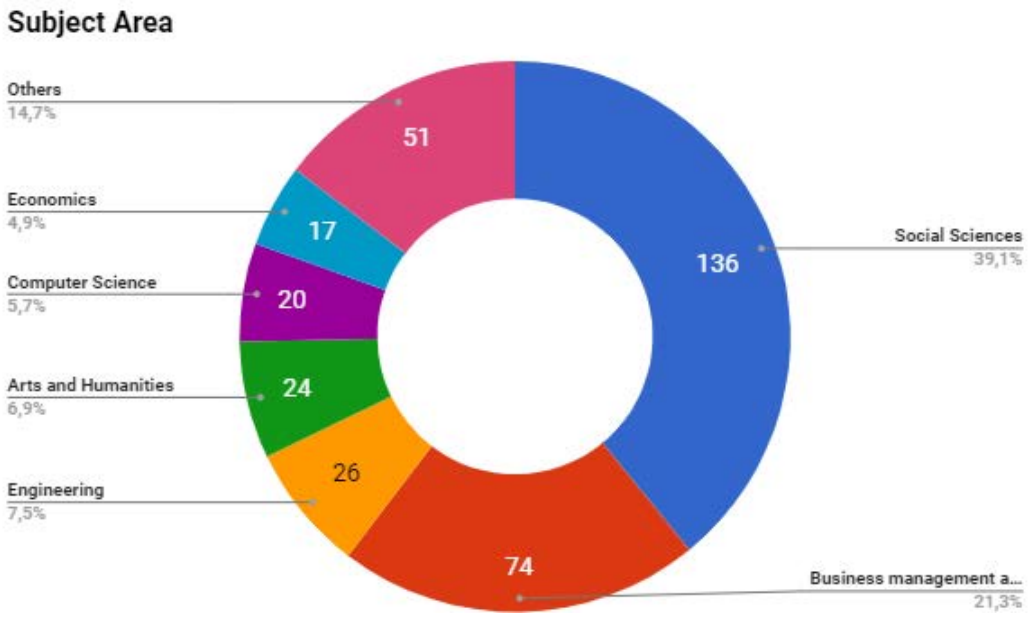

Figure 4 - Documents by subject area

Source: Prepared by the authors, based on the research data.

From Figure 5, it is possible to notice a breakthrough in the amount of documents per year, the rise beginning in 2000 and with the peak in 2005, and a significant decrease in the following year, but rising again in 2008 and, in recent years, maintaining stability. The data of 2016 are not complete, as the portfolio presents documents available on the basis only until the first quarter of 2016.

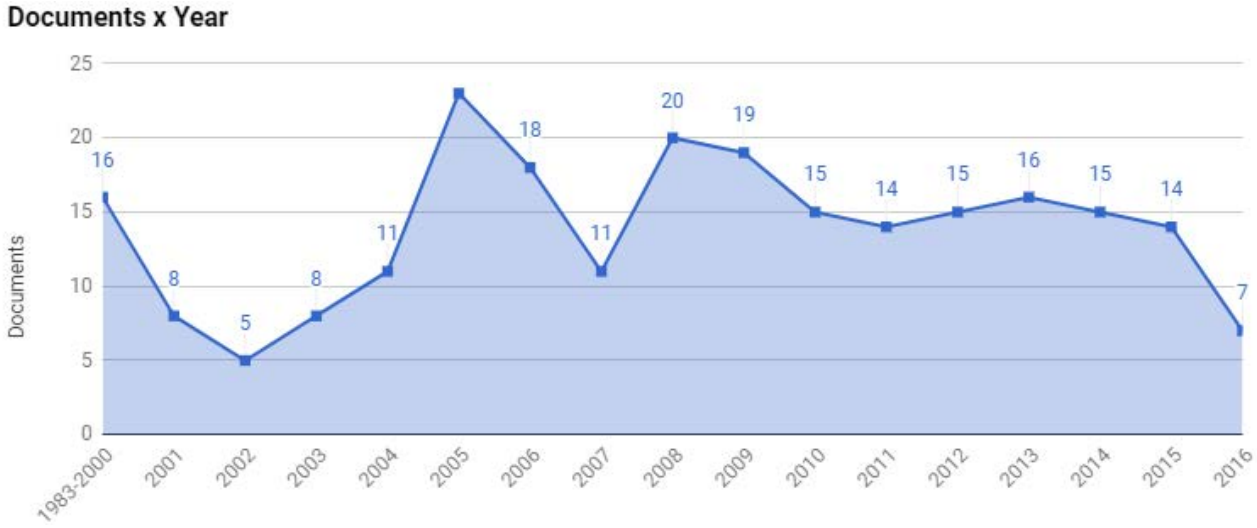

Figure 5 –Documents per year

Source: Prepared by the authors, based on the research data.

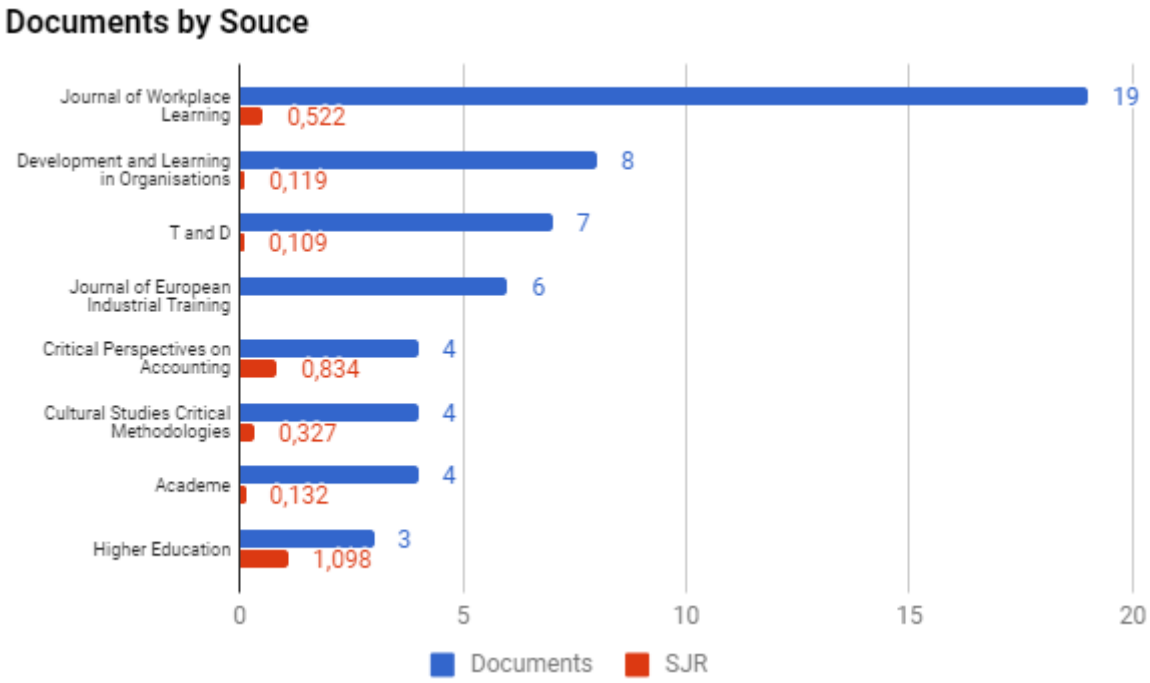

Figure 6 - Documents by source and its SJR index

Source: Prepared by the authors, based on the research data.

In addition to the documents by source and its SJR index (Figure 6), in which the leadership of the Journal of Workplace Learning is observed, a mapping of documents by country is presented from the Figure. In this mapping, the highlight is the English-speaking countries in order of classification: United States (70 documents) and United Kingdom (28 documents), followed by Australia and Canada, with 19 documents each. Brazil is the fifth with the largest number of documents in the area with 9 documents, ahead of Germany and Italy, both with 6 documents each. But still, it is possible to perceive a greater popularization of the research of the Corporate University in the more developed countries.

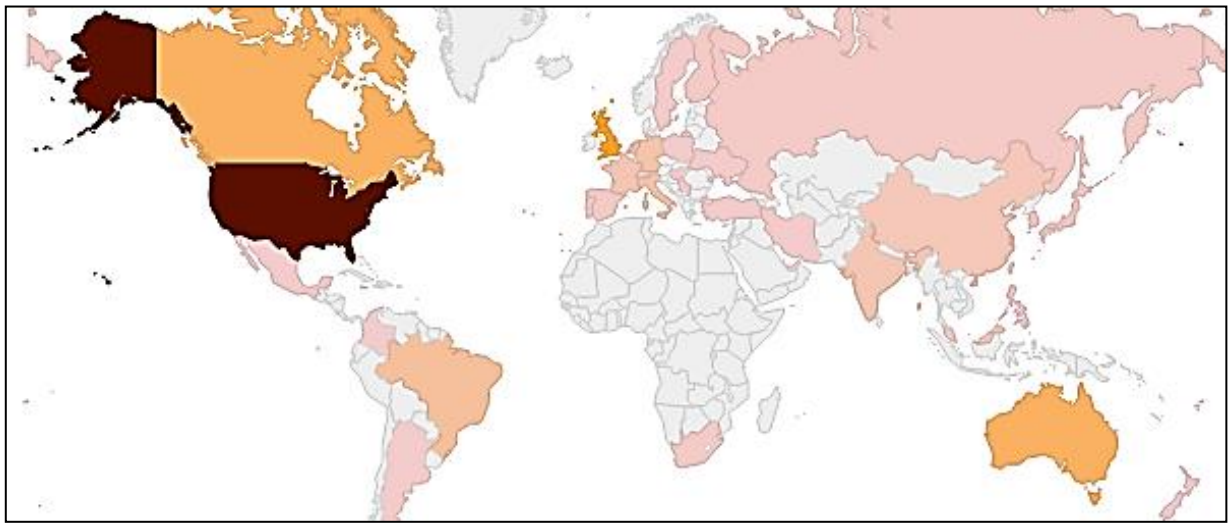

Figure 7-Publications by country

Source: Prepared by the authors, based on the research data.

From the analysis of the portfolio, the highlights of the set were identified according to the amount of quotations and/or documents. Initially, the authors' main institutions of affiliation are identified, and highlighted by the amount of documents. The Figure 8 represents the amount of documents by size of the sphere and also by the colors: green, orange and red, respectively: larger, medium and smaller amount. For the analysis, institutions with less than three articles were removed.

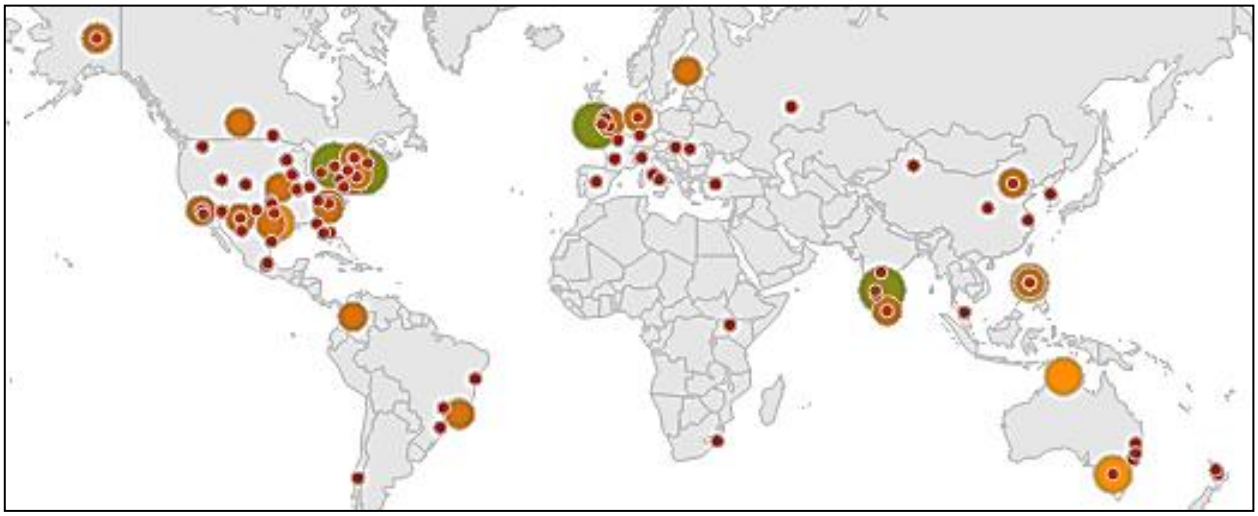

Figure 8 - Publications by authors' institution of affiliation

Source: Prepared by the authors, based on the research data.

The institutions with the largest number of articles published in the area are "Intellectual Partnerships Consulting Limited" (5 documents), "Swansea University" (4 documents), "Manchester Metropolitan University" (4 documents), "York University" (4 Documents) and "Indira Gandhi National Open University" (4 documents).

In Brazil, 30 authors have documents in the area. The authors are affiliated with nine different institutions, being Federal University of Rio de Janeiro, Rio de Janeiro State University, and Petrobras, with two documents each; and University Center Augusto Motta - UNISUAM, Severino Sombra University, São Paulo State University - USP, Federal University of Goiás, Federal University of Santa Catarina and Santa Catarina State University, with one document each. The types of documents are: journal articles (4 documents), conference articles (4 documents), and a book chapter

The main sources of these Brazilian documents on the theme are: "Revista Espacios", with two documents, "International Journal of Knowledge Culture and Change Management", "Proceedings of the Annual Offshore Technology Conference", and "Revista Brasileira de Gestão de Negócios", with one document each.

Continuing the portfolio analysis, Figure 9 presents the variation of the most cited documents: Grey (2001), Lawrence and Sharma (2002), Castree (1999), Keskin and Metcalf (2011), and Buchbinder (1993). In addition to these, two documents that have gained notoriety in the last 5 years are included: Boyce (2004) and Zammuto (2008)

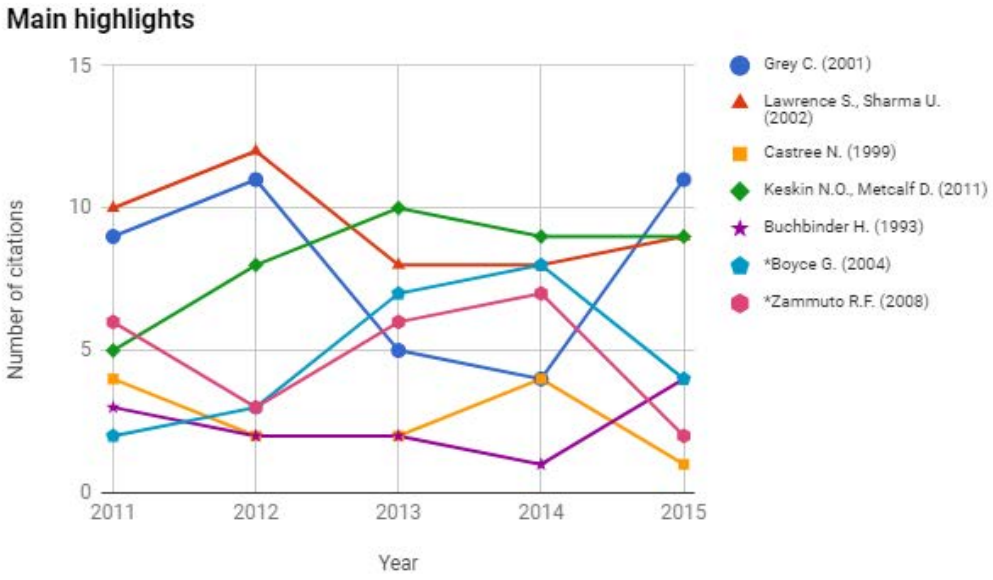

Figure 9 - Documents highlighted by the number of citations

Source: Prepared by the authors, based on the research data.

In relation to the network of cooperation between authors, it is possible to notice small communities formed. For reduction, only authors with three or more articles were considered. Figure 10 highlights the nodes by the amount of documents of each author; the width of the edges identifies a greater approximation between the authors, and the authors represented by purple nodes have a greater network of cooperation, not necessarily fully presented.

In this analysis, Dealtry, R. is the author with the highest number of documents, but with a small cooperation network. Already the authors Storey, J. and Taylor, S. have, mutually, the largest cooperation network.

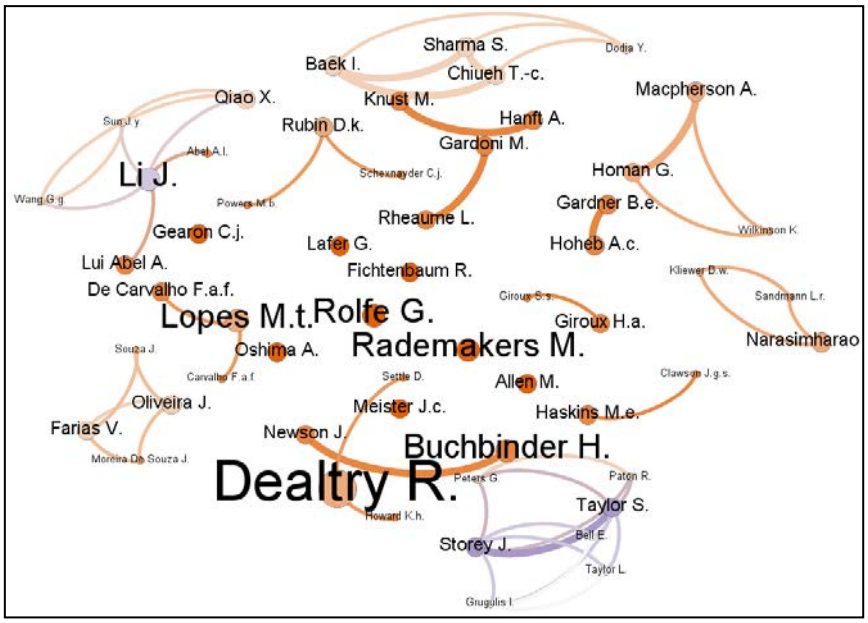

Figure 10 - Cooperation network between authors

Source: Prepared by the authors, based on the research data

Descriptive analysis

After the quantitative data analysis, the portfolio was qualitatively analyzed to explore the highlighted themes and topics, which portray the purpose of the use of technologies by the contemporary models of corporate university. In addition, a comprehensive analysis was carried out, categorizing the articles for the purposes of the use of the technologies. For this categorization it was used the revised Bloom's taxonomy (Anderson et al., 2001), which structure the cognitive process in six dimensions: (a) remember; (b) understand; (c) apply; (d) analyze; (e) evaluate, and (f) create. The categorization considered the action verbs used by the authors of the documents selected to define the interaction of stakeholders with technology at the Corporate University. Table 2 presents a synthesis of the main technologies found in the research portfolio.

The dimension (a) "**Remember**" is related to the relevant knowledge recovery processes such as facts and basic concepts (Krathwohl, 2002), with the purpose of recognizing and remembering. Cranch (1987) described the importance of integrating technologies into approaches involving hybrid activities between the corporate education system, the university, and the government.

After the beginning of the discussions on the integration of technologies, the "**remember**" dimension is the most addressed among the articles, in particular the virtual electronic learning environments and repositories. In Crocetti (2001), Learning Management systems (LMS) are considered as elements of the framework.

Among the researches on the use of electronic learning systems, Macpherson, Homan and Wilkinson (2005) observe a series of lessons learned by the "pioneers of corporate e-learning", including the evolution of the programs and the need to create an "organizational readiness". However, Macpherson et al. (2005) Consider that the advantages of an "on-line" pedagogy are not yet fully exploited, either by the limitations of technology or by other strategic priorities. Since then, several initiatives that make up e-learning as a base, integrate other technological elements, such as: user-centric design (Zachry, Cook, Faber, & Clark, 2001); dynamic learning networks (Romano & Second, 2009); and multiplatform access (Keskin & Metcalf, 2011). These cases are some of the topics discussed as being a differential for e-learning platforms.

The dimension (b) "**Understand**" is understood as a determination of meanings, which occurs by instructional messages such as oral, written and graphical communication. Therefore, there is an explanation about the possibilities of use of the material or ideas communicated, but not necessarily a relationship of implication for other materials. Therefore, the interpretation, classification, synthesis, selection and comparison, among others, are the purposes at this level (Krathwohl, 2002).

Table 2 - Classification of technologies by purpose

PURPOSE	TECHNOLOGIES	Authors
(a) Remember	E-learning	Crocetti, 2001; Mühlhäuser & Trompler, 2002; Gardner & Hoheb, 2005; Gould, 2005; Homan & Macpherson, 2005; Macpherson et al., 2005; Senthil Karthick Kumar & Md. Zubair Rahman, 2015
	Virtual Education programs	Luna-Amaya et al., 2016
	User-centered design	Zachry et al., 2001
	Dynamic Learning Networks	Romano & Secundo, 2009
	IT-based Human Resource Development (HRD)	Oshima, 2008b; a
	Multiplatform access	Keskin & Metcalf, 2011
	Technologies	Cranch, 1987
(b) Understand	Interaction strategies	Huijun & Fusheng, 2011
	Knowledge Media	Clinton et al., 2009
(c) Apply	Recommendation Systems	Allaho & Lee, 2014
	Ontologies	Farias et al., 2009
	Knowledge management and individual skills	Zuber-Skerritt, 2005
	Real-Time Learning Systems	Dealtry & Settle, 2005
(d) Analyze	Competitive Intelligence	Camelo et al., 2013
	Sector Learning Communities	Selby & Russell, 2005
	Social Networks	Smith, 2005
(e) Evaluate	Simulation and gamification	Freund & Mustaro, 2016
	Virtual Business School	Pantovic et al., 2008
	Computer-Supported Collaborative Learning (CSCL)	Sheremetov & Romero-Salcedo, 2003
(f) Create	Team-formation algorithms	Caetano et al., 2015
	Knowledge communities	Martin, 2011
	3D Learning Environments (3DLE), Personal Learning Environment (PLE), and Cloud Computing space	Elia & Poce, 2010
	Real-time multidisciplinary co-creative environments	Dealtry, 2005
	Project Characteristics for the CUs	Jansink et al., 2005
	Distance education and knowledge media proposed by the SU	Margherita & Secundo, 2009
	KM and KE tools proposed by the NCU	Freire et al., 2016

Source: Prepared by the authors.

At a next level is the dimension (c) "**Apply**", which refers to the abstractions of information in new, particular and concrete situations (Krathwohl, 2002). The research of Zuber-Skerritt (2005) provides a model for the development of record management of knowledge and individual skills. Such a model

presented is then composed by values and principles of research on the culture of an active learning and research-action. In relation to real-time learning systems, Dealtry and Settle (2005) suggest the application to quality control programs.

In this dimension of **application**, the registration and the representation of knowledge collaborate for the purpose of organizational performance, as presented by Farias, Oliveira and Souza (2009), which use ontology, in order to identify, share and present the Different knowledge of the stakeholders. Allaho and Lee (2014) also discuss the application of knowledge aided by a system of recommendation

In dimension (d) "**Analyze**", there is an explanation of the connections between ideas, because a "collapse" of communication in its constituent elements or parts for a general purpose (Krathwohl, 2002) occurs. Analyzing is one of the principles of competitive intelligence, which camel, wheat, Quoniam and Cardoso (2013) discuss as a guide to the studies of the stakeholders and perception of a broader view of organizational knowledge.

The analysis from the communities is also the research focus of Selby and Russell (2005), in which the authors identify them as "Sector Learning Communities". In their research, the chain of partners, educational institutions, students and the organizations integrate their knowledge into a dedicated web environment, called "Digital Media U" (DM-u). Research involving practice communities also seeks information from social networks. As Smith (2005), who examines the way networks, socialization among stakeholders, self-organizing systems and thought systems have influenced the communities of practice within the communities of competence, in addition to accompanying the Adaptability among the participants.

In dimension (e) "**Evaluate**" occurs a trial of the solution for certain purposes, beginning from criteria and standards (Krathwohl, 2002). This enables the individual to evaluate the initiatives as in gamification dynamics, thus addressing Freund and Mustaro (2016), which discuss the use of simulators in the most practical training, enabling the stakeholder to evaluate their actions and decisions.

Finally, it is in the dimension (f) "**Create**" that a junction of rearranged elements occurs in order to think of a functional whole (Krathwohl, 2002), there is then the production of a new or original work. In order to stimulate this creation, some authors address in different ways the synergistic interaction between the stakeholders during the joint formation. Caetano, Ferreira, Camilo-Junior and Ullmann (2015) study algorithms that help to form complementary teams in knowledge, to learn from each other. As well as Martin (2011), it presents the dynamics of the even virtual knowledge communities.

Elia and Poce (2010) discuss the relationship of Mobile Learning Environments (MLE) and 3D Learning Environments (3DLE) to a personalized environment (Personal Learning Environment – PLE), using cloud computing in a framework called "Future Internet Framework". The scope of this framework represents the key technologies of the moment, in a customized integration for the user.

The model described by Jansink, Kwakman and Streumer (2005) features 11 design features that collaborate for corporate universities to be knowledge-producing. Dealtry (2005) presents a model with the objective of providing a prospect of advancement on multidisciplinary environments in real time ("real-time co-creative multidisciplinary environments"), which discusses infrastructure and sets of transferable skills, which enable new solutions for organizations.

The creation of new knowledge is perceived as the main product of the corporate university, from Margherita and second (2009) and Freire et al. (2016A). The SU model includes technologies of distance education and knowledge media; the NCU model demonstrates the interaction between stakeholders through the engineering and knowledge management tools, in a discussion involving the entire stakeholder network. In these models, technologies are fundamental mediating elements for the knowledge integration, obtaining, as a result, new knowledge.

Conclusion

Corporate universities represent a significant principle for innovation in organizations and the constant search for competitiveness. However, by analyzing the role played by technologies in the contemporary models of corporate university it is clear that resources are underutilized as merely communication tools, which are still little explored in order to provide a really collaborative and creative space.

This is because the subject of virtual environments and distance education is constantly explored in different perspectives for their ease of use and integration, without transcending their application to the development of network interaction.

Therefore, a structuring of the corporate university needs to explore new relationships with the expectation of generating value. Thus, other possibilities of the technologies are highlighted in the research with the greater purpose of generating knowledge.

Although new cognitive technologies and educational paradigms assist in the process, even common technological tools already allow the interaction between knowledge, in particular those that promote the virtual environment as a convergence of collective knowledge. This is perceived in the creation of interinstitutional teams and the tendency to develop interdisciplinary communities. Thus, the evolution of the models highlights not only a transfer or sharing of knowledge, but the need to generate new knowledge as the essence of innovation.

Given this, the objective of this research was to identify the purpose of the use of technologies by the contemporary models of corporate University: Stakeholder University and the Networked Corporate University (NCU).

For this purpose, a descriptive exploratory research was developed by means of an integrative review (Beyea & Nicoll, 1998). The methodological approach was quantitative, with bibliometric analysis, but also qualitative, with descriptive analysis of the objectives and purposes of the documents raised. From the objectives and key question, were defined as words of search the terms in English "corporate university" or, in the plural, "corporate universities", carrying out the due filtrations to approach the subject and established objectives, all previously explained in this work.

From the identified documents, there was a great ancestry of current studies in the area, since in the last decade there are more documents than in the previous 25 years. It was also identified that the research is related mainly to the areas of knowledge of the social sciences (39.1%) and of companies, business and accounting (21.3%). On the other hand, in the area of Computer Science, only 5.7% of the documents on

Corporate University (CU) are included in this field, representing the deficit of research that involve computer science and, consequently, the computation technologies for the CUs.

As for the mapping of documents by country, it was found that the United States takes the lead (with 70 documents), with superior performance to the UK (with 28 documents), followed by Australia and Canada, with 19 documents each. Therefore, it is possible to perceive greater popularization of research in the more developed countries.

The institutions with the largest quantity of articles published in the area are "Intellectual Partnerships Consulting Limited" (5 documents), "Swansea University" (4 documents), "Manchester Metropolitan University" (4 documents), "York University" (4 documents) and "Indira Gandhi National Open University" (4 documents).

As for the documents highlighted by the number of citations, Grey (2001), Lawrence and Sharma (2002), Castree (1999), Keskin and Metcalf (2011) and Buchbinder (1993) gain prominence. In addition to these, two documents are included that have gained notoriety in the last 5 years: Boyce (2004) and Zammuto (2008). When analyzed the cooperation network between the authors, it was found that, although Dealtry is the author with a greater number of documents, he has a small cooperation network. In their turn, authors Storey and Taylor have mutually the largest cooperation network.

After the bibliometric analysis, the portfolio was qualitatively analyzed to explore the highlighted themes and topics, which portray technologies as a tool for a purpose of NCU. An analysis was also carried out to categorize the articles by the purpose of using the technologies

By identifying the characteristics and tools, this research points to these new approaches of technological integration in mediation between stakeholders, which constitute a network interaction with a view to: (a) remember; (b) understand; (c) apply; (d) analyze; (e) evaluate, and (f) create, according to the Bloom's taxonomy (Anderson, Krathwohl, & Bloom, 2001), but especially to generate value, from these relationships.

Regarding the purpose of "Remembering" (relevant knowledge recovery processes), it was found that this is the most treated dimension by the articles identified in the integrative review, in their discussions on the integration of technologies, with a highlight in virtual electronic learning environments and repositories.

In the purpose of "Understanding" (interpreting, classifying, synthesizing, selecting and comparing), the recommendation of Clinton, Merritt and Murray (2009) is highlighted in relation to the careful selection of the media for the transfer of knowledge among the stakeholders, In order to achieve a competitive advantage. In addition to the indication of Huijun and Fusheng (2011) on integration strategies.

Related to the purpose of "Applying" (concerning the abstractions of information in new, particular and concrete situations), it was found that the research of Zuber-Skerritt (2005) provide a model for the development of record management of knowledge and of individual competences. Still, that Dealtry and Settle (2005) suggest real-time learning systems, and that would, Oliveira and Souza (2009) use ontologies.

In the purpose of "Analyzing", the authors suggest the learning communities, social networks and competitive intelligence.

Concerning the purpose of "evaluating" (judgement of the solution for certain purposes, beginning from criteria and standards) were identified the technologies of gamification, simulators, virtual business school and collaborative learning.

In the purpose of "Creating", the technologies of: algorithms, dynamics of the knowledge communities, mobile learning environments and the 3D environments for a custom environment, using cloud computing in a framework called "Future Internet Framework". In addition to the model described by Jansink, Kwakman and Streumer (2005), which have 11 design characteristics, and the model of Dealtry (2005), in which it is suggested the use of real-time co-creative multidisciplinary environments.

Returning to the central objective of this research, it turns out that the purpose of creating new knowledge is perceived as the main product of the Corporate Universities.

In this sense, it is concluded that distance education technologies, the knowledge media, and the management and engineering tools of knowledge emerge as empowering elements of the purpose of "Creating" technologies, to generate shared knowledge, storing them in the form of collective memory, besides promoting interaction and collaborative communication between the multiple stakeholders, in accordance with the models of SU and NCU.

Therefore, as future work, studies are recommended to understand how educational systems can appropriate the use of purposes and diversified technologies in the context of Corporate Universities to promote the knowledge sharing and the effective interaction of the stakeholders involved.

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Enhancement of Chemistry Self-efficacy of Students using Computer Aided Instruction among Secondary school Learners in Kenya.

***[1]Judith Kinya Julius**
*[1]Kenyatta University, P.o Box 43844- 00100, Nairobi, Kenya, Tel: +254-0716984316, E-mail: judithkinya02@gmail.com

[2]Nicholas, W. Twoli
[2]Kenyatta University, P.o Box 43844- 00100, Nairobi, Kenya, Tel: +254-0721451323, E-mail: nicholastwoli@yahoo.com

[3]John, N. Maundu
[3]Kenyatta University, P.o Box 43844- 00100, Nairobi, Kenya, Tel: +254-0721210374, E-mail: maundu.john@ku.ac.ke

N/B *[1] is the Corresponding author

Abstract

Chemistry self-efficacy is to do with desire or confidence to perform well in Chemistry and has been predominantly low among secondary school students in Kenya, and many other developing countries. The study investigated the effect of Computer Aided Instruction (CAI) on Chemistry self-efficacy of students as compared to Conventional Methods (CM). The study adopted Solomon Four- Group, Non-equivalent Control Group Design which emphasizes Quasi Experimental design. A sample of 174 Form Two secondary school Chemistry students in Tharaka Nithi County in Kenya was used. Four schools were purposively sampled and randomly assigned as either Experimental groups or Control groups. The students of the Experimental groups were taught through CAI while the Control groups were taught through Conventional methods on the topics "the structure of the atom, the periodic table and chemical families" for six weeks. Data was collected using Students' Self-efficacy Questionnaire (SSEQ) and was administered before and after exposure of intervention (CAI). Both descriptive and inferential statistics, in particular, t-test and Analysis of Variance was used to analyze the data. The study revealed that, the students taught through CAI obtained significantly higher Chemistry self-efficacy scores than the students taught through CM. Further, the study revealed that girls obtained higher Chemistry self-efficacy scores than their counterpart boys when taught through CAI. Thus, Chemistry teachers, should adopt CAI in their teaching to help in enhancing Chemistry self-efficacy of students, and by extension enhance performance in Chemistry.

Keywords: Computer aided instruction, conventional methods, Chemistry self-efficacy and gender

1. Introduction

Self-efficacy is defined as self-judgment of one's competence to successfully execute a course of action necessary to reach desired outcomes (Bandura, 1982). In Chemistry academic settings, Chemistry self-efficacy refers to students' confidence in their ability to master Chemistry concepts, tasks and activities.

Self-efficacy of students is an important aspect in learning secondary Chemistry as it directs learners to rate their confidence for attaining a specific goal in the subject (Martin, Mullis & Foy, 2008). Bandura (1993) posits that self-efficacy beliefs affect students' learning outcomes by influencing their determinations of interests, choices, efforts, perseverance, persistence and career paths. Kennedy (1996) believes that self-efficacy in science, including Chemistry may affect science learning, choice of science, amount of effort exerted, and persistence in science. Moreover, it predicts initial engagement and in turn, success leads to greater interest and engagement in that task in the future (Diane, 2003). This assertion is supported by Britner and Pajares (2006) who noted that a student with low self-efficacy in science activities, tends to avoid them and more so put less effort when faced with challenging tasks. Therefore, self-efficacy is an important aspect needed for successful learning of Chemistry, and science in general.

The low self-efficacy in learning Chemistry and science in general exists in countries across the world. In United States, for instance, the National Center for Educational Statistics, NCES (2000) reported that the number of students who took additional science courses was considerably lower than the number of students who took at least one year of science in high school.

In addition, only 60% of students took two years of high school science and the percentage dropped to 25% who took three years of science. For advanced science courses, only 6% took Advanced Placement Chemistry. Britner and Pajares (2001) suggested self-efficacy as one potential factor that influence the academic choices of students towards science. In Turkey, Guvercin (2008) reported a decrease in students' self-efficacy beliefs in science from 6th grade level to 8th grade level, in which the 6th grade students had higher levels of self-efficacy beliefs than 8th grade students. This suggested a decline in students' self-efficacy in science as the grade level increased. In Kenya too, low self-efficacy of students in learning Chemistry is a possibility. For instance, Chepkorir (2013), observed that students in Kenyan secondary schools lacked self-confidence in themselves when learning Chemistry. According to Chepkorir (2013), some students could not work out problems they considered difficult without assistance from the teacher. Lack of self-confidence by students is predetermined by low self-efficacy in their ability to carry out Chemistry academic tasks. The low self-efficacy of students, specifically in Chemistry is a concern that need to be addressed.

Additionally, gender gap in Chemistry self-efficacy has consistently been predominant in higher levels of education where the study of Chemistry is not compulsory. Some studies have revealed that from primary school level, female students have lower science self-efficacy as compared to male students (Smith & Owen, 1991; Tippins, 1991). Other research studies have suggested that gender differences in science self-efficacy is insignificant (Chen & Zimmerman, 2007; Kay & Knaack, 2008; Kenney-Benson, Pomerantz, Ryan, & Patrick, 2006). Another study by Britner and Pajares (2006), revealed that the middle school girls had higher science self-efficacy than boys. Literature review of previous study findings regarding to gender self-efficacy in science, Chemistry included, revealed inconsistencies, hence the need for further study.

1.1 Statement of the problem

Chemistry self-efficacy among secondary school students in Kenya has been given minimum attention. While the self-efficacy of students has been recognized as an important affective aspect in Chemistry education, it has received much less attention by researchers than the instructional team. Available researches on Computer Aided Instruction (CAI) have mainly focused on its use in classroom instruction for improvement of students' academic performance with less emphasis on Chemistry self-efficacy, which is one of the main driving force on performance.

1.2 Purpose of the study

The purpose of this study was to investigate effect of Computer Aided Instruction on Chemistry self-efficacy of students as compared with the use of Conventional Methods among selected secondary school students in Kenya.

1.2.1 Objectives

The study was guided by the following objectives:

(a) To investigate the effect of computer aided instruction on Chemistry self-efficacy of students as compared to Conventional Methods.

(b) To establish gender difference in Chemistry self-efficacy of students when taught using Computer Aided Instruction as compared to Conventional Methods.

1.2.2 Hypotheses

The following hypotheses guided the study and were tested at 0.05 level of significance.

$H_0$1: There is no significant difference between Chemistry self-efficacy scores of students taught using CAI and those taught in CM.

$H_0$2: There is no significant gender difference in Chemistry self-efficacy scores of students' when taught using CAI as compared to CM.

2. Literature Review

The confidence to approach learning in an independent manner which promotes the belief in one's ability to execute a given task may invariably lead to enhanced self-efficacy. Bandura (1997) mentioned that student's beliefs about their efficacy to manage academic task demands can influence them emotionally by decreasing their stress, anxiety, and depression. Studies affirms a positive link between self-efficacy and engagement to learning. For example, Zimmerman and Kitsantas (1997), found self-efficacy to be highly correlated with students' rated intrinsic interest in a motoric learning task as well as in a writing revision task. Pajares and Miller (1994) observed that learning skills acquisition enhances self-regulated learning behavior which in turn ensures motivation and confidence as a learner engages in learning tasks. Salomon (1984) also found that self- efficacy is positively related to self-rated mental efforts and achievement during students' learning from text material that was perceived as difficult. Studies have demonstrated a connection between computer-based learning and self-efficacy in elementary and higher science education. For example, Liu and Chen (2013) observed that grade 5 students from elementary school in Northern Taiwan demonstrated effectiveness in learning science when taught through computers.

Similarly, Yien, Hung, Hwang and Lin (2011) observed that computer-game-learning was more effective in enhancing the self-efficacy of students in learning nutrition course. Based on the results of existing research studies, there appears to be a relationship between self-efficacy and computer supported learning in higher and elementary science education (Liu & Chen 2013; Yien, Hung, Hwang & Lin, 2011). However, no research has yet established a firm connection between computer-aided instruction and self-efficacy of secondary school chemistry students in a developing country like Kenya.

2. Theoretical Framework

The study was based on Bandura (1986) self-efficacy theory which holds that people possess a "self-system" that enables them to exercise control over their thoughts, emotions and feelings, and actions. This

self-system is comprised of both cognitive and affective components including the ability to symbolize, learn from others, plan alternative strategies, and regulate one's own behavior and self-reflection. In Chemistry teaching, the instructional strategy play a major role in determining the students' perception of success or failure in learning outcomes. Bandura (1986) emphasized that being involved with the specific task experience is the most effective source of self-efficacy information for educational purposes. This implies that educational efforts should therefore design teaching and learning strategies that focus on improving students' self-efficacy.

2.1 Conceptual Framework

In this study, the conceptual framework was based on a mode of instructional method which included both computer aided instruction and conventional methods. The dependent variable for this study was chemistry self-efficacy of students, while the intervening variables were learner characteristics such as gender. The interactions among the independent variables, intervening variables and dependent variables that were used for the study are diagrammatically represented in Figure 1.

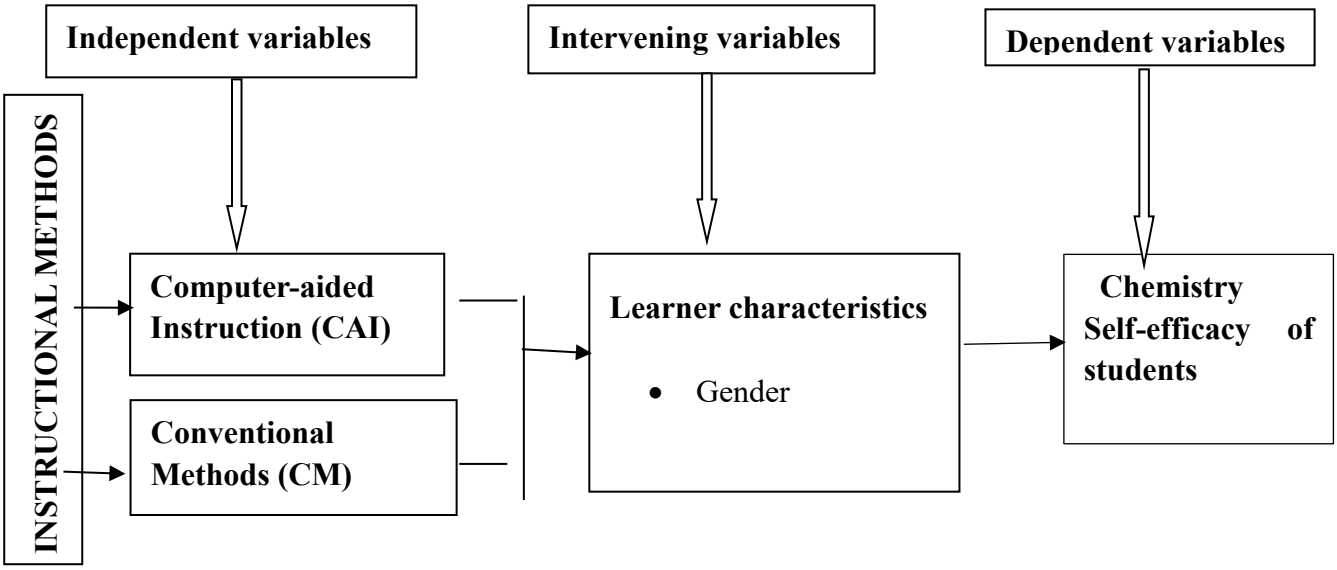

Figure 1: Conceptual framework for the study

3. Research Methodology

The study applied a Quasi-Experimental design based on Solomon Four-Group, Non-equivalent Control Group design which is widely used in education (Borg & Gall, 1989).
Quasi-experimental design involves no randomization of the subjects to the sample groups but rather it involves random assignment of intact classes to sample groups.

The Solomon-Four group design is illustrated in figure 2.

	Pretest	Treatment	Posttest
Experimental Group 1	O_1	X	O_2
Control Group 1	O_3		O_4

Experimental Group 2	X	O_5
Control Group 2		O_6

Figure 2: Solomon-Four Group Design

3.1 Participants

Four secondary schools were purposively sampled from the 15 secondary schools with computer laboratories in Tharaka Nithi County, Kenya. Purposive sampling was used in order to select schools with similar academic level as possible. Sampling involved only schools with computer laboratories because the computer was considered as the key resource that was required for Computer Aided Instruction lessons. The assignment of the four schools (groups) to either experimental or control conditions was done using simple random sampling. Random sampling gives each and every school from the target population a known and equal probability of selection (Kothari, 2004). A total of 174 Form Two Chemistry students (Group EI=45, E2=46, C1=45, C2=38) were involved. The Groups E1 and C2 comprised of boys only while Groups E2 and C1 comprised of girls only.

The Form Two students were preferred to other levels (forms) for the study because at this level, study of Chemistry is compulsory and the students were acquainted with computer skills.

3.2 Research Instrument

The Students' self-efficacy questionnaire (SSEQ) was used to measure the perceived Chemistry self-efficacy (confidence) of students. Students' self-efficacy scale was used as the pre-test and post-test. The pre-test self-efficacy scale was used to measure perceived Chemistry self-efficacy of students before the exposure of the treatment (CAI). On the other hand, the post-test self-efficacy scale was used to measure chemistry self-efficacy of students after the treatment. The items of the pre-test self-efficacy scale were re-arranged to form the post-test self-efficacy scale items. The items of the SSEQ assessed students' level of confidence (self-efficacy) in mastering Chemistry concepts, for example, generally perceived Chemistry self-efficacy of students, and the choice of Chemistry as preferred subject and career courses related to Chemistry. The SSEQ comprised of 12 items on a five- point likert scale namely; 1= strongly disagree, 2= disagree, 3= not sure, 4= agree and 5= strongly agree.

To enhance reliability of the instrument a pilot study was necessary. Piloting is important as it helps identify misunderstandings, ambiguities, and inadequate items (Wiersma, 1985). The SSEQ instrument was pilot tested using two secondary schools from the same County (Tharaka Nithi) as the major study sample. The pilot schools had similar characteristics as the sample schools. The reliability of the self-efficacy scale was estimated using Cronbach Alpha method. This is because the items of the SSEQ yields data that is not dichotomous (Borg & Gall 1989). The reliability estimate obtained for students' self-efficacy Scale (SSEQ) was 0.884. Thus, the SSEQ instrument was considered appropriate for this study.

3.3 Data Collection procedure

Installation of CAI program in the computers of the experimental schools was done first. This was followed by the training of chemistry teachers on how to use CAI program for one week. Before the exposure of the treatment, pre-test self-efficacy scale was administered by the regular Chemistry teachers to the students of the Experimental group 1 and Control group 1, which lasted for 20 minutes. It was then followed by

exposure of treatment to the students of Experimental groups who were taught using Computer Aided Instruction while the control groups were taught using conventional methods covering selected topics. These topics included; "the structure of an Atom, the Periodic Table and chemical families" for a period of six weeks. At the end of treatment period, the post-test self-efficacy scale was administered to all the four groups.

3.4 Statistical Analysis

Data analysis was done using both descriptive and inferential statistics which included; mean, standard deviation, t-test and Analysis of Variance (ANOVA). The descriptive statistics described the self-efficacy variable of the various groups while the inferential statistics tested the significance difference between the groups' means. The ANOVA test was performed to determine the difference in the mean scores of the four groups while the independent samples t-test was performed to determine the significance of the difference in the mean scores of boys' group and girls' group. This is because t-test has the power to detect difference between two means (Borg & Gall, 1989). The statistical significance was tested at $\alpha = 0.05$. The data analyzed was finally presented in tabular form and graphics such as bar graphs.

4. Results and Discussion

The results were based of the following null hypotheses;

i) There is no significant difference between Chemistry self-efficacy scores of students taught using CAI and those taught in CM.

ii) There is no significant gender difference in Chemistry self-efficacy scores of students' when taught using CAI as compared to CM.

4.1 Students' pre-treatment scores in Self-efficacy

The aim of the pre-testing the groups was to ascertain whether the students selected to participate in the experimental group and control group had comparable self-efficacy measure before they were exposed to treatment (CAI). Both experimental and control group students were exposed to a self-efficacy questionnaire (SSEQ) before the application of treatment (CAI).

Self-efficacy questionnaire contained 12 items, in which students were asked to report their confidence in learning Chemistry on a five point likert scale calibrated Strongly Disagree (SD), Disagree (D), Not Sure (NS), Agree (A) and Strongly Agree (SA). In analyzing the results, "strongly disagree" was rated as 1, "disagree" as 2, "not sure" as 3, "agree" as 4 and "strongly agree" as 5. The data obtained were analyzed using descriptive statistics and t-test and the results indicated in Table 1.

Table 1: Descriptive and Independent Sample t-test of pre- treatment scores in Self-efficacy

Variable	Group	N	Mean	Std. deviation	df	t-value	p-value
Self-efficacy	Experimental	53	37.25	5.445	107	-0.333	.740
	Control	56	37.59	5.328			

The results from table 1 show that the experimental group had 53 respondents while control group had 56 respondents. Experimental group obtained an average score of 37.25 out of 60 on CAT. For control group

the average score was 37.59. The t-test analysis revealed that the computed p-value (0.740) was greater than the set alpha value 0.05. Therefore, there was no significant difference in pre- treatment scores in self-efficacy between experimental group and control group, (t (107) = -0.333, p > 0.05. Therefore, the Experimental and Control groups were similar on self-efficacy measure, hence they were homogenous at the beginning of the study. This made the groups suitable for the study. Regarding difference in gender self-efficacy in learning Chemistry, descriptive and t- test was performed. The results of analysis were as indicated in Table 2.

Table 2: Independent Sample t-test of pre- treatment scores in Self-efficacy by Gender

Variable	Gender	N	Mean	Std. deviation	df	t-value	p-value
Self-efficacy	Female	56	37.59	5.328	107	-0.333	.740
	Male	53	37.25	5.445			

The results in table 2 show that the self-efficacy average score of male and female were 37.25 and 37.59 out of 60 respectively. Both female and male obtained relatively the same mean score. The t-test analysis showed that the computed p-value (0.740) was greater than the set alpha value (0.05). Therefore, the self-efficacy mean scores of female and male students were not significantly different, t (107) = -0.333, p > 0.05. Thus, the female and male student samples were similar before the application of the treatment.

4.2 Effect of CAI and CM on Students' Self-efficacy in learning Chemistry

The research aimed at investigating whether there was significant difference in Chemistry self-efficacy of students when taught with CAI from those taught through CM. Self-efficacy scale application was administered to the four groups after the exposure of the treatment to the experimental groups. Self-efficacy scale contained 12 items in the instrument, in which students were asked to report their confidence in learning Chemistry on a five point scale calibrated Strongly Disagree (SD), Disagree (D), Not Sure (NS), Agree (A) and Strongly Agree (SA). In analyzing the results, "strongly disagree" was rated as 1, "disagree" as 2, "not sure" as 3, "agree" as 4 and "strongly agree" as 5. The data obtained was analyzed using descriptive statistics and Analysis of Variance (ANOVA).

Table 3: Descriptive Statistics of Post Scores in Self-efficacy

group	Mean (Max =60)	N	Std. Deviation
Experimental group1	47.11	45	5.793
Control group 1	40.91	45	5.854
Experimental group 2	49.04	46	5.362
Control group 2	42.92	38	5.952

Table 3, shows that the average self-efficacy scores of experimental groups were higher than those of the control groups. This indicates that the students of experimental groups who were taught Chemistry with CAI approach were more obtained higher Chemistry self- efficacy scores than those of the control groups. To illustrate the analyzed quantitative data more clearly, graphics in form of bar graph was used as in Figure 2.

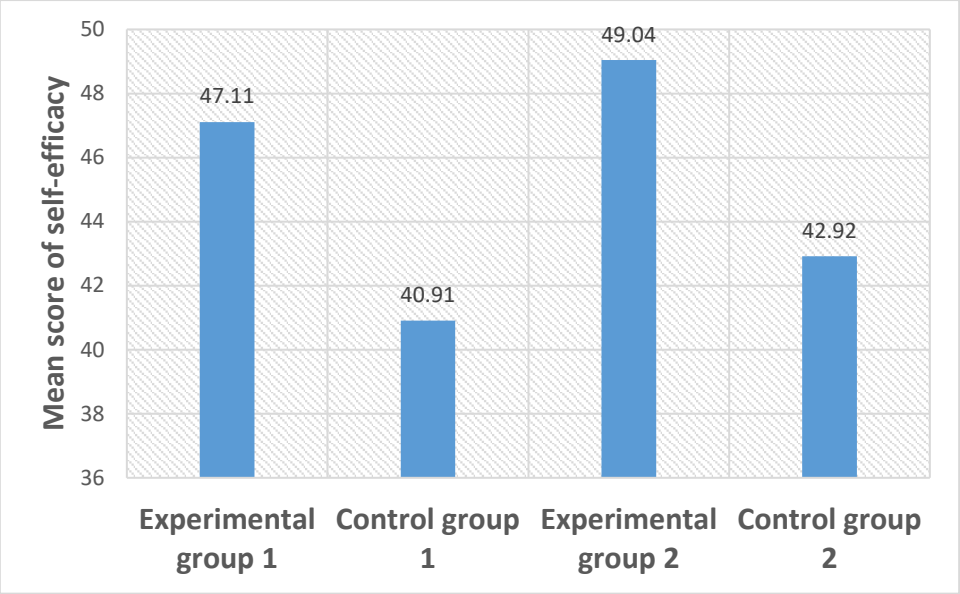

Figure 2: Chemistry self-efficacy based on Groups

Figure 2, clearly show that students taught Chemistry using computer aided instruction had higher self-efficacy than the students who were taught chemistry using conventional methods. To determine whether the groups were significantly different, One-Way ANOVA was performed. The results are indicated in Table 4.

Table 4: One-Way ANOVA of Post scores in Self-efficacy

Source of variation	Sum of Squares	df	Mean Square	F-ratio	p-value
Between Groups	1867.373	3	662.458	18.934	.000
Within Groups	5888.765	170	32.875		
Total	7456.738	173			

The results in Table 4 show that the difference in self-efficacy post-test means scores of the students between the experimental and control groups was significant, $F(3,170) = 18.93$, $p < 0.05$. This shows that the students taught with Computer Aided Instruction (CAI) achieved higher self-efficacy mean scores than the students taught with Conventional Methods (CTM). The findings of this study are in agreement with the report by Fencl and Scheel (2005) which investigated the effects of different teaching methods on the classroom climate and self-efficacy in non-majors Physics students. The results indicated that use of electronic applications had a positive correlation with increased self-efficacy in non-majors physics students. The findings further, are in agreement with findings of Liu and Chen (2013) who observed that grade 5 students from elementary school in Northern Taiwan demonstrated effectiveness in learning science when taught through computers.

Similarly, Yien, Hung, Hwang and Lin (2011), observed that computer aided learning was more effective in enhancing the self-efficacy of students in learning nutrition course than conventional methods. The findings of this study may be explained in line with the study of Zimmerman (2000); Pajares and Miller (1994) which observed that learning skills acquisition enhances self-regulated learning behaviour which in turn ensures motivation and confidence as a learner engages in learning tasks.

4.3 Chemistry Self-efficacy by Gender when taught with CAI

The research aimed at establishing whether there was significant gender difference in Chemistry self-efficacy of students when taught with CAI.

Experimental group 1 and group 2 which were taught with Computer aided instruction had 45 boys and 46 girls respectively. After the application of CAI treatment to both groups, self-efficacy questionnaire was administered to both female and male students groups. In the questionnaire, students were asked to report their confidence in learning Chemistry on a five point scale calibrated Strongly Disagree (SD), Disagree (D), Not Sure (NS), Agree (A) and Strongly Agree (SA). In analyzing the results, "strongly disagree" was rated as 1, "disagree" as 2, "not sure" as 3, "agree" as 4 and "strongly agree" as 5. Descriptive statistics were to describe the difference of self-efficacy scores between male and female students. The results are indicated as in Table 5.

Table 5: Descriptive statistics of post-test Scores in Self-efficacy by Gender

Variable	gender	N	Mean	Std. Deviation	Std. Error Mean
Self-efficacy	Male	45	47.11	6.348	1.239
	Female	46	49.04	5.362	.791

From Table 5, it is apparent that the average self-efficacy post-test scores of female students were relatively higher than those for the male students. This indicates that female students were more confident in learning chemistry concepts than male students when they were taught with CAI. In order to illustrate the male and female mean score more clearly, graphics in form of bar graph was used as in Figure 3.

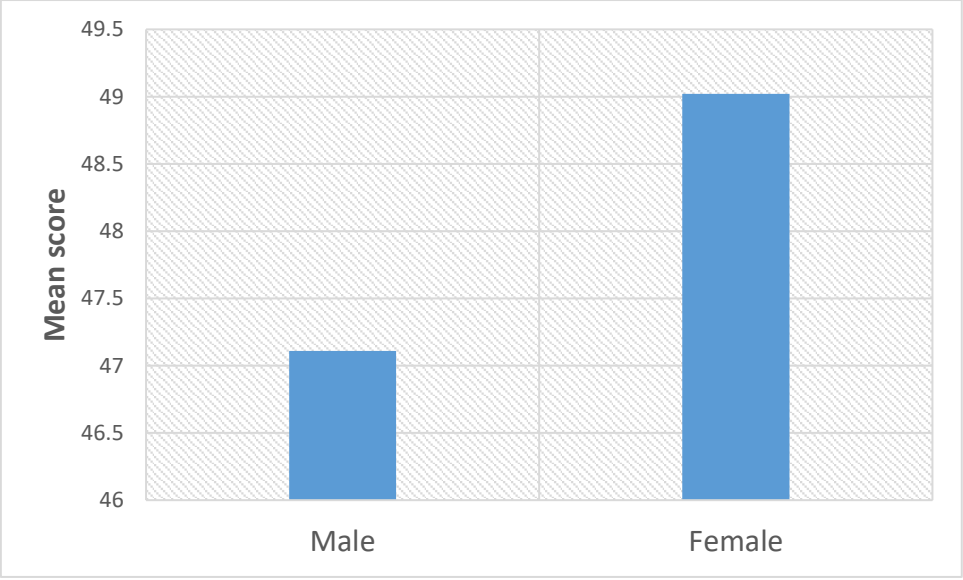

Figure 3: Chemistry self-efficacy by Gender

From figure 3, it is evident that the self-efficacy mean scores for female students was relatively higher than those of male students. In order to determine whether the difference in self-efficacy post-test scores by

gender was statistically significant, an independent sample t-test was carried out. The results are shown in Table 6.

Table 6: Independent sample t-test of post-test scores in Self-efficacy by gender

Variable	Gender	N	Mean	Std. deviation	t-value	df	p-value
CAT	Male	45	47.11	6.348	-2.445	89	.016
	Female	46	49.04	5.362			

The t-test analysis results in Table 6 shows that the difference in self-efficacy post-test mean scores between male and female students was significant, ($t(89) = -2.445$, $p < 0.05$.
This revealed that on average female students obtained a different chemistry self-efficacy mean score than males students, with females having a higher mean score.

From the findings of this study, it is clear that use of computer aided instructional method enhances chemistry self-efficacy of female more than it does to the male students. The findings of the study concurs with the results of Britner and Pajares (2006), which reported that the middle school girls had higher science self-efficacy than do boys. The findings of this study found similar results, which indicate that there exists a gender difference in science self-efficacy (DeBacker & Nelson, 1999). In addition, the findings of this study agrees with the report of (AAUW, 1999) that suggested, females are more likely to take both Biology and Chemistry in high school than males. Moreover, the findings of this study finds support from Bandura's (1997) argument that gender can influence academic performance through its mediating effects on self-efficacy.

5. Conclusions

Based on the findings of this study, the following main conclusions were drawn:
The study revealed that the students who were taught Chemistry with Computer Aided Instruction obtained higher Chemistry self-efficacy mean scores than the students who were taught with Conventional Methods. Therefore, use of computer aided instruction enhances students' self-efficacy in learning Chemistry concepts more than use of conventional methods. Thus, CAI is particularly an impressive instructional technique, and worth adopting by Chemistry teachers, for it appears, self-efficacy can translate in performance.

The study further revealed that the female students obtained higher self-efficacy scores than the male students when taught with computer aided instruction. This implies that use of computer aided instruction enhances girls' self-efficacy in learning Chemistry more than it does for boys. It is apparent that use of CAI in classroom instruction can make female students more self-confident in learning Chemistry. Therefore, Chemistry teachers, more so in girls' schools should adopt CAI in their teaching in order to enhance self-efficacy of girls which has been reported to be low by many studies. This could be one way of getting girls to perform in Chemistry and possibly in other science subjects.

5.1 Recommendations

Computers are these days available in many schools. I would recommend that:

(a) Chemistry teachers should be encouraged to use Computer Aided Instruction (CAI) in their teaching so as to improve students' self-efficacy.
(b) Teacher training institutions such as colleges and universities should emphasize Computer Aided Instruction as part of their Chemistry training curriculum so as to produce teacher trainees who would be able to integrate CAI in their teaching.
(c) The government of Kenya should provide adequate ICT infrastructure and equipment, including computer hardware and software (CAI) in all schools. Availability of adequate computer aided instruction hardware and software in schools will enable the Chemistry teachers to utilize available CAI approach in the teaching and learning processes.

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Spatial Distribution of Tourist Attraction Sites in Southern Geo-Political Zone of Adamawa State, Nigeria

BASSI PAUL
and
ALFRED D. MSHELIA
DEARTMENT OF GEOGRAHY, ADAMAWA STATE UNIVERSITY, MUBI, NIGERIA,
Email:alfredmshelia@yahoo.com

Abstract

Tourism is mainly seen as a growth industry since the flow of tourists to different tourist destinations contributes to economic growth. The importance of an area as a tourist delight is a function of three major factors; accessibility, natural and cultural attraction and social amenities. Southern Adamawa Geo-Political Zone has a wide range of such attractions, and is easily accessible to the state capital, Yola, where social amenities are concentrated, a common characteristic of Nigerian urban centers. The research therefore, assess the spatial distribution of tourist attraction sites using Global Positioning System (GPS) to establish the coordinates of the sites, and the tourist attraction sites were identified on the Google Earth. Notable tourist attraction site identified are the Farai festival, Lamurde warm spring, Kiri dam and resort, Gumti park and Vunom wrestling festival among others. These sites are easily accessible by a motor able road over a short distance to the state capital Yola, which houses most social amenities most importantly are the hospitality and catering service. The study recommend among others, the upgrading of facilities and infrastructures in and around these attraction sites, creation of tourism database to be linked to a website to showcase these sites to the rest of the world.

Keywords: Spatial, Distribution, Tourist, Attraction site.

Introduction

Among the world's largest and most rapidly expanding industries is tourism, one of the major items of international trade. It is mainly seen as a growth industry since the flow of tourists to different tourist destinations contributes to economic growth (Ghosh, 1998; Medlik and Jinkins, 1991). Tourism contributes over 10% to global GDP and generates employment for over twenty million people worldwide (Ake, 2000).

Given the definition of tourism by the World Tourism Organization (WTO) as an activity involving the travels of persons to places outside their usual environment for not more than once for leisure, it is indicative of how such activities may benefit host and local economies and communities. Indeed, tourism has a wide range of benefits both to the individual tourist, tourism organizations, and the local economies and communities in terms of employment, income, and enhancement to the quality of life (Besculides et

al, 2002). For some major tourist destinations, tourism has become a major alternative form of commodity export and a significant source of foreign exchange that allows internal and external trade balances to be reconciled.

Africa has the lowest number of arrivals of all regions in the world but has the potential to top world's tourism chart, but these potentials have not been brought under the right eye and the benefits not fully understood by governments and individuals as dependency is pushed to other resources (Ghosh, 1998). This study tries to incorporate the use of spatial data in identifying tourist site in the study area with a view to assessing the potentials that abounds.

Spatial data can be linked to other data sets thereby potentially increasing explanatory power of GIS (Goodchild, 2010). Nevertheless, different traditions in tourism studies have different understandings of space and how it should be studied. For example, even though Nepal (2008:138) concludes that a spatial approach is one of the hallmarks of contemporary tourism in geography research, the full potential of spatial technologies "in examining form and processes of touristic development, travel flows and tourist's movement and tourism impacts, has not been realized yet.

Adamawa State is called "The Land of Beauty", with 58 ethnic groups is essentially made up of a picturesque mountainous land, transverse by river valleys of Benue, Gongola and Yedsaram. The state is noted for its rich cultural heritage reflected in its history, craftsmanship, music, dance, dress pattern and hospitality. It is regrettable that those in charge of tourism publicity and management in the state are less mindful of this fact; senses are beclouded by oil revenue, where each state in the nation goes to the headquarters to collect pay cheques on monthly basis or are ignorant of the potentialities of certain geographic locations. Geospatial analyses of locations entails identifying, acquiring, inputting, storing, organizing, manipulating and out-putting data in a fashion that is understandable and useful so as to enable development of these area(s) tourist havens.

Adamawa State, like most parts of Nigeria has a wide range of potential tourist attractions. However, some of them are yet to be fully developed and mapped to showcase such sites. A realization of the under usage of geo spatial information and activities by state Government with regards to tourism necessitates the need for this study and proves it timely, as world's economies today are turning to tourism. The study thus provides geospatial data on natural, cultural and other attractions to be found in the southern geo-political zone of the state.

The Study Area "The Land of Beauty".

Adamawa state as it is known today was carved out of the defunct Gongola State on the 27th August, 1991. The State is located in the North Eastern part of Nigeria, and it lies between latitude 7^0 and 11^0 North of the equator, and longitude 11^0 and 14^0E of the Greenwich Meridian. It shares common boundaries with Taraba State in the South and the West, Gombe State in its Northwest, and Borno to the North. Adamawa State has an international boundary with the Cameroun Republic along its eastern border. Adamawa State consists of 21 Local Government Areas and covers the total area of about 38,741 Km2 (Adebayo, 1999). It is on this land that exists a population of about 3,168,101 persons (2006, National Census). This gives the population density of about 82 persons per sq Km. (Adebayo, 1999). The southern senatorial zone of

Adamawa state consists of nine local governments; Jada, Ganye, Numan, Lamurde, Guyuk, Shelleng, Mayo Belwa, Toungo and Demsa local as shown in figure 1.

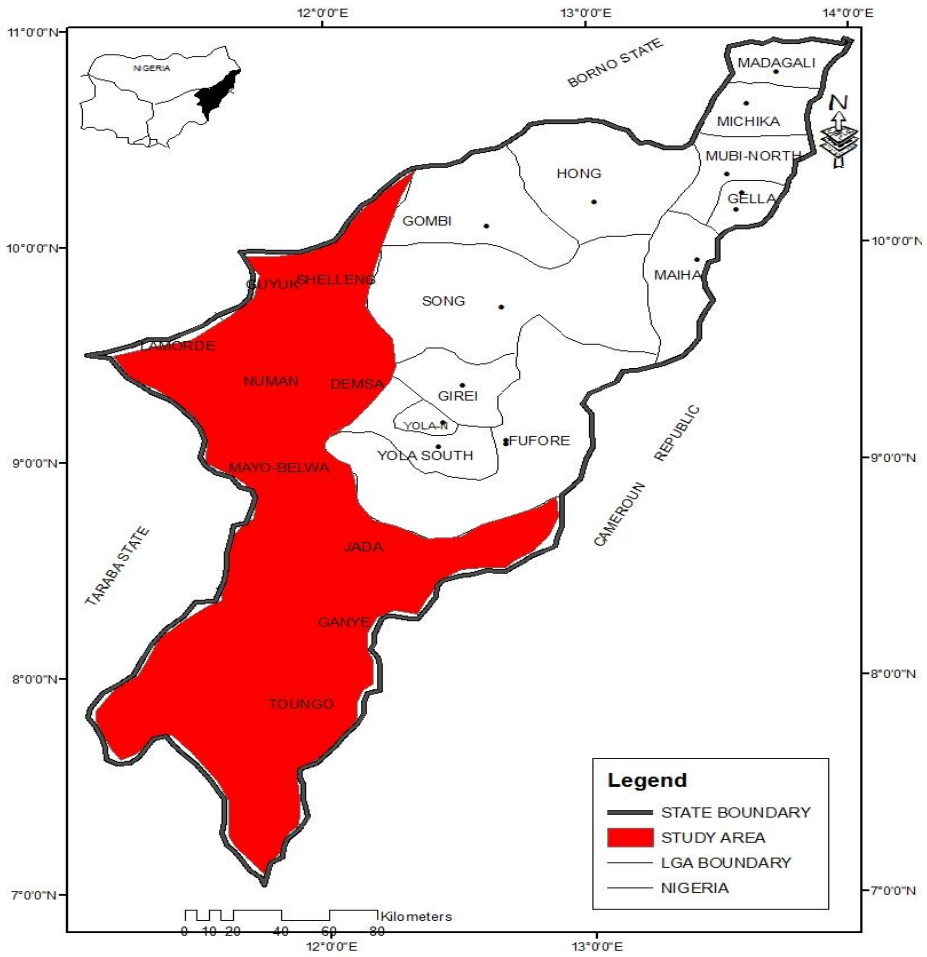

FIGURE 1. The Study Area.

The climate of the study area is characterized by rainy and dry seasons. The rainy period last for 7 (seven) months, beginning from April to November, with rain fall peak in august. The main annual rainfall is 900 to 1100mm per annum, the dry season is however accompanied by dust as a result of the north-east trade winds blowing from the Sahara desert. These winds are commonly known as the harmattan winds, these harmattan winds has dehydrating effects on human skin. The driest months during the period are January, and February with the average annual relative humidity of 27%. The temperature is relatively high throughout the year with the mean yearly maximum temperature of 39.6 degree Celsius and the minimum of 27v degree Celsius, while the average daily hours of sunshine are between 6 and 8 hours (Adebayo,1999).

Most part of the study area falls into the vegetation zone of the sub-Sudan zone and guinea savannah zone which covers the greater part of the south of Adamawa state. The vegetation in the guinea savannah is thick with tall grasses and medium height trees and shrubs. The Sudan savanna is characterized by short grasses and trees. This type of vegetation covers a greater part of Adamawa state (Akosin, Tella and Jatau 1999).

The vegetation of the study area is the secondary type of savanna vegetation due to man's activities through construction, farming, gathering, livestock grazing, etc. as a result the trees found are the economic trees planted by man. This shrubs and grasses are obtained close to the town while outstretch of the town has woodland. This shows the extent of human interference with the vegetation around the study area. (Akosin, Tella, and Jatau, 1999).

Materials and Methods

Two basic types of data were collected for this study, primary data: these are geo-spatial data and attribute data of the tourist attractions. Field work using handheld GPS to acquire the coordinates of the various attractive sites in the different local government areas also forms part of the primary data collected. Sources of econdary data collected includes; Google Earth image, internet, published brochures, magazines, leaflets and books.

Hardware

A HP 530 Laptop, HP colour printer and hand held GPS (Garmin 72) were the main hardware used in collecting and processing some off the data that was used in assessing the spatial distribution of tourism potential sites.

Software

The software packages that were used are of two categories: the GIS and non-GIS packages. Arcgis 10.1 was the GIS software packages used to digitize and performs feature identification, recognition and visualization. The non-GIS packages used were corel Draw 12 for map conversion to Tagged Image File Format (TIFF) and Microsoft Word for word processing.

The Global Positioning System (GPS) was used to pick the coordinates of the identified tourist site in the state which was inserted in the search interface of Google Earth software. Each of the sites was accurately captured and displayed in Google earth. A network of roads linking all tourist sites in the study area including the state capital were then overlaid onto an existing map of Adamawa state in which the distance from the state capital to each of the identified tourists site were measured in kilometer as attribute data. The roads were directly digitized on the interface of the Google Earth software.

Results and Discussion

Table 1 shows a variety of festivals in the study area but they are mostly small, clan based or ethnically inclined. The Farai or Vunon Wrestling Festival is the most popular in the study area and allows for participation from wider sources than other smaller festivals that occur within the study area. The travel distance is 48.9 kilometers from the state capital Yola which is bestowed with an International Air Port, palatial hotel accommodation, notably among them are Homtel Derivatives and Suites, Yukoben, Duragi, Lelewal Hotels that serve both International and local cuisine would be a tourist delight.

Warm and Hot Water Springs occur in two different locations where they all last through the rainy and dry seasons. The Lamurde Hot Spring (Ruwan Zafi) is above 50^0 C at its hottest spot which makes it the hottest within the study area. . The place was designated as UNESCO World Heritage Site in 1999. The Lamurde Hot Spring empties into a stream making it a tributary to the drainage system of the area unlike the other springs within the study area which do not flow but occur as tiny pits in groups and relatively warm.

Sightings of Hippopotamus in and around the Kiri Dam during early hours of the day are frequent. The Kiri Dam is the largest artificial Hippo habitat in Africa and called "Hippo Sanctuary" by the Adamawa Travel Journal. The spatial location of all the sites is clearly indicated for each of the tourist attraction. There coordinates of the tourist site are clearly seen and roads leading to each of the site were as shown (figure 2).

Table 1: Tourist Attractions sites in the Study Area

S/N	**TOURIST SITE**	**OTHER NAME**	**LGA**	**DISTANCE FROM ADAMAWA STATE CAPITAL, YOLA (km)**	**LOCATION COORDINATES**
1	Kiri Dam	Nil	Shelleng	83.70	9^0 40' 46.04"N 12^0 00' 52.36"E
2	Lamurde hot spring	Ruwan Zafi	Lamurde	103.00	9^0 32' 56.74"N 11^0 49' 37.05"E
3	Gumti park	Nil	Toungo	209.00	7^0 54' 56.38"N 11^0 52' 47.14"E
4	Jada warm Springs	Nil	Jada	96.50	
5	Vunon wrestling festival	Farai	Demsa	48.90	9^0 27' 44.26"N 12^0 05' 21.87"E

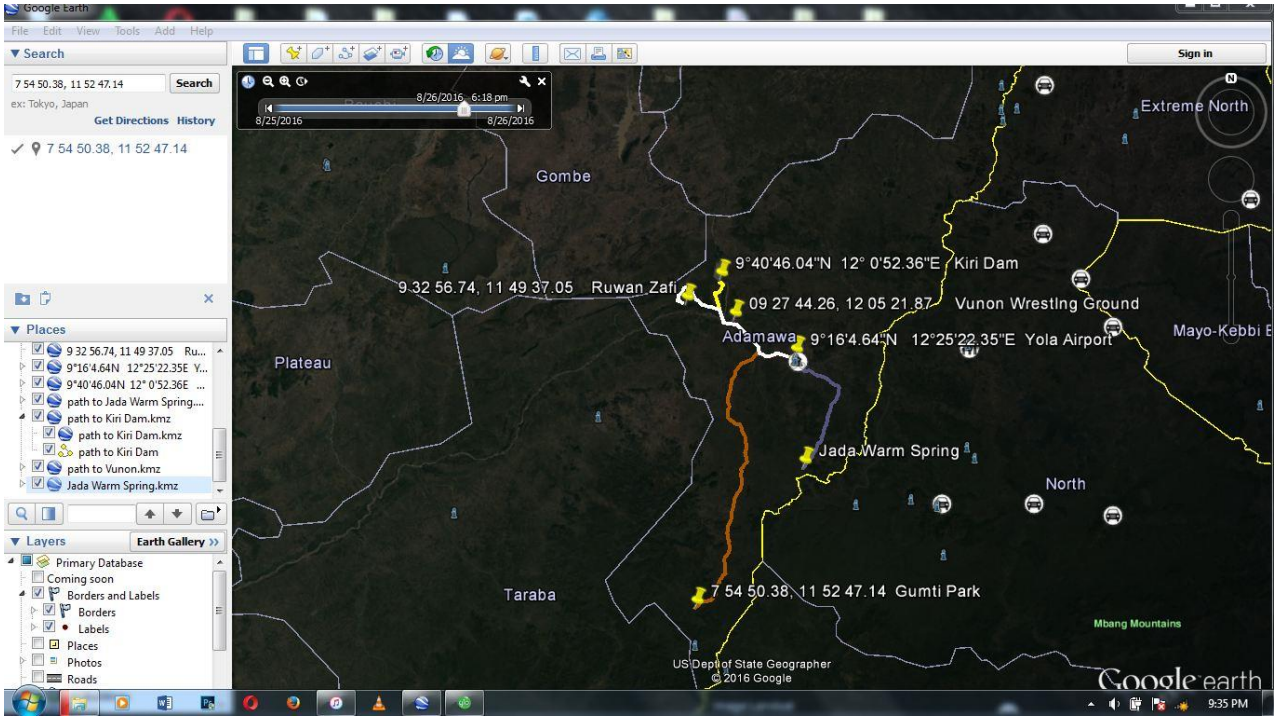

Figure 2: Tourist Attraction Sites, their Locations and Connecting Road.

Table 2 shows that all the sites in this study are under developed as there is little or no efforts by government or private enterprises to harness these potentials through infrastructural development or preservation measures to secure these resources except for Gumti park which is part of the Gashaka Gumti National Park and the Vunon Wrestling Festival which receives support from the government through the Ministry of Culture and Tourism.

All roads leading to these sites of attraction within the study area are dirt roads but motor able, and are off the various federal roads connecting through the entire state linking towns and cities.

Table 2: Level of Development of Tourist Site

S/N	TOURIST SITE	OTHER NAME	LGA	LEVEL OF DEVELOPMENT	DISTANCE FROM STATE CAPITAL/km	LOCATION COORDINATES
1	Kiri Dam	Nil	Shelleng	Underdeveloped	83.70	9^0 40' 46.04"N 12^0 00' 52.36"E
2	Lamurde hot spring	Ruwan Zafi	Lamurde	Underdeveloped	103.00	9^0 32' 56.74"N 11^0 49' 37.05"E
3	Gumti park	Nil	Toungo	Developed	209.00	7^0 54' 56.38"N 11^0 52' 47.14"E
4	Jada warm Springs	Nil	Jada	Underdeveloped	96.50	

5	Vunon wrestling festival	Farai	Demsa	Underdeveloped	48.90	9^0 27' 44.26"N 12^0 05' 21.87"E

Conclusion

The study reveals the spatial features of tourism attraction sites in Adamawa South showcasing the socio economic potentials for sustainable development among communities in the region. These sites are veritable tools that can be used to attract indigenous and foreign investors to Adamawa state if properly developed, and in turn change the revenue base of the state and the nation, whose economies are fuelled by dwindling fortunes from petroleum resources (hydrocarbon), a product the world is aggressively shifting away from because it is environmentally not benign.

Recommendation

- Private enterprises and the State Government should make concerted effort for further development of these tourist havens
- Creation of the tourist attraction sites database and linked to a website to create awareness among tourists across the globe.
- Transportation infrastructure such as good road linkage, travel agencies and facilities to be improved upon to uplift the standard of facilities available for tourist delight by the state government and by private enterprises.
- Hospitality industries which is about accommodation and catering services be improved to meet international standards like what is obtained in South and East Africa

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Construction of soil moisture and irrigation IoT monitoring system using Project Based Learning

Rabelo, S. L. [1], Jucá, S. C. S. [1], Gonçalves, D. L. C. [1], Silva, V. F. [1], Pereira, R. I. S. [2] , Solonildo Almeida da Silva[2]

[1] Computation Department, Federal Institute of Ceará Maracanaú Campus, Brazil

[2] Engineering Department, Federal University of Ceará Pici Campus, Brazil

Corresponding Author: sandrojuca@ifce.edu.br; Tel. +5585 3878.6321

Abstract

This article describes a project developed using principles of Project Based Learning (PBL) and aims to use an embedded system for soil monitoring, thus measuring soil moisture and implementing automatic irrigation, as well as, the temperature and humidity of the environment. The configuration data for irrigation time control and the lower and upper limits of soil moisture percentage can be adjusted through a PHP page, where also the monitoring of the variation of soil moisture through a graph can be done in real time. The proposed project is divided into two steps using PBL. Phase one focuses on developing a circuit with sensors capable of doing measurement of ambient parameters and soil moisture, and phase two, on developing an irrigation system to control soil moisture, both using Internet of Things (IoT) concepts.

Keywords: Internet of Things; Monitoring; Project Based Learning.

1. Introduction

The Project Based Learning (PBL) is applied to enabling students to confront issues and real-world problems that they consider meaningful, determining how to address them and then acting cooperatively for solutions [1].

In proposing PBL as a guiding reference for the teaching of these technical subjects, it is intended to contribute, not only to instrumentalization in the technical domain of methodologies, but also to the appropriation of a new form of teaching/learning technique, which can be collectively constructed, updated and reformulated.

On the other hand, plants need a good quality soil to grow healthily, however, there are several types of environmental situations that hinder their growth [2], among them:

- Excessive solar radiation
- Lack of nutrients in soil
- Low humidity soil
- Pests

All these situations can lead to losses. For this reason, it is necessary to use automatic systems that assist the farmer in the monitoring of his crops, in order to obtain an increasing efficiency and consequently reduce the occurrence of undesired situations [3].

The Internet of Things (IoT) refers to the integration of physical and virtual objects into networks connected to the Internet, allowing "things" to collect, exchange and store a huge amount of data in the Cloud, where once they are processed and analyzed, they generate information and services on a big scale.

Thus, the present article has the objective of finding a solution to this problem, thus making soil moisture monitoring in real time of an environment with plants and an IoT system for irrigation control [4], using PBL principles.

The NodeMCU development board has an ESP8266 microcontroller and has become popular in recent years [5, 6]. This becomes relevant since on a small board are available Input/Output (I/O) pins, voltage regulator, USB interface for programming and Wi-Fi connectivity featuring an ideal board for IoT projects [7].

IoT consists of equipment that connects to others or to services over the Internet [8]. Despite of having a definition since 1982, IoT only became popular with the diffusion of the Internet and with the cheapness of embedded systems. A well-known IoT device is Raspberry Pi that can be used without technical knowledge [9].

For the irrigation IoT system the use of NodeMCU 12E programmed by Arduino's IDE (Integrated Development Environment) is proposed using free and easy to use microcontroller software development platform [10] together with a hygrometer and signal conditioning circuit based on operating amplifier LM393 which are two precision single-acting operational amplifiers on a single chip [11] and one actuator module with one channel responsible for triggering the water pump. The NodeMCU connects via the Internet to an API (Application Programming Interface) responsible for persisting the data, which consists of saving the data in a database for later consultation [12]. The system also has a web page that can configure and display the data acquired by NodeMCU.

2. Bibliographic Review

The ESP8266 is an ideal microcontroller for IoT applications. This microcontroller has small size, requires only 3.3 Volts and embedded Wi-Fi modem. In [13] a software was developed to measure soil moisture, so an LED lit according to the sensor reading. If a red LED is lit, that is because the soil has low humidity, if a green LED is on, the soil has regular humidity and the blue LED indicates adequate humidity.

In [14] a project was developed using a type of analog sensor that detects humidity levels (HL-69). A light and sound system using Arduino was also used to inform when the plant needs water.

In [15] a system with an Arduino was created in which values were recorded in a micro SD card and combining the temperature sensor, the light sensor and the soil sensor, allowed the monitoring and the irrigation of a plant. The soil sensor was developed by the author himself, using nails to do the soil sensing.

A system that implements IoT with RFID modules to Cloud control of a farm production is proposed in [16]. The project proposed by [17] implements the monitoring of soil moisture, soil water level and light intensity using Arduino and Raspberry Pi. Data is sent via GSM (Global System for Mobile

Communications) using SMS (Short Message Service) for mobile phones. In this sense, the present project proposes a solution in low cost using the microcontroller ESP8266 NodeMCU that costs in the market around $ 3,00 USD in 2018. The data is sent via Wi-Fi to a database in the Cloud. The use of the Wi-Fi network allows the system to be installed in places where the Wi-Fi network is already available, thus being a project with low complexity of installation and maintenance.

3. Materials and methods

According to [18] a microcontroller is like a computer system, where CPUs (Central Processor Unit), RAM (Random Access Memory), ROM (Read Only Memory), I/O pins other internal peripherals are integrated in the same component.

The ESP8266 IoT microcontroller has a single 10-bit analog port with a voltage range from 0 to 1 Volts [7]. The hygrometer has an analog output that alternates between 0 and 3.3 Volts which makes them incompatible, however the NodeMCU board has a voltage divider capable of connecting these different voltages by dividing the output voltage of the hygrometer by three thus making the sensor output compatible with the input of the microcontroller.

In the subtopics below, the specific materials used for the IoT system for soil moisture monitoring and the IoT System for irrigation monitoring and control, respectively, are described.

3.1 IoT system for soil moisture monitoring

The following materials were used in this project with IoT concepts:

- 1 Wi-Fi Module ESP8266 NodeMCU.
- Protoboard.
- 1 Humidity and Temperature Sensor DHT22.
- 1 Soil moisture sensor.
- 1 Resistor 100 Ohm.
- 1 Resistor 200 Ohms.
- Some connection cables.

The DHT22, (Figure 1) is a 1-wire temperature and humidity sensor that allows temperature readings from -40 to +80 degrees Celsius and humidity between 0 to 100%, and is very easy to use with Arduino, Raspberry and other microcontrollers.

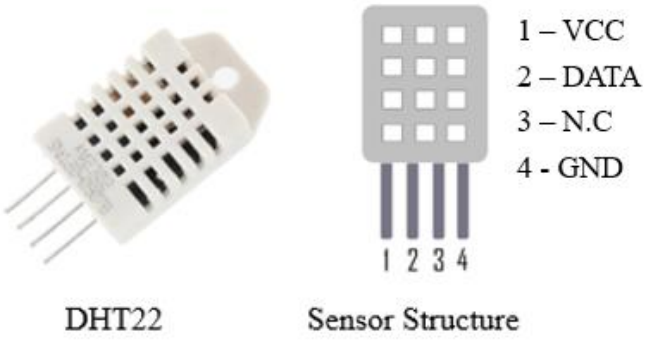


Figure 1. Temperature and humidity sensor [19].

The soil moisture sensor or hygrometer (Figure 2) consists basically of two rods that are tucked into the soil and of a comparator circuit that returns the level of soil conductivity. This circuit consists of a total of six pins, two of which are used to connect the metal rod to the comparison circuit. The other four inputs have the functions of feeding the circuit and returning the soil moisture level. The determination of soil moisture level can be done in two ways:

1. A digital signal that basically informs if the ground is dry or not (less precision but not dependent on an analog-digital converter (ADC) circuit). ADC is an electronic device capable of generating a digital representation from an analog quantity, usually a signal represented by a voltage level or electric current.
2. An analog signal that can be used to estimate how humid the soil is (more accurate but will depend on an ADC circuit).

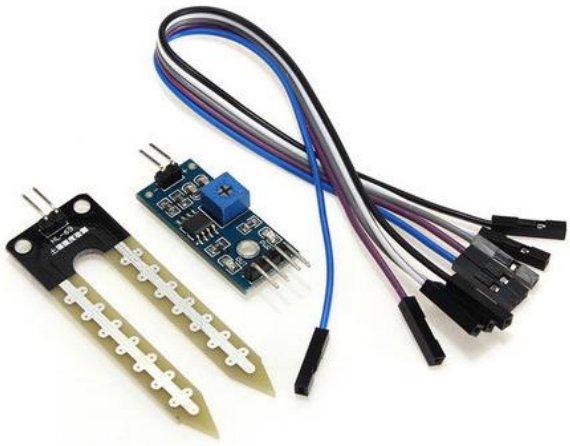


Figure 2. Soil moisture sensor (hygrometer) [20].

3.2 IoT system for irrigation monitoring and control

The submersed water pump (Figure 3) used for soil irrigation is characterized by having voltage from 2.5 to 6 Volts and submerged installation (Vertical) from 40 to 110 cm. The water pump offers an output flow between 80 and 120 l/h, with external diameter of 7.5 mm and internal diameter of 5 mm. The pump is made of injectable plastic and it is powered by direct current (DC).

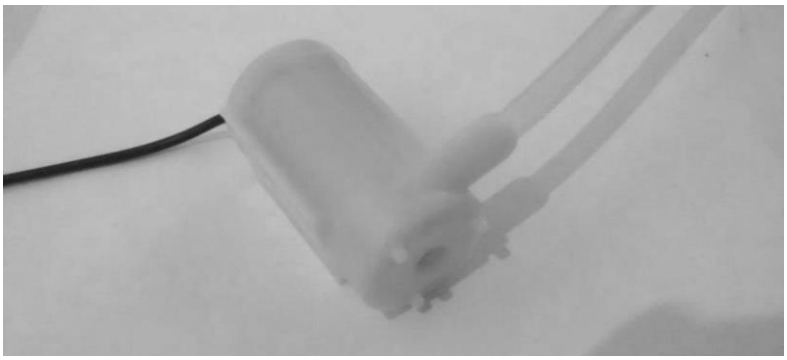


Figure 3. Submerged water pump.

Connected to another output pin of the microcontroller, there is a relay, which is an electrically driven switch that allows the electrical isolation of two circuits that when driven by electromagnetic induction closes the contacts of the switch [18]. This relay is responsible for activating the water pump.

For data transmission, the ESP8266 connects to a Wi-Fi network via the Internet and sends JSON-encapsulated data that is a lightweight and independent language format for exchanging information for a remote page using HTTP (Hypertext Transfer Protocol) [21] and the Internet base communication protocol [22]. The page receiving the information responds acknowledging receipt and with the parameters for actuation and updating of the system which are: interval between measurements, minimum and maximum humidity and actuation if the minimum and maximum are outside the defined range.

The web page has been configured with four sections: startup, status, settings, and data. On the homepage there is a short introduction to the system. In the status area, the status of the pump and the indication whether the system should be actuated or not can be monitored and configured. In 'Settings' there are two possible configurations: time between measurements and minimum and maximum desired humidity value. Finally, in the data area, the history of readings of the hygrometer are available.

4. Development of the proposed IoT monitoring project

In the following subtopics, the development of the proposed project divided into two parts is described. The first is the IoT plant monitoring system and the second is the IoT system for irrigation monitoring and control.

4.1 IoT system for soil moisture monitoring

The choice of the project to be developed in the area of embedded systems is fundamental in the application of the PBL, since the project must motivate and lead the students to new discoveries, covering at least the programmatic content defined for the course [23].

For the development of the proposed project, it was necessary to know the disciplines of embedded systems taught at the laboratory of an education institution. In order to optimize teaching and learning, and according to the PBL methodology, the teacher and the students begin to play roles, linked to a specific responsibility in the elaboration of the project.

In this practical sense, for the realization of the project, the ESP8266 NodeMCU microcontroller was

connected to ThingSpeak, showing how to send data from the plant to the Cloud. ThingSpeak is an IoT analytic platform service that allows to aggregate, visualize and analyze data flows in real time in the Cloud. Data can be sent to ThingSpeak from computational devices, instant data views can be created, and alerts using Web services like Twitter can be sent. With MATLAB analytics within ThingSpeak, it is possible to write and execute MATLAB code to perform pre-processing, visualizations, and analysis. ThingSpeak allows engineers and scientists to prototype and create IoT systems without configuring servers or developing web software [24]. The main features of this platform are:

- Configuration of devices to send data to ThingSpeak using an APIREST or MQTT;
- Getting instant views of real time sensor data or through historical data;
- Processing and analyzing of collected data using integrated MATLAB;
- Acting on data and communication using third-party services such as Twitter.

For sending data to ThingSpeak, an HTTP request is made to the ThingSpeak server. An HTTP request is a string (which contains the HTTP request information) sent via TCP client socket to TCP server socket (server that will receive the request, in this case the ThingSpeak server) through port 80.
This experiment consists in having the NodeMCU sending, every few minutes, the percentage humidity measured for a ThingSpeak channel. That way generating graphs or doing analysis with MATLAB is possible. Figure 4 shows the flowchart of the monitoring system.

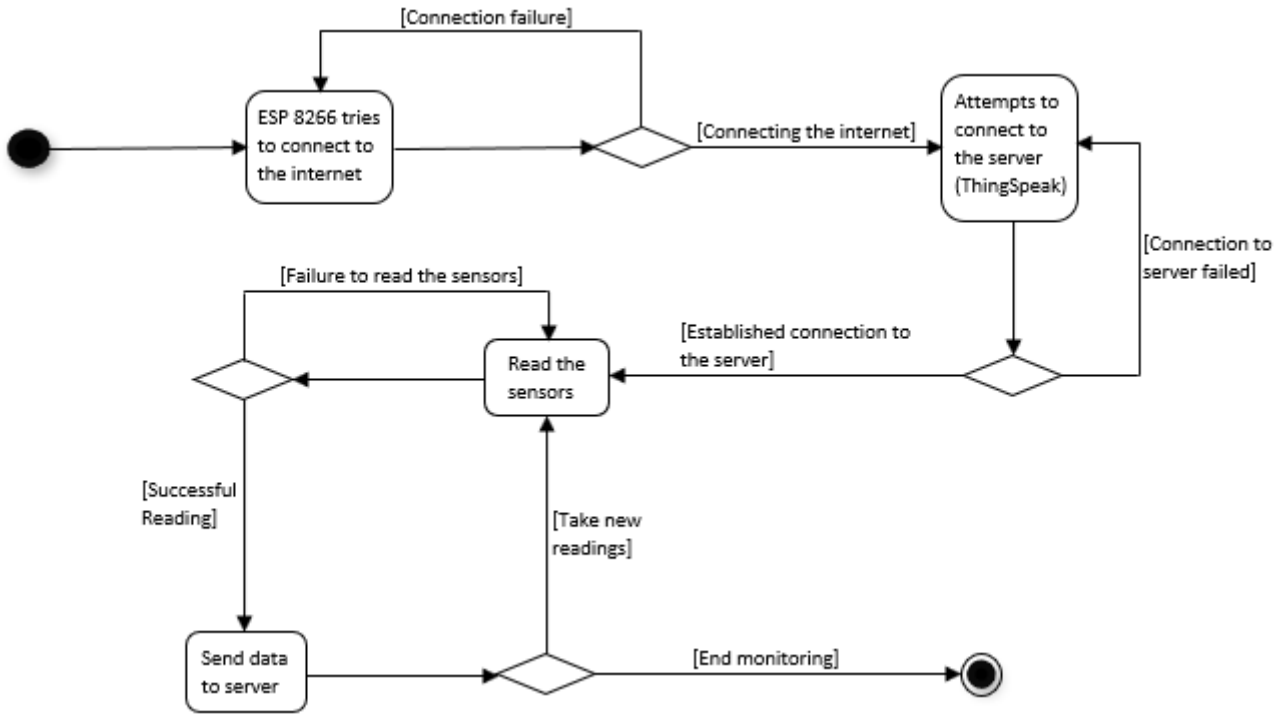


Figure 4. Monitoring system flowchart.

The power for ESP8266 microcontroller is supplied via USB cable (the same cable used in programming). The hygrometer sensor is read through the single ADC pin of the NodeMCU (A0), which allows reading

of the percent humidity (0 - 100%). The voltage divider is necessary because the output voltage A0 of the sensor provides 5 V, while the analog input of the NodeMCU accepts a maximum of 3.3 V. Figure 5 shows the schematic circuit of this experiment.

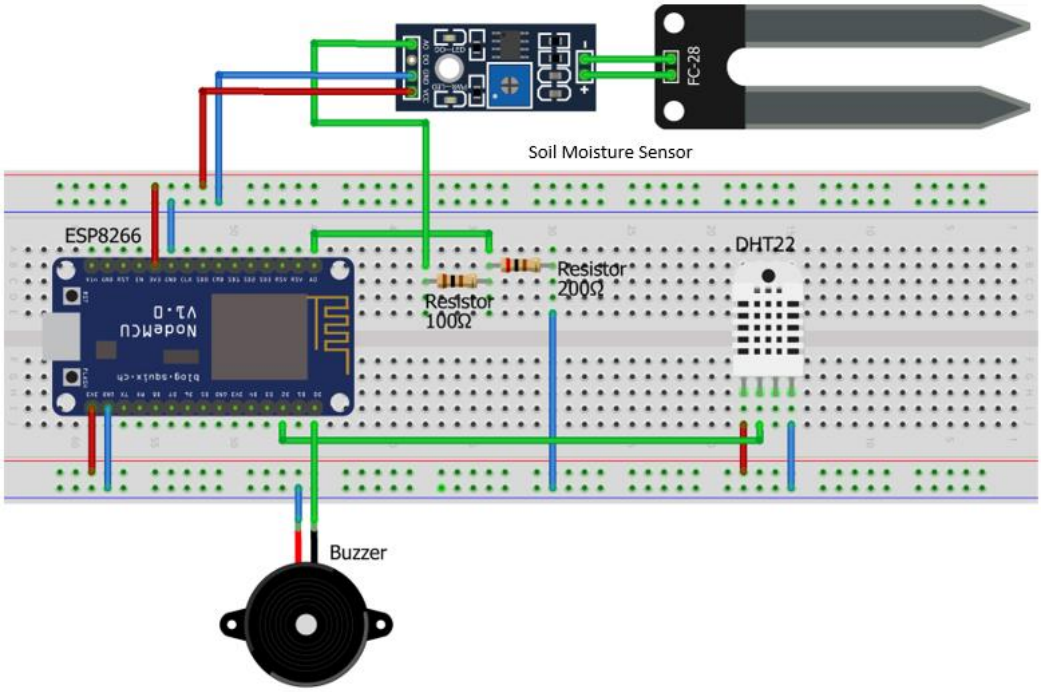


Figure 5. Proposed circuit diagram of phase one.

The programming was performed in C Language. After loading the source code for the NodeMCU, the Serial Monitor (with baud rate at 9600 baud) port to debug what the NodeMCU is doing can be open. Also, opening the channel site in ThingSpeak, each arrival of data in a graph can be seen in real time.

The result of the final circuit is shown in Figure 6. A buzzer has been added to the project for emiting a beep as soon as the ESP8266 sends a message to the server, so whenever a new data is collected the system will inform.

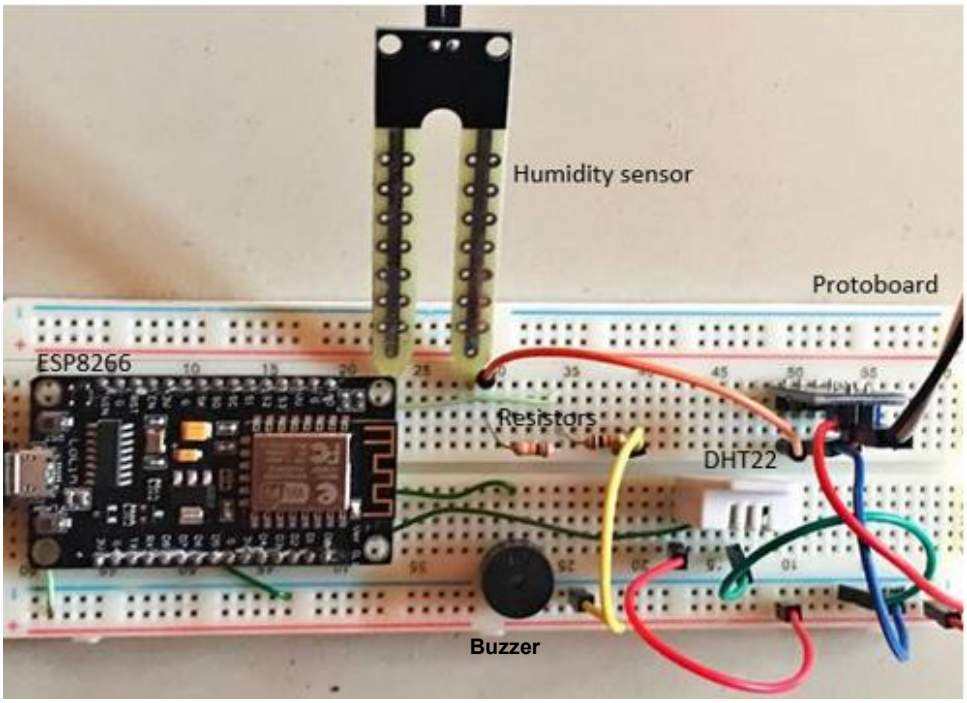


Figure 6. Final Project Circuit of phase one.

Figure 7 shows the developed circuit of the proposed phase one applied for monitoring the soil moisture of a small plant pot. The circuit can be powered with a 5 V battery or with a cell phone charger.

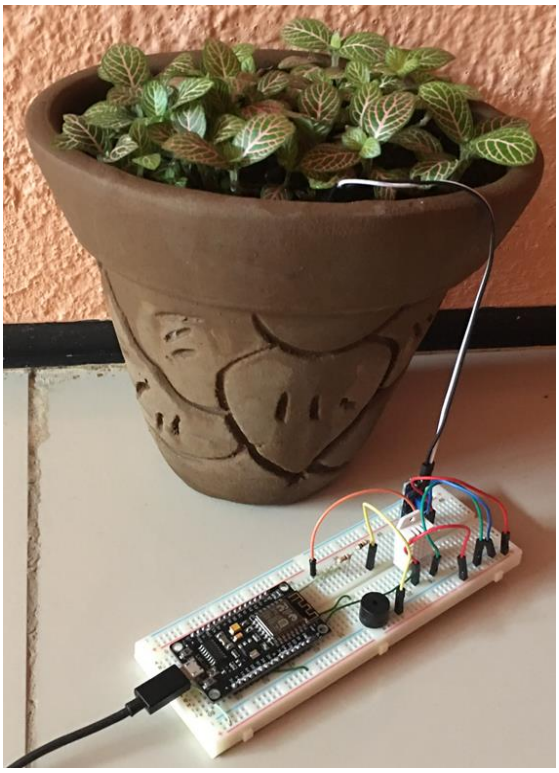


Figure 7. Circuit Monitoring a Plant.

4.2 IoT system for irrigation monitoring and control

The phase two system follows the following cycle: initially the microcontroller assumes a value of one second among measurements and must act to maintain the minimum or maximum values of humidity. Then

it sends the result of the first sensing to the API, where the data is stored in the database and receives with the server response the parameters of minimum or maximum, interval of measurements and whether to drive the water pump or not. The electrical schematic can be seen in Figure 8.

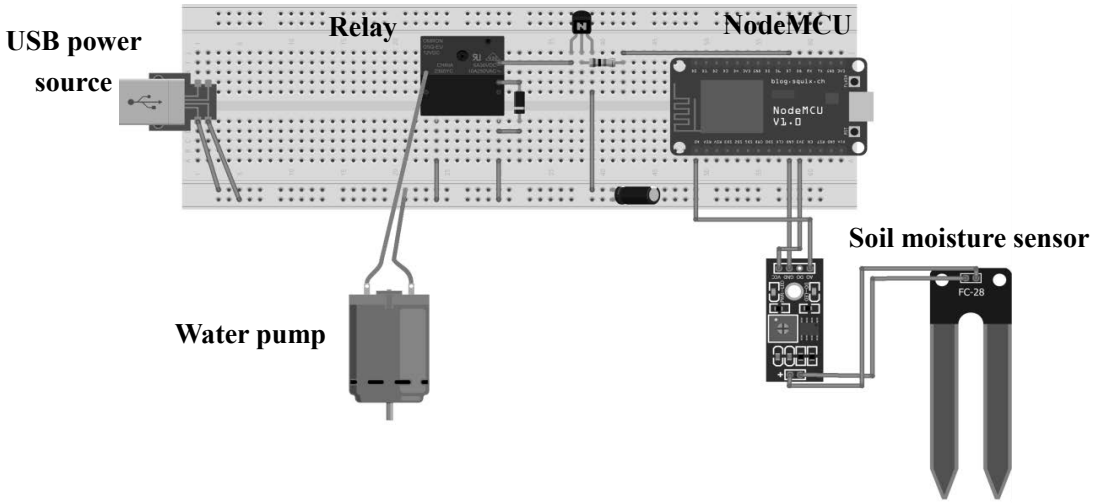


Figure 8. Circuit of the schematic project.

In Figure 9 the schematic of Figure 8 can be observed in operation.

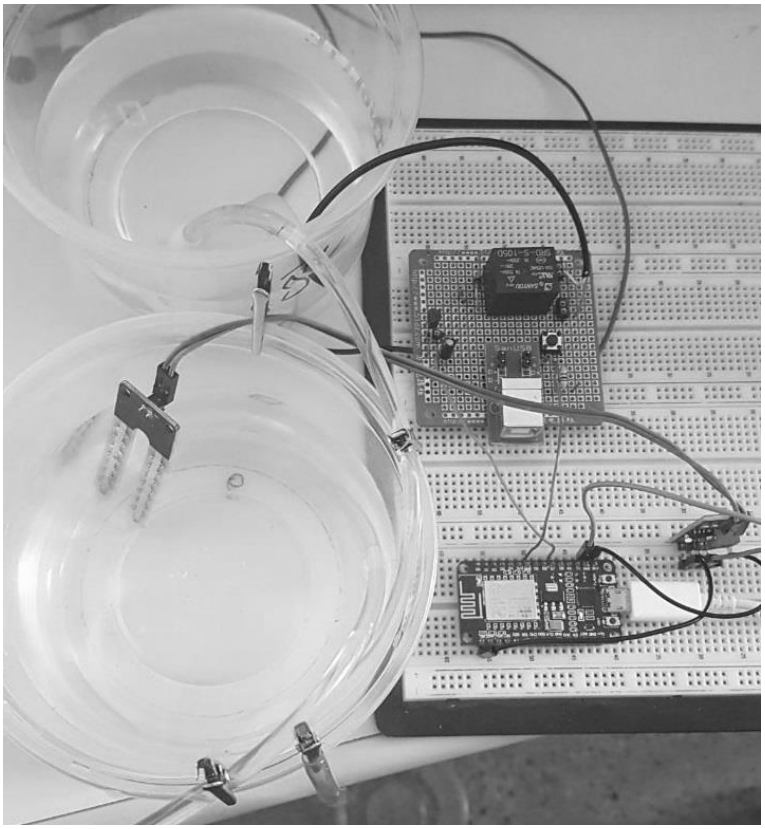
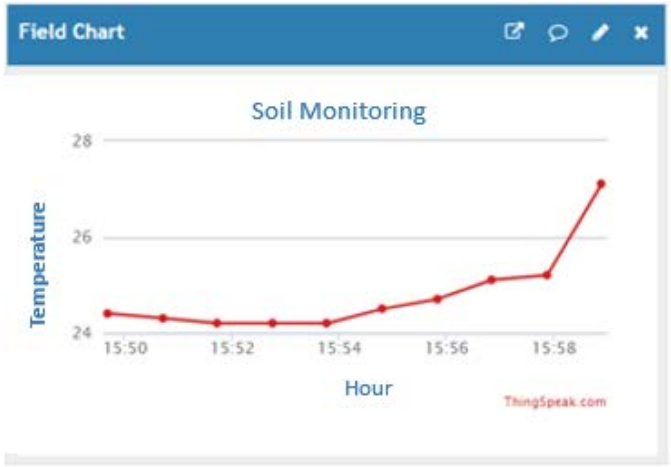


Figure 9. Complete circuit in operation.

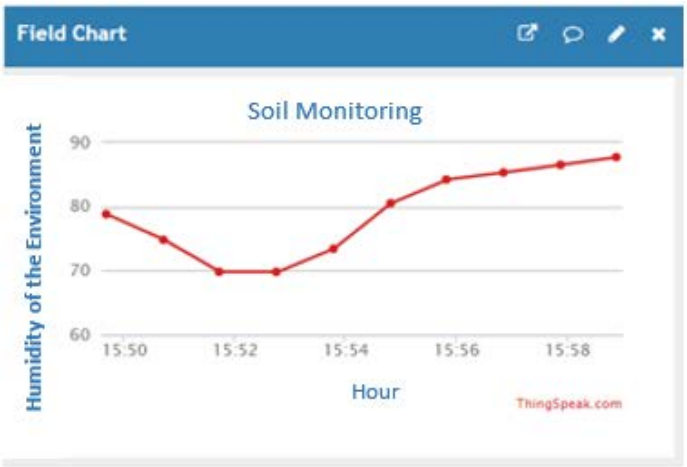
The software running on NodeMCU was written using the C language libraries created by Dennis Ritchie at the Bell Labs in 1972 [25]. The web page was developed using PHP, which is a language developed by Rasmus Lerdoff using the C language itself in 1994 [26].

5. Results

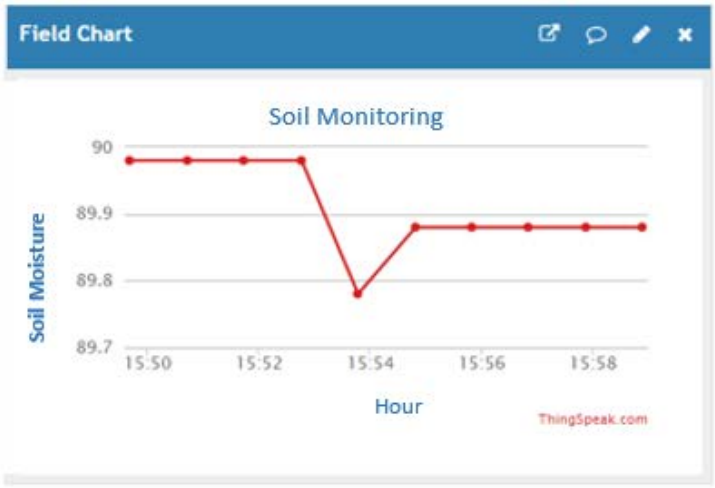
The graphs of Figure 10 show the phase one results. The ambient temperature (Figure 10 (a)) remained constant with a slight rise in the end of the evaluated period. On the other hand, the humidity of the environment (Figure 10 (b)) had a slight oscillation. In soil moisture (Figure 10 (c)), which is the main parameter to monitor, there has been a sharp drop.



(a) Ambient Temperature



(b) Ambient Humidity



(c) Soil Moisture

Figure 10. Graphs with phase one results.

In phase two, the data is stored in a MySQL database, which is an open source relational database maintained by Oracle [27]. Each measurement performed by the microcontroller is stored with date and time information, thus facilitating the generation of reports with the acquired data [28]. If the ESP8266 runs out of connectivity, the data is unfortunately lost. This data loss can be seen as white space in reports. One solution would be to store the values locally for later sending to the server [29].

Observing the graph of the developed Web interface for soil moisture monitoring and time generated by the system (Figure 11), it was seen that it succeeded in detecting a fall in moisture and correcting soil moisture, thus maintaining a constant environment. It was also relevant for real-time remote analysis of

reports, thus allowing remote analysis of the current moisture and moisture search in other periods, since the data is stored in the database as historical data.

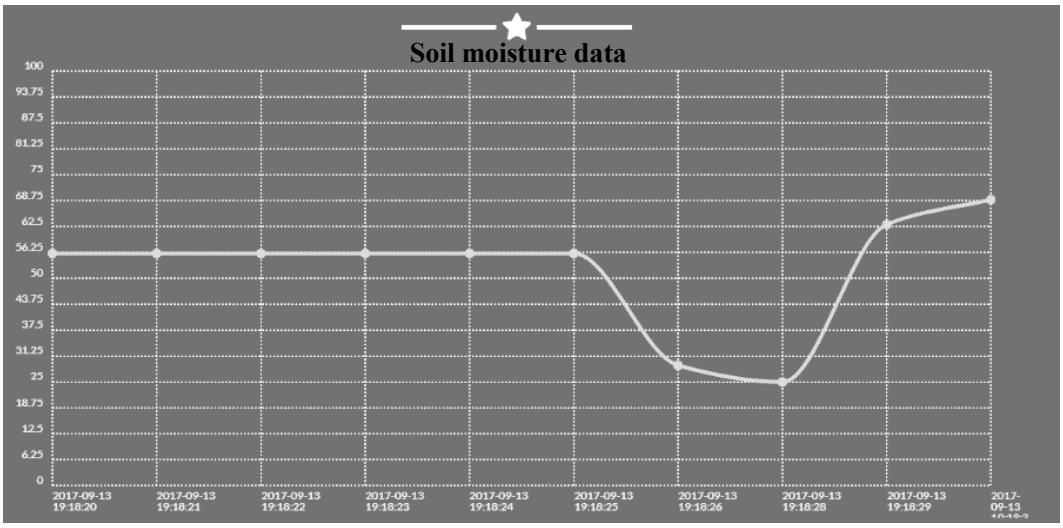


Figure 11. Developed Web interface for soil moisture monitoring.

6. Conclusion

This project reported a Project-Based Learning (PBL) application in teaching the disciplines in the area of embedded systems taught to undergraduate students in an educational institution. The ESP8266 IoT microcontroller made it possible to develop a versatile IoT project using low-cost embedded systems. With the proposed project, the use of ESP8266 applied in a real-world problem became satisfactory, since with small lines of code, numerous applications can be achieved, opening several possibilities for future projects in PBL, mainly with concepts of Internet of Things (IoT). The configuration data for irrigation time control and the lower and upper limits of soil moisture percentage could be adjusted through the developed PHP Web interface, where the monitoring of the variation of soil moisture through a graph can be done in real time. Considering that the monitored data could be accessed using the IoT ThingSpeak platform in phase one and using the Web interface developed in phase two, the obtained results were satisfactory.

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Religion: Helping or Hindering Moral Development

James Thomas
Indiana University Northwest

Introduction

The goal of helping students to become ethical citizens is a concern of college educators. There have been a number of factors, which seem to contribute to this goal. Religious inclination is one factor that researchers have considered. We would expect religious people to be highly ethical. However, research suggests that is not the case. In fact, some research suggests that religion can inhibit moral growth. In most cases, religiosity negatively affected moral development.

Research indicates that there is a complex relationship between morality and religion (Allport and Ross, 1967; Batson, 1976; Ernsberger & Manaster, 1981; Glover, 1997; Sapp & Gladding, 1989). Although, religion has long been associated with morality, Fowler (1981) declared that faith is not always religious in content or context, but there was a high correlation between the development of faith and moral development. Kohlberg (1969) believed that moral development was independent of religious development. Pascarella and Terenzini (2005) found inconsistent results in studies concerning religion and moral reasoning. Rest (2000) found a consistent and separate correlation between political attitudes, religion, and moral reasoning.

This study examines the literature to uncover nuances of the relationship between religion and moral judgment. It examines the four arguments researchers often make concerning religion and moral development. It looks at the testing measures that are frequently used to measure religiosity and moral development. It examines whether testing discriminates against certain religious factors. It examines the biases of political conservative and liberal leanings in a religious context. Finally, it looks for clues to enhance moral education in college.

Definitions

Religion.

Religion is a broad and complex concept. Religion is one of the personal outcomes of growth. King and Mayhew (2004) organized personal outcomes in college as cognitive, identity and social. There are many way to measure religious influence in studies. The broad range of measuring religious conviction creates a problem in relating religion to moral development. Religiosity is described as an organized set of beliefs concerning some higher power usually associated with rituals, texts, traditions, practices, and a code of ethics (Helminiak, 2001: Shafranske & Malony, 1990). Batson & Ventis (1982) say that religion is whatever we do to confront existential questions, such as who are we and how should we relate to others. Research suggests that religions manifest through numerous dimensions (Cornwall et al, 1986; DeJong et al., 1976).

Fowler (1981) speaks of faith in terms we might call religion, morality and identity. Although, religion has long been associated with morality, Fowler (1981) declared that faith is not always religious in content or context, but there was a high correlation between the development of faith and moral development. Fowler found that faith development was parallel to and preceded moral development. He finds that faith can be religious or not religious. His interview looks at what gives a life meaning, life shaping experiences, personal values. Based on his interviews, he places people in his stages of faith. He speaks of religion as the cumulative traditions constituted by texts of scripture including narratives, myths, symbols, traditions, music, dance, teachings, theologies, creeds, rites, liturgies, myths, prophesies, and other elements. Fowler (1981) says that faith is the deeper and more personal response the individual uses to respond to this tradition. Faith is a universal quest for a relation to transcendence. Faith gives purpose and goal to all we do. Fowler believes that people advance through stages of faith from infancy through adulthood.

Roehls (1997) speaks of a broad range of Orthodox Protestants as evangelicals. They believe that the Bible is the final source of authority, God's saving work as a reality, Christ redeemed us all because we have all sinned, the importance of individual evangelism, and the value of a spiritually transformed life through the Holy Spirit. Orthodox religious people who believe that stealing and murder are wrong and can never make a choice to steal or murder. Religious experience takes many forms and affects people differently. Religion is psychologically complex; involving emotions, beliefs, attitudes, values, behaviors, and social environments. Wallis (2016) says evangelicals are white political conservatives who overwhelmingly show opposition to abortion and gay marriage.

Allport and Ross (1967) developed terms to describe how individuals experienced religion. They defined an extrinsic individual orientation where people use religions for their own ends. This orientation uses religion to serve as a reflection of their egos. Individuals with an intrinsic religious orientation find religion as the ultimate motive in their lives. Batson (1976) added a quest orientation in which individuals face complex existential questions, recognizing that they do not have answers and probably will never know the ultimate truth of these matters. These individuals still have a religious orientation in their lives (Batson & Ventis, 1982).

We can examine religious influence through individuals' images of God and their degree of certainty about their beliefs. Glock and Stark (1966) called this concept and conviction. Their scale examines religious influence through the individuals' images of God and their degree of certainty about their beliefs. While they claimed that that over 97% of Americans say they believe in God, they found a great variety in the images of God and the certainty of that belief. Some beliefs include belief in God, the Divinity of Jesus, whether Jesus was born of a virgin, whether Jesus performed miracles, the validity of the Bible, life after death, and the devil. It is also worthwhile to examine the attention people devote to the ritual expectations of their beliefs. This includes how often they pray, attend services, and read the Bible. These concepts define religious orthodoxy and can be measured by the Religious Orthodoxy Scale (Glock & Stark, 1966). College students are less likely to endorse orthodox religious beliefs than those who have not gone to college (Batson, Schoenrade & Ventis, 1993).

Getz (1984) reviewed a number of articles that surveyed religious variables and their relationship to moral development. She divided the articles into variables including religious affiliation, religious knowledge, religious ideology, religious experience, intrinsic-extrinsic motivation, and religious education. She concluded that the complexity of the religious variable makes any conclusions tentative. Some areas did provide consistent relations with moral development. Conservative religious ideology consistently related to conventional (limited) moral development (Brown and Annis, 1978; Cady, 1982; Clouse, 1979; Ernsberger, 1977; Ernsberger and Manaster, 1981; Lawrence, 1979; Sanderson, 1974). Liberal religious groups were more likely to prefer principled (higher) moral development. She speculated that conservative religious groups may let their religious ideology override their independent thinking. The dominant theory of moral development before Kohlberg was the socialization view or behaviorism. This view suggested that individuals learn the norms of their culture, accept and internalize them, and behave accordingly. Kohlberg (1981, 1984) adopted a constructionist view in which the individual determines what is moral. He defined moral reasoning as characterized by three different types of relations: between self, society, and rule expectations. The individual interprets situations, derives psychological and moral meaning from social events, and makes moral judgments. Sometimes, conforming to social norms can be wrong. Kohlberg was interested in how people arrive at moral judgments.

Other measures of religion include the willingness to engage in unethical behavior, prosocial behavior, seminarian behavior, college attended, church affiliation, dogma, faith, orthodoxy, ethical business behavior, and various assembled scales. In general, there are many facets of religion mentioned in research. While most of these facets seem to be positive influences it has been difficult to find religious influences that increased moral development.

Moral Development.

To measure religious influence we need to define moral development. We need to determine the best moral solution to a moral dilemma. We need to agree on the best moral solution. This is not always true.

Two common measures of moral development have been the Reflexive Judgement Interview (MJI) and the Defining Issues Test (DIT). The DIT is used extensively in moral research. Higher levels of morality can be complex. Turiel (1983) cited morality as prescriptive judgments of justice, rights and welfare considering how people should relate to each other. Moral judgment is measured in the research by the DIT *p*-score. This *p*-score represents the percentage of responses that agree with theoretical philosophers and psychologists. The DIT is used extensively to measure moral judgment based on its ease of use and popularity in many fields. The DIT consists of a number of small vignettes that present moral dilemmas. Subjects choose a course of action and list reasons for their choice. Bampton and Cowton (2009) claim that around 25% of all accounting moral research since 1990 has used it. The DIT boasts face validity (Rest, 1993), test retest reliability (Davidson and Robbins, 1978), criterion group validity (Rest, 1993), longitudinal validity (Rest, 1979), convergent divergent correlation (Rest, 1979), discriminate validity (Rest, 1979), validation through experimental enhancement studies (Rest, 1979), validation of faking studies (McGeorge, 1975), and validation through studies of internal structure (Davidson, 1978).

Much of modern moral development theory begins with Lawrence Kohlberg. He could not accept that the people of Nazi Germany in World War II could eliminate the Jewish people. Kohlberg believed that development is the transfer of reasoning to more complex cognitive structures that result from interaction with one's environment. Individuals seek equilibrium within themselves and with others. He believed that moral development and religious development are separated on parallel paths. Developments that occur within individuals are parallel to changes in our perceptions of others. Experiences of role taking and the opportunities to react to differing perspectives provide for cognitive disequilibrium, which leads to moral growth. Successful development involves restructuring ourselves, our relationships, and our role in the social world (Kohlberg, 1969, 1981, 1984).

Kohlberg described six stages within his pre-conventional, conventional, and post-conventional moral levels. His first stage is obedience and punishment driven, which focuses on the direct consequences of the individual's behavior. His second stage is self-interest driven, where individuals determine what is in their own self-interest yet are aware of family and friends' needs. The third stage includes individual accord and conformity concerns of an individual's role in society. His fourth stage centers on authority and social order, which includes maintaining a functioning society. His fifth stage is social contract driven. Individuals hold different views and values. Laws are social contracts that should provide the greatest good for the greatest number. He believed that advancement to this stage required an identity crisis, which is sufficiently resolved to develop adult commitments that establish care toward others. This requires sustained care for the welfare of others, and living with irreversible moral choices. The sixth stage includes universal ethical principles, which mandate doing the right thing because it is the right thing to do, whatever laws and the social order prescribe. Kohlberg developed the Moral Judgment Interview to measure moral development (Kohlberg, 1976).

Rest built upon Kohlberg's research to develop the cognitive theory of moral development. James Rest (1979, 1986, 1999) described Kohlberg's work as biased on concepts of organizing cooperation. Rest stated that cooperation is a fundamental structure for interpreting the social world. Cooperation helps people to arrive at the most important aspects of a moral situation. Rest believed it provides a way to link the relationships of the parties to each other. Cooperation leads to a strategy to determine which considerations are the most important and helps to identify the moral course of action. Rest (1999) calls this macro morality where people think about the formal structures of society, including laws, roles, institutions, and general practices.

Rest furthered the work of Kohlberg in moral development. He found correlations between moral judgment and those who love to learn, seek new challenges, take risks, take responsibility for themselves and their environments, and operate in social milieus that support them. Much of moral development occurs as people develop socially (Rest, 1986).

Rest developed the Four Component Model to explain moral behavior. He recognized that judgment is just a part of moral action. The model explains the psychological processes needed to perform morally in a dilemma. It includes moral sensitivity or the ability to identify a moral issue in a dilemma, the use of a moral judgment framework, the moral motivation to put moral values ahead of other values, and the moral character to take the morally correct action (Rest, 1986).

Rest developed an objective systematic test called the Defining Issues Test based on the scenarios of Kohlberg's Moral Judgment Interview. People at different points of development interpret moral dilemmas differently, have different determinations about what is right and fair in any situation. This test measures one's preference for more complex differentiating and discriminating moral considerations. Respondents encounter moral dilemmas and choose alternative courses of action, noting reasons behind their choices. This test calls on respondents to reflect their current moral judgment framework. The test measures the percentage of post conventional moral reasoning used in responding (the *p*-score). This *p*-score reflects the percentage of reasons that respondents tell us refer to rights, values, and universal principles.

Much of the debate today concerning religion centers on Kohlberg's level 4, conventional reasoning, and level 5, post conventional or principled reasoning. Conventional reasoning centers on following rules. Rest (1999) uses the term Maintaining Norms Schema stating that society needs normative rules and role systems to address common needs in ways that are reliable and provide for safety and coordination among the community. Post-convention reasoning centers on being aware of what is best for society despite the rules. Rest (1999) states that moral criteria such as human rights are a higher priority over social conventions such as laws, roles and contracts.

Research on Religion and Morality

Research regarding the effect of religion and moral development is abundant, but the results are inconclusive. The main categories of studies centered on moral development and what is the correct moral action, religious beliefs and activities, liberal and conservative congregations and colleges, and non-moral actions such as cheating and breaking the law. Often conservative religious ideology lead to conventional (limited) moral development. Liberal religious groups were often more likely to prefer principled (higher) moral judgment. Kohlberg (1969) believed that moral development was independent of religious development. There are other arguments regarding religion and moral judgment. King and Mayhew (2004) reviewed 600 studies covering religion and moral development. They found that students with liberal religious orientations were more likely to use post-conventional moral reasoning. Getz (1984) reviewed over 30 studies and found a consistent relationship between religion and moral reasoning. She believed that religion brings out the best and worst in people, but found a consistent if not direct relationship between religion and moral reasoning. Rest (2000) reviewed over 20 studies and found a consistent and separate correlation between political attitudes, religion, and moral reasoning. Liberal and conservative influences affect moral judgment studies. Study results were inconsistent, but most reported higher levels of moral reasoning in liberal schools and congregations.

Religion may influence students in choosing a college. Researchers have found a significant difference in the growth of moral development depending on the type of college attended and the major studied. The literature refers to this phenomena as the college effect. In 172 studies, differences in types of colleges produce differences in moral reasoning (King & Mayhew, 2002). Allport and Ross (1967) reviewed studies of prejudice and volunteering. Moral reasoning differs significantly depending on college

type (Pascarella & Terenzini, 1991). The type of institution influences moral development (Ponemon, 1990). McNeel (1994) studied religious congregations and their relationship to moral development.

Many studies found that religion did not promote ethical reasoning. However, the means of testing of moral development and degree of religiosity seem to influence the results. All of these studies used either the Moral Judgement Interview or the Defining Issues Test (DIT). These studies used different instruments to evaluate religious factors but found religious inclination limited moral development (Dirks, 1988; Holly, 1991; Kohlberg, 1969; Lawrence, 1979; Wahrman, 1981). Other studies reported similar conclusions (Batson, 1976, Burwell et al., 1992; Buier et al., 1989; Cummings et al., 2001; Foster & LAFarge, 1999; Gongre, 1981; Good & Cartwright, 1998; Hood, 1984; Icerman et al., 1991; Jeffery, 1993; King and Kitchner, 1994; McNeel, 1994; Metkowski & Straight, 1983; Needham & Friedman, 2012; Ponenman & Gabhardt, 1994; Shaver, 1985 & 1987; St Pierre et al., 1990; Whitely, 1982; Zeidler &Schafer, 1984). The majority of these studies relied on the Moral Judgment Interview or the Defining Issues Test.

Thomas and Dunphy (2011) also surveyed 270 students at a regional campus and found religious orthodoxy to have a significant negative effect on moral judgment. The regression analysis revealed that religious Orthodoxy was significantly, negatively related to ethical development using the DIT. Participants were asked if they attended religious services. Participants who expressed views high in religious orthodoxy tended to attend church services more frequently than those whose expressed views that were not high in religious orthodoxy (r= -.54**). Although attending religious services was positively related with moral judgment scores (r=.117), the regression analysis revealed that the relationship was not significant when other variables were included in the analysis.

Another way to measure religious influence is to refer to the university or religious group in political terms such as conservative or liberal. Many studies concentrated on liberal and conservative congregations and colleges. These studies typically found the conservative congregations and colleges limited moral development.

Many scholars reported conservative religious beliefs limited moral judgment with the DIT (Dirks, 1988; Lawrence, 1979; Rest, 1979). Needham & Friedman (2012), using the DIT acknowledge that religious conservatives are inferior in moral decision-making. Bible colleges seem to inhibit moral reasoning (Rest, 1979). Rest (1979) using the DIT reported that the conservative Christian commitment of Bible colleges is associated with lower levels of principled reasoning. Evangelical students at Bible colleges obtain lower moral development *p*-scores using the DIT (Dirks, 1988). Conservative schools reported lower levels of moral judgment (Rest 1979, 1986) associated a conservative Christian focus with lower levels of moral reasoning. Lawrence (1979) using the DIT found fundamental seminarians exhibited lower moral growth than ninth graders. Shaver (1987) using the DIT believed that Bible colleges inhibited moral growth. Sanderson (1974) using the DIT found that moral reasoning had a strong negative correlation to conservative religious and political orientations. Clouse (1985) using the DIT found conservative religious and political views limited moral development.

Many other studies examined moral development and liberal and conservative colleges both religious and secular and found that liberal colleges increased moral development. McNeel (1994) using the DIT found that even conservative religious Christian liberal arts colleges showed strong longitudinal growth in

moral reasoning. McNeel (1994) using the DIT found that moral development fits nicely with a liberal arts focus. Research found that higher moral reasoning resulted using the DIT in a number of studies of Christian liberal arts colleges (Buier, Butman, Burwell, & Van Wicklin, 1989; Bridges & Priest, 1983; Burwell, Butman, & Van Winkler, 1992; McNeel, 1991; Metkowski & Straight, 1983; Shaver, 1987). Buier, Butman, Burwell, and Van Wicklin (1989) used both qualitative and quantitative methods including the DIT with freshmen and seniors at three Christian colleges. Buier et al. (1989) found that students attending Christian institutions make significant improvements in their ability to reason at higher moral levels and are similar to students at secular institutions. Ponemon (1990) declared that accounting students and alumni from liberal arts colleges reported higher moral reasoning. This is one of the few studies showing moral development in accounting students probably due to the liberal arts college. Pascarella and Terenzini (1991) reanalyzed Rest's 1979 study of 2,500 college students from across the country. They believe different institutional environments may have differing impacts on the development of moral reasoning. Their results reported the greatest level of moral judgment measured by *p*-scores at church-affiliated liberal arts colleges, followed by public research institutions and two-year colleges. Lower scores resulted at private liberal arts colleges, private universities, and public comprehensive universities.

Other studies found that certain elements of religion did promote ethical reasoning. Batson and colleagues (Batson, 1976: Batson et al., 1989) using the MJI found that people driven to find religious truth and question their own faith are more likely to use higher stages of Kohlberg's principled reasoning. Agle and Van Buren (1999) found a small relationship between religious beliefs and measures of corporate social responsibility using a Guttmann like social responsibility scale. Ernsberger (1976) and Ernsberger and Manaster (1981) using the DIT found liberal church congregations reported increased moral development. Clouse (1979) using the DIT reported religious and political liberals displayed higher moral reasoning. Cady (1982) using the DIT found those congregations that considered a flexible interpretation of the Bible displayed higher moral reasoning. Needham-Penrose (2012) using the Christian Fundamentalist Belief Scale, the Moral Identity Measure and the Christian Inventory of Moral Belief found religious individuals enjoyed higher moral development. Fowler used his Faith scale and found students in higher levels of faith possessed a higher moral development. Holley's (1991) study using a modified DIT found students with more liberal religious orientations were as likely to use post-conventional moral reasoning as were students from more conservative religious orientations. Divergent results typically revolve around religious and moral measures.

Other studies reported mixed results or no influence. Pascarella and Terenzini (2005) found inconsistent results in studies concerning religion and moral reasoning for all studies published in the 1990's. Tittle and Welch (1983) along with Weaver and Agle (2002) reported mixed conclusions regarding religion and ethics. Others (Hood et al., 1996; Smith et al., 1975) found no difference between religious and nonreligious individuals on unethical behaviors. Kidwell et al. (1987) found no relationship between religiosity and ethical behavior of managers. Hood et al. (1996) concluded that relating religion to ethics is a roller coaster ride. Vittle and Paolillo (2003) reported insignificant results comparing religion and consumer ethics. Harris (1981) found no correlation between moral judgment and religious belief.

It appears that there is an inconsistency in reporting study results when researchers are using one facet of the broader concept we call religion.

Four Arguments

Let us examine some of the issues surrounding religious orientation and moral development. While there are numerous studies looking at religion and moral development from a multitude of perspectives, there is seldom any conclusions. The complexity of the concepts and measures involved make meaning conclusions difficult. Four possible conclusions are available to describe the effect of religion on moral development.

Some studies represent special issues. Wahrman (1981) found that religious dogma negatively correlated with higher levels of morality. This study ignored individual differences. Getz (1984) and Richards (1992) question the use of affiliation as a means of defining religiosity. Thomas and Dunphy (2009) found individual's measure of orthodoxy significant but not unique in influencing moral development. For example, Wahrman grouped Roman Catholics and Orthodox Jews as orthodox, while Conservative and Reformed Jews as liberal. The broad strokes used to measure religion, detract from the results.

Another argument for influencing moral development was Fowler's (1981) use of the term faith. Fowler found a positive relationship between faith and moral development. His faith term uses concepts of religion, morality and identity. Possibly, due to measuring similar dimensions Fowler's work is not used to contribute to the religious moral development argument (Getz, 1984).

The third argument states that the DIT is prejudiced against conservatives. Evangelicals often claim that there is war against religion as evidenced but the DIT. The DIT has been accused of using terms that decrease the scores of conservative people and increasing the scores of liberal people. Conservatism is any political philosophy that favors tradition in the face of external forces for change, and is critical of radical social change. Conservatives favor a yardstick such as the Bible. Liberalism is a philosophy advocating measures of progressive political reform including the freedom of the individual and government guarantees of individual rights. Liberals favor a yardstick such as the greatest good for the greatest number.

In other words, the DIT may have a liberal bias. One possible explanation for the results of religion and moral research is the handling of conservative issues by the DIT. This goes back to the issue of what defines the highest level of moral development. One critique of the DIT implies that moral judgment is influenced by political persuasion, and understates the moral judgment of conservatives (Sweeney and Fisher, 1998/9). Bay (2002) implies that biases including gender, politics, culture and religion influence results along with dated questions. While these critiques do not invalidate results, they suggest that results may be subject to various influences.

Thoma (2014) answers this claim by stating that the DIT measures an individual's understanding of social cooperation in terms of justice and fairness within the context of laws, governments and social institutions. Thoma (1999) points to four studies (Getz, 1985, Rest, 74, Rest 1979, Thoma, 1993) which control for liberal/conservative issues and still relate the DIT scores to public policy and moral development. Liberal/conservative leaning are a limited influence. He states the DIT captures decisiveness

of actions, agreement with philosophy and political science students who achieved high DIT scores.. Thoma (2014) believes that much of the conflict is due to the distinction between micro-morality which is the morality of everyday exchanges, and macro-morality which focuses on society wide considerations. The DIT measures the schema or framework an individual uses to judge a moral dilemma. It does not measure motivation to correct a moral wrong or whether an individual will take action against the wrong.

The last argument with religion and moral development deals with the measures and words the DIT uses to define moral development. The issue is how can we always define the correct moral action. The DIT measures results consistent with philosophers and psychiatrists views. As a constructionist, Rest and Kohlberg believed the individual needs to create truth and not rely on existential laws.

Are there absolute measures or moral development and if so what are they? Is there agreement on what is right or wrong? Philosophers refer to the concept of moral absolutism. This concept refers to the belief that there are absolute standards that we can use to address moral questions. Under this concept, actions are inherently right or wrong. This implies that morals are inherent in the laws of the universe, the nature of humanity, the will of God, or some other fundamental source. Plato, Aristotle and Kant were followers. (philosophybasics.com/branch_moral_absolutism.html 9/8/2016).

An example of moral absolutism would be the Ten Commandments which include "Thou shalt not steal and Thou shalt not murder" (biblegateway.com/passage/?search=Exodus+20 9/8/2016). This concept would be particularly relevant to orthodox religious people.

Another related concept is Nonmaleficence which is the obligation not to inflict harm intentionally. This is part of the Hippocratic Oath taken by doctors and considered bioethics first obligation to physicians. (guides.library.jhu.edu/c.php?g=202502&p=1335752 9/8/2016).

An alternative version of moral absolutism is moral relativism. It states that moral positions do not reflect universal truths. Instead, moral truths are relative to social, cultural, historical, or personal circumstances (philosophybasics.com/branch_moral_absolutism.html 9/8/2016). This questions whether there is any universally accepted source of what is right. It also questions why there are so many possible opinions of what is morally correct. Kohlberg believed in a constructionist philosophy where individuals define what is moral (1975). Rest concurred saying that morality should not be shielded by a privileged source of authority (1986).

The DIT 2 Test (Rest & Narvaez, 1998) offers one of these dilemmas. A trolley on a track is careening out of control down a hill. The trolley is headed toward a group of unsuspecting people who will surely be killed unless an individual chooses to pull a lever which will cause the trolley to divert to another track where it will surely kill one other unsuspecting individual. The DIT relies on self –reported choices which are linked to levels of moral development. The DIT associates the response of pulling the switch to kill less people with a higher moral development. A conservative orthodox religious person would find switching the track to kill only one person an active commission of murder defying a divine commandment not to kill. The utilitarian school of morality would argue that the loss of one life is better than the loss of many lives. The evangelical would argue that each life is sacred and divinely inspired. Only God can take a life. Evangelicals argue that the DIT values this life over the life after death; it dishonors conservative religious

teachings such as the Bible, and is biased by mistaking higher levels of morality by favoring utilitarian answers to dilemmas (Needham & Friedman, 2012).

Another dilemma in the DIT 2 Test (Rest & Narvaez, 1998) is in the disease dilemma. A woman was dying from a unique disease. One drug existed that could possibly save her. The woman's husband, Heinz, could not get or borrow the money to buy the drug, which the druggist was selling at ten times what he paid for it. The druggist refused to lower the price. Should the husband steal the drug? The DIT associates stealing the drug with a higher level of moral development. A conservative religious person would equate stealing with a lower level of moral development since stealing is against the Ten Commandments.

There appears to be a divide between conservative religious groups such as evangelical orthodox Christians and the psychologists and philosophers who developed the DIT (Needham-Friedman, 2012). Needham (2012) suggest a subtle ant-religious bias against orthodox religious people. Cummings, O'Donohue and Cummings (2009) believe there is a war against religion waged by liberal ideology and psychologists. Some (Al-Shebab, 2002; Lawrence, 1987; Richards and Davidson, 1992; Shweder, 1990; and Walker et al., 1990) argue that religious conservatives are not lacking in moral development at all, rather they adhere to a different set of moral values as suggested by the Bible. Rest (Rest, et al., 1999) noted that the conservative (religious) perspective poses a problem to his DIT. There could be a number of reasons for this.

These four arguments are mentioned in the literature and point to issues involved in relating religious influence and moral development.

Discussion

After reviewing the literature there are a number of dominate if not universal themes that can be identified. These themes are blurred by the myriad of measures used to measure religious influence used over the last 60 years. While DIT and MJI are by far the most dominate measures used to gauge moral development, there are many others. Many of the studies used influences defined by large groups such as Protestants, which possibly could have been more meaningful had individual measures been applied. All of these issues complicate the ways we can associate religion to moral development.They diminish our progress to influence the growth of morality in students.

There are over a hundred different measures of religious influence. They include religious affiliation, religious knowledge, religious ideology, religious experiences, intrinsic- extrinsic motivation, religious education, quest orientation, evangelical orientation, various religious scales, reversion to unethical actions and many others. The vast majority of studies bare little influence to each other. This dilutes the results and encompasses a lack of consistency of the research.

On the other hand, the DIT and RJI are the predominate tools used to measure moral development. There are tens of thousands of studies using these measures. Not that there is universal agreement on whether these are the best measures. Criticisms involve whether the DIT is influenced by political orientation or verbal ability. Another criticism involves if the DIT measures the correct universal moral goal.

The dominate theme indicates that religious appears to diminish moral judgment. Most but not all studies support this conclusion. Results depend on the myriad of measures used to measure religious influence. Religion is influential in moral development.

Another dominate theme is that liberal religious groups and liberal universities support moral development. Hundreds of studies support this conclusion. Conversely, conservative religious affiliation and conservation universities limit moral development. Which would seem to follow.

In general, there are correlations between religion and moral judgment in the literature. However, the direction and strength depends on the measures used in the studies. Most studies resulted in showing diminished moral judgment as religious influence increased, particularly when measuring moral judgment with the DIT or RJI. Other results were recorded when studies used other scales. These included a Quest or prosocial scale, corporate responsibility, or helping behavior. Other religious scales included conservative religious colleges with a liberal arts focus, the Christian Fundamentalist Belief Scale, the Moral Identity Measure, and the Christian Inventory of Moral Behavior.

Conservative religious groups point to the dilemma of moral judgment. They question whether moral judgment is relative or absolute. They question whether killing is ever justified. They question whether stealing is ever justified. We can question whether an evil act is ever justified. We can question who makes this determination. Since the purpose of the DIT and RJI is to determine the moral framework of the individual, we need to define the best moral outcome. We must weigh the betterment of society and a high moral code.

The final dominate theme is that there is a strong correlation in the literature between political attitudes in religious group and university settings and moral judgment. The more liberal focus of the setting, the greater the gain in moral judgment. The more conservative focus of the setting the more limited the gain in moral judgement. This is particularly true when using the DIT, which admittedly has a liberal bias.

Conclusions

It is not the individuals that determine the results, it's the measures used that determine the results when studying religious influence. This study is a review of literature relating religious measures and moral development. Research suggests that religion is less important to morality development than political persuasion. Religious measures are too numerous to find a generic norm. Research finds that the DIT or RJI is the primary method to measure moral development. This helps us to standardize the responses and provide some validity and verifiability. The nature of morality is complex. Morality is subject to cultural, religious and other influences. Most of the studies relating religion and moral development have been located in the United States with Christian subjects. The stories in the DIT and RJI are dated. The language in the DIT and RJI seem to make them susceptible to political influences. The highest moral responses in the DIT reflect constructionist, social and philosophical assumptions. The wording of the DIT limits the responses of certain persuasions. The language may cause responses to fall from post conventional reasoning to conventional reasoning. There are lessons in the literature that should be used in universities to encourage moral development. There are a number of themes suggested in the literature.

The first theme is that political persuasion predicts moral development better than religion. While the term religion is used extensively in the research as a predictor of moral development, the results are primarily negative or limiting when measuring moral development with the DIT or RJI. Only when other measures of moral development are used, does religion influence become more pronounced. Religion limits moral development when aspects of religion are measured. These aspects include beliefs, affiliations, and other individual characteristics.

Taken as a separate variable, religious influence on moral development has produced a variety of results. Parboteeah, Hoegl, and Cullen ((2008) suggest some reasons for the lack of consensus. Religion is complex and studies often include only unidimensional conceptualizations of religion such as church attendance. Those studies that include multiple dimensions of religion fail to include a theoretical model that justifies their choice. Most studies use only one religion and ignore cognitive, affective and behavior components of religion. Many studies include ethical measures that suffer from social desirability biases. Many studies focus on narrow groups of subjects.

When religion is coupled with political characteristics such as liberal congregations or liberal religious universities, the political aspects dominate. Conservative religious congregations and universities limit moral development in the literature. Liberal congregations and universities foster moral development in the literature. McNeel (1994) reported on strict religious students attending a liberal arts college. He reported that the liberal arts focus had the greater influence on the students fostering moral development. He concluded that the liberal arts focus fits nicely with the DIT. Further research could verify this.

The second theme involves the wording of the scenarios in the DIT and RJI. Strict religious groups object to defining the highest moral action in some scenarios. They object to conclusions where individuals should steal or kill to defend human rights because this defies moral laws. Strict religious groups define moral development in terms of following moral laws such as the Ten Commandments or the Bible. This is a different scale from that used in the DIT. Rest and Kohlberg would argue that philosophers and psychologists would state that moral criteria such as respect for human rights have precedence over social conventions such as laws, roles and contracts. Kohlberg might ask if citizens today should follow lows that persecute groups.This is the dilemma.

Part of the issue revolves around the wording used in the original scenarios dating back sixty years. Kohlberg worked with mostly male students at Harvard University. To force students to choose the best alternative they purposefully chose situations where students could weigh situations where stealing, murder, and breaking laws might better protect human rights. Perhaps, by updating the language and situations to exclude breaking laws and commandments a compromise could be achieved. Is there a way to assimilate the higher level goals while not offending individuals who look to the Bible for moral truth? Rest and Kohlberg may not agree.

Holley (1991) found a way to modify the DIT's language to negate the normal results. In this study religious influence increased moral development. Perhaps, instead of forcing an individual to switch the tracks in the trolley scenario, an earthquake could switch the tracks. This would take the individual guilt out of the equation. This might also take the guilt out of the decision to take the drug. Or those scenarios which require a decision to break a commandment could be eliminated from the DIT. Ultimately, post-

conventional reasoning requires an individual to choose between human rights and social constructs. Is there a way to word the scenarios that enables evangelicals and other conservative religious individuals to achieve post-conventional reasoning? Further research is needed.

The third theme involves how we can use these studies to foster moral development in college students. "American postsecondary education has a role in the development of citizens who both think and act morally" (Pascarella & Terenzini, 2005, p. 345). The National Association of State Universities and Land Grant Colleges (2006) reviewed the National Center for Public Policy and Higher Education paper which indicates that the public expects graduates to have certain abilities. They include a sense of maturity, the ability to self-manage, the ability to get along with people, problem solving and thinking abilities, technology skills, career expertise, writing and speaking abilities, and good citizenship practices. Religion and political persuasion are both identity outcomes of growth (King and Mayhew, 2004). Research implies we can influence moral development by helping students to develop their identity. Unfortunately, Astin (2002) documents a decline in entering students expressing a goal of developing a meaningful philosophy of life.

Experiences and opportunities to react to differing perspectives provide for cognitive disequilibrium, which leads to moral growth. Successful development involves restructuring ourselves, our relationships, and our role in our social world (Kohlberg, 1969).

Rest found correlations between moral judgment and those who love to learn, seek new challenges, take risks, take responsibility for themselves and their environments, and operate in social milieus that support them. Much of moral development occurs as people develop socially (Rest, 1986). Rest's concept of separate correlations between political attitudes, religion and moral development suggest that identity development may be the key to moral development.

Chickering's model of student development, for example, included seven vectors that act as roadmaps to help determine where students are and which way they are headed. These vectors include developing competence, managing emotions, moving through autonomy toward interdependence, developing mature interpersonal relationships, establishing identity, developing purpose, and developing integrity (Chickering & Raiser, 1993).

The literature provides example of many activities in universities that encourage student identity development. They include community service, dealing with community problems, dealing with social injustice, experiential learning, reflection, group work, active leaning, decision making, small classes, student interaction, working with diverse peers, ethics courses, membership in professional associations, mentoring, logical training, and providing students safe environments (King & Mayhew, 2004). Encouraging students to develop support systems also has been reported (Thomas & Dunphy, 2009). Further research is needed to determine how best to utilize these tools with various groups of students.

There are many limits to this review. While many studies and mega studies are examined, thousands of other studies and variables were not. Many of the variables were studied in isolation. Certain variables may influence other variables. Kohlberg studied male students in the 1950's. Students are more varied than they were in Kohlberg's era. Students today come in a greater variety of backgrounds and certain variables

may have a varying influence on certain groups of students. As education has become more commoditized, aspirational goals may have become less relevant than employable skills.

This review of the relationship between religion and moral development has pointed to a number of factors that intervene. The lack of a consistent religious measure accounts for much of the confusion. The use of the DIT and RJI measures of moral development seem to be limited somewhat by an individual's political persuasion. Identity development appears to one of the results of student education and may play a role in ethical development. The issue of religion is intermixed with the issue of political orientation. Students have political leanings which can influence religious leanings and moral development. Religious leanings may or may not be a part of identity development. Further research is needed to explore the concept of religion, political persuasion and moral development as identity development. While religion seems to limit the growth of ethical development, the influence of conservative political persuasion may be the real influence. What element will bring these issues together? These issues require further research.

Finally, we are reminded of the results of many years of studies of moral development. Rest (1986) postulated that although a number of factors are known to influence moral development, we are unable to determine why. Derryberry and Thoma (2000) concluded we have no specific advice from the literature on academics for creating programs designed to foster moral reasoning. Pascarella and Terenzini (2005) suggested the effects of academic contexts on moral reasoning are indirect. Although we can appreciate the efforts to increase moral reasoning, the inconsistent results of studies suggest that we have much to learn about how religion influences moral development.

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Low cost Device for Online Monitoring of Noise in Libraries using Internet of Things

Antonio Leandro Martins Candido[1], Sandro Cesar Silveira Jucá[1], Renata Imaculada Soares Pereira[2*], Paulo Marvin de Brito Lima[1], Solonildo Almeida da Silva[3]

[1] Computing Department, Federal Institute of Ceará (IFCE) - Maracanaú Campus, Brazil

[2] Electrical Engineering Department, Federal University of Ceará (UFC) - Pici Campus, Brazil

[3] Pedagogical Department, Federal Institute of Ceará (IFCE) - Maracanaú Campus, Brazil

*Corresponding Author: renata@dee.ufc.br; Tel. +5585 3366.9585

Abstract

The present paper describes the development and practical application of an embedded system that performs the online monitoring of sound noises in a library of an educational institution using Internet of Things. The main objective of the proposed project is to record sound levels in closed areas and to alert users when allowed limits were exceeded. Thus, it was used a set of cost-effective tools, like free software and low-cost technologies. Raspberry Pi, PIC microcontroller and a sound sensor module were applied in the first phase. In the second phase, only ESP8266 microcontroller with sound sensor were used. Results of these two implemented phases are discussed. It was observed that both developed embedded systems, which use Internet of Things concept, contributed satisfactorily offering a better space for concentration.

Keywords: Embedded System; Internet of Things; Sound Noises.

1. Introduction

The NBR 10152 regulation of the Brazilian Association of Technical Standards (ABNT) - "Noise Levels for Acoustic Comfort", establishes values between 35 and 45 decibels (dB) for places as a library and guides dB values above this level do not necessarily entail risks of harm to health, but are considered acoustic discomfort [1].

Although 45 dB is, in practical terms, relatively low and difficult to maintain in a space where there is usually a lot of movement, it is recognized that levels far above this value generate discomfort for those who intend to establish a reading activity. Silence is a goal pursued in the reading environments, since a quiet and pleasant environment favors the study [2]. However, absolute silence in an environment in which there is human activity is impractical. For this reason, efforts should be to educate users that there are tolerable noise levels for environments such as a library.

The development of the embedded system for online monitoring of sound noises originated after the knowledge of the needs of the users of libraries in general and the main one of them is the predominance of the silence in the environment [3].

Thus, to implement techniques that help in the control of these levels of noise is necessary, since such

noises affect the concentration in these environments and, in a certain way, exclude the real purpose of these places, which is to provide a suitable place for the studies.

The embedded systems presented in this project has as main objective to assist in the control of the noise levels in such environments, thus being able to supply the users needs. From a low cost and always prioritizing to use free technologies and tools, this system can be used by other institutions or researchers and can be modified as needed.

2. Material and methods

According to [4], users of a library have diverse needs. They use not only the collection disposed, but also the space and equipment. Regarding spaces, at least two different needs can be identified: individual or group study/reading, being essential the noise level control in reading and individual study environments, where the aid of electrical and electronic devices presents to libraries an alternative to combating noise pollution.

Environmental comfort in libraries is little studied in Brazil, especially when referring to noise levels and user satisfaction [5]. These concerns are often neglected in the country even though noises cause a reduction of up to 60% in productivity, as it makes it difficult to concentrate, causing errors, waste due to distraction. In Brazil, libraries in general are adaptations of existing buildings that have these functions, although these results are not the adequate, some professionals architect a space that is basically summarized in two environments: the deposit of books and the place of reading.

The embedded systems proposed use principles of Internet of Things (IoT). IoT is an extension of the Internet, which gives everyday objects ("things"), but with computational and communication skills, connection to the Internet [6]. The Internet connection enables to remotely control the objects and to allow them to be accessed as service providers.

The Internet currently connects people and enterprises through computers and computational devices of any shape and capacity [7] and can collect large amounts of data [8].

3. Methodology

The methodology used to develop this project was firstly to carry out an experimental research in the library of an education institution. During the development of this embedded system, some equipment, devices, technologies and software were tested to find the most cost-effective and with less difficulty so that the system could be replicated.

The two proposed embedded systems for noise monitoring are described in the next subsections. The second phase is developed to reduce costs, applying ESP8266 IoT module (US$ 3.00) to replace both Raspberry Pi (US$ 35.00) and PIC microcontroller (US$ 4.00), quotation for 2018.

3.1 First version of the proposed system

In this section, an initial possibility of implementing the embedded system for monitoring noise is proposed. Firstly, it was implemented with Raspberry Pi (RPi), considered the smallest computer in the world, with the size of a credit card, USB connections to connect keyboard and mouse used in desktop computers. HDMI output is available, as can be seen in Figure 1 along with the description of the other connections. The embedded software Debian is free, based on Linux [9].

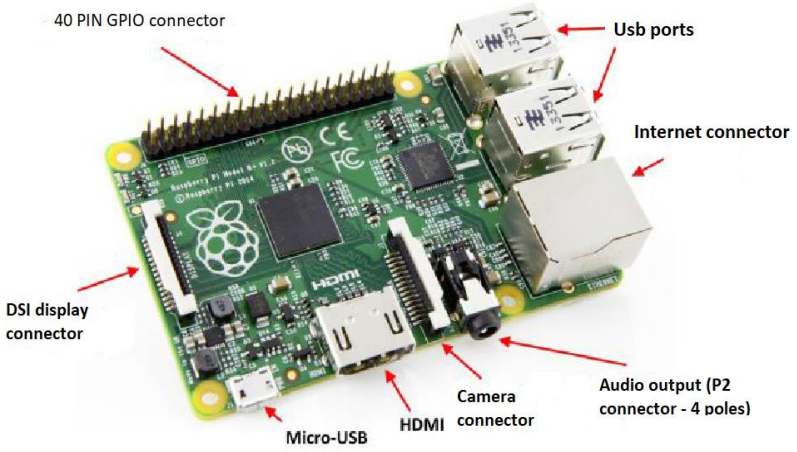

Figure 1. Raspberry Pi B+ [9].

The RPi used is the B+ Model has the following features:

- More GPIO. The GPIO header has grown to 40 pins while retaining the same pinout for the first 26 pins as model A and B;
- More USB ports. Four USB 2.0 ports, compared to 2 of Model B;
- Micro SD. The old friction-fit SD card socket has been replaced by a push-pull micro SD plug;
- Lower energy consumption. By replacing the linear regulators, power consumption is reduced with power between 0.5 W and 1W.
- Better audio quality. The audio circuitry incorporates a dedicated low-noise power supply;

The Model B+ is suited for use in schools and academic projects, offers greater flexibility than the simpler A or A+ model, is more useful for integrated projects that require very low power, and require more USB ports than model B [10].

Considering that RPi has no analog-digital converter (ADC), a PIC18F2550 microcontroller for this first proposed version was selected (pin diagram shown in Figure 2). It is a complete computer system, which includes internally a CPU (Central Processor Unit), RAM (data), flash (program memory) and EEPROM, I/O pins (Input/Output), plus other internal peripherals such as oscillators, USB channel, USART asynchronous serial interface, timing modules and A/D converters, among others, integrated in the same component (chip)

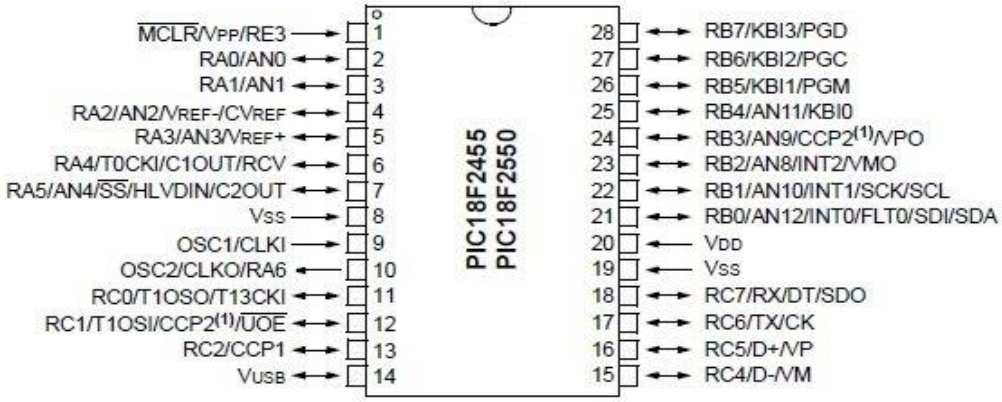

Figure 2. PIC18F2550.

In this version of the system the features offered by the Raspberry Pi GPIO pin set must be used, where values are received on the Rx serial pin (pin 18) and pin 7 is used to trigger the buzzer. These pins can be switched as either input or output. In other cases, each pin can be flexibly configured to accept different logic voltage sources. Figure 3 shows the table of the RPi GPIO pins.

The Raspberry Pi was used to communicate via serial interface with the PIC microcontroller, and the microcontroller received the data from an LM393 sound sensor module, which did not have a good reading of the noise changes in the environment, especially at longer distances. This module was later replaced. LM393 communicates with the microcontroller through an ADC input. The purpose of this sensor is to measure the sound intensity in the environment by varying the state of its digital and analog output if a beep is detected. It has an electric condenser microphone and can be used in alarm systems for example.

```
pi@raspberrypi ~/Code/wiringPi $ gpio readall
 +-----+-----+---------+------+---+---B Plus--+---+------+---------+-----+-----+
 | BCM | wPi |   Name  | Mode | V | Physical | V | Mode | Name    | wPi | BCM |
 +-----+-----+---------+------+---+----++----+---+------+---------+-----+-----+
 |     |     |    3.3v |      |   |  1 || 2  |   |      | 5v      |     |     |
 |   2 |   8 |   SDA.1 |   IN | 1 |  3 || 4  |   |      | 5V      |     |     |
 |   3 |   9 |   SCL.1 |   IN | 1 |  5 || 6  |   |      | 0v      |     |     |
 |   4 |   7 | GPIO. 7 |   IN | 0 |  7 || 8  | 1 | ALT0 | TxD     |  15 |  14 |
 |     |     |      0v |      |   |  9 || 10 | 1 | ALT0 | RxD     |  16 |  15 |
 |  17 |   0 | GPIO. 0 |   IN | 0 | 11 || 12 | 0 | IN   | GPIO. 1 |   1 |  18 |
 |  27 |   2 | GPIO. 2 |   IN | 0 | 13 || 14 |   |      | 0v      |     |     |
 |  22 |   3 | GPIO. 3 |   IN | 0 | 15 || 16 | 0 | IN   | GPIO. 4 |   4 |  23 |
 |     |     |    3.3v |      |   | 17 || 18 | 0 | IN   | GPIO. 5 |   5 |  24 |
 |  10 |  12 |    MOSI |   IN | 0 | 19 || 20 |   |      | 0v      |     |     |
 |   9 |  13 |    MISO |   IN | 0 | 21 || 22 | 0 | IN   | GPIO. 6 |   6 |  25 |
 |  11 |  14 |    SCLK |   IN | 0 | 23 || 24 | 0 | IN   | CE0     |  10 |   8 |
 |     |     |      0v |      |   | 25 || 26 | 0 | IN   | CE1     |  11 |   7 |
 |   0 |  30 |   SDA.0 |   IN | 0 | 27 || 28 | 0 | IN   | SCL.0   |  31 |   1 |
 |   5 |  21 | GPIO.21 |   IN | 0 | 29 || 30 |   |      | 0v      |     |     |
 |   6 |  22 | GPIO.22 |   IN | 0 | 31 || 32 | 0 | IN   | GPIO.26 |  26 |  12 |
 |  13 |  23 | GPIO.23 |   IN | 0 | 33 || 34 |   |      | 0v      |     |     |
 |  19 |  24 | GPIO.24 |   IN | 0 | 35 || 36 | 0 | IN   | GPIO.27 |  27 |  16 |
 |  26 |  25 | GPIO.25 |   IN | 0 | 37 || 38 | 0 | IN   | GPIO.28 |  28 |  20 |
 |     |     |      0v |      |   | 39 || 40 | 0 | IN   | GPIO.29 |  29 |  21 |
 +-----+-----+---------+------+---+----++----+---+------+---------+-----+-----+
 | BCM | wPi |   Name  | Mode | V | Physical | V | Mode | Name    | wPi | BCM |
 +-----+-----+---------+------+---+---B Plus--+---+------+---------+-----+-----+
```

Figure 3. Raspberry Pi GPIO Pinboard Table.

The detection limit can be set via a potentiometer in the module that regulates the digital output D0. However, for a better resolution it is possible to use the analog output A0 and connect to the ADC of the PIC18F2550 microcontroller. LM393 module specifications can be seen in Figure 4.

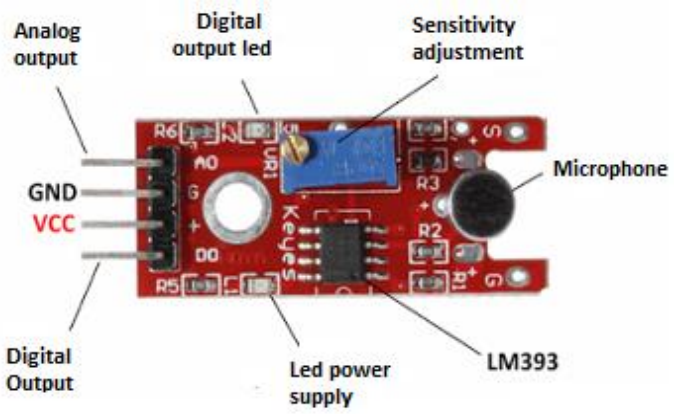

Figure 4. LM393 Sound Sensor Module, Model KY-038.

The microcontroller sends the data to the RPi through the TX serial pin, after the data acquisition, the code sends this data to a MySQL database hosted in the Cloud. Thus, this project is based on the Internet of Things (IoT) concept. A C library developed by Gordon was used to access the GPIO ports of RPi called "WiringPi" [11]. To avoid having to use an internal loop inside the Raspberry Pi program, where the values would be constantly sent to the database, the technique offered by Crontab, a Linux application capable of scheduling the execution of tasks in the operating system, was used. In this schedule it was set for the Linux operating system to run the RPi program every five seconds.

In addition to the program running on RPi, a program (firmware) was also developed to run on the PIC18F2550 microcontroller. Figure 5 highlights the steps required to burning this program in the microcontroller, where the free SanUSB educational platform to manage this recording was used.

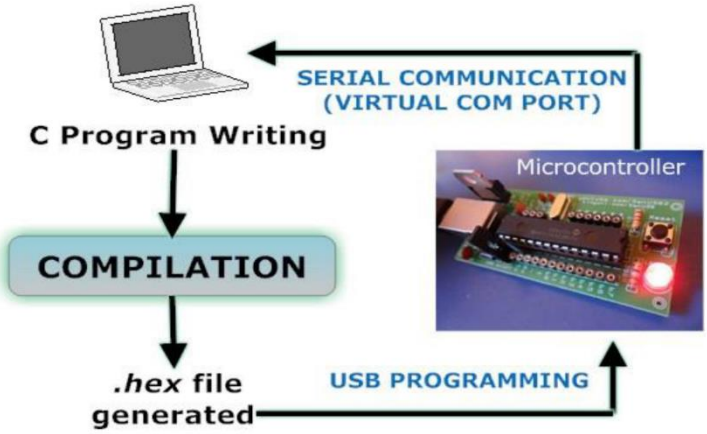

Figure 5. Recording PIC microcontroller through SanUSB [12].

The SanUSB tool, also applied to intelligent embedded systems, such as the online microgeneration monitoring via WiFi modem proposed in [13], is characterized as an educational application software with technological purpose that emphasizes concepts related to the practical application, which contributes to the assimilation of the content addressed [14]. This educational software was used by students during the 4th Robotics Competition of the IFCE (Federal Institute of Education, Science and Technology of Ceará-Brazil) and in the Engineering Category of the Brazilian Science and Engineering Fair (FEBRACE 09) held at University of São Paulo (USP). The students, without the need to consult the teachers, obtained the first places in both competitions. This fact presented satisfactory indications related to the didactic efficiency of software interaction. In addition, the placements achieved also provided satisfactory indications as to the technological contribution of the software in the general performance of the students [12].

In addition to the program for the microcontroller that realized the sensorial reading; the RPi program that received this sensor readings and posted in a database besides triggering a buzzer (sound device) when the allowed limit was exceeded, a web page hosted in the Cloud was also developed for the real time presentation of the obtained values from this embedded system.

The goal was achieved using the tools described above, but a new challenge arose, making a better cost-effective embedded system. This fact is due to the RPI cost in average of US$ 35.00 in 2018, which is still low cost for a computational embedded system, but it offers more resources than the necessary for the implementation of the noise detection proposed application. Faced with such a situation, a research was done on new devices that could replace those already used, maintaining the purpose of the embedded system and lowering its cost of acquisition.

3.2 Second version of the proposed system

It is possible to acquire a small board today where 11 input and output pins are available, with voltage regulation circuits, USB connectivity for programming, which can be done in Lua programming or by Arduino IDE, WiFi connectivity through the module ESP8266 12- E, standard 802.11 wireless, GPIO with PWM functions, I^2C, SPI, operating voltage: 4.5 to 9V, transfer rate of 110-460800bps, Supports 5 TCP/IP connections and costs around US$ 3.00 up to a maximum of US$ 4.00. This is the NodeMCU Esp8266 Wifi Module, however, it is characterized a self-sufficient development board for IoT projects, currently considered one of the most used. The NodeMCU module is one of the most complete and simple boards to use. This means that the additional use of other components, such as PIC microcontroller and RPi, used previously in the first version of the proposed project is no longer necessary.

In this IoT project, all sensor data processing is performed on the NodeMCU ESP8266 and transmitted through WiFi to the platforms in the Wireless Monitor web page developed or to the ThingSpeak Cloud server.

The Wireless Monitor web platform aims to enable embedded system developers to send the data obtained by IoT equipment to the Cloud and view it in the internet browser. Being an open source application licensed by the GPLv3 (GNU Public License), it can be used by both teachers and students of advanced courses and technicians to study microcontrollers, embedded systems as well as by companies or people who want to interact with their personal equipment [15]. The platform was developed using the Laravel framework plugin features [16], and new plugins can be created according to the users needs.

ThingSpeak is an IoT platform that lets you collect and store sensor data in the Cloud and develop IoT applications. The ThingSpeak platform provides applications that allow analyzing and visualize data in MATLAB and then act on the data. The sensor data can be sent to the ThingSpeak from the NodeMCU, Arduino, RPi, BeagleBone Black and other embedded systems with embedded WiFi module [17].

These IoT platforms are responsible for displaying the data acquired on the web. With the launch of NodeMCU, new research and applications have been started, since these same applications have become more robust and inexpensive, for example, applications such as for smart cities, smart garbage collection, as shown in [18], applications that use Radio Frequency Identification (RFID) [19], some applications in artificial intelligence as shown in [20]. Even in the smart health area, such as biofeedback control in HealthCare [21], in agriculture, such as hydroponics projects and in fish farming, where aquaponics projects also use the NodeMCU [22].

To measure the volume of the sound and to be able to compare different measures, it was necessary to use a module where the gain is configurable, without changing automatically. Four sound modules were evaluated, and their comparisons are presented in Table 1. The low efficiency HXJ17 was replaced by the TK0862, and then replaced by KY038. In the final tests, MAX4466 had the best results.

Table 1: Comparison between sound sensor modules.

Model	Adjustable gain	Perception distance	Price
MAX4466	Yes	+ 10 m	≈ US$7.50
KY038	Yes	≈ 1 m	≈ US$2.70
TK0862	Yes	≈ 30 cm	≈ US$3.10
HXJ17	Yes	≈ 5 cm	≈ US$3.30

The MAX4466 sound sensor module showed a greater perception capacity of alterations in noise levels, making it the best choice among the four evaluated modules, mainly for detecting changes of levels noise at greater distances (more than 10 m). This module has an adjustable gain that can be controlled with a small potentiometer of one turn. There is a Vcc pin, a grounding pin and an analog output pin. The analog pin emits a waveform where "0" is Vcc/2 and the amplitude depends on the gain and volume of the sound. It has optimum performance because the MAX4466 is an operating amplifier specifically optimized for use as a microphone amplifier [23].

The audio signal from the MAX4466 output is a variable voltage. To measure the sound level, several steps to find the minimum and maximum extensions or "peak-to-peak amplitude" of the signal are needed. In the program developed in C language, using the Arduino IDE, an example window of 50 milliseconds was chosen, this was enough to measure sound levels of frequencies of at least 20 Hz (the lower limit of human hearing). After finding the minimum and maximum samples, the difference was calculated and converted into Volts, which could range from 0 to 3.3V [24]. After performing this calculation, the resulting values were compared with values obtained through the Sound Meter decibel meter application, developed for the Android operating system by the company Abc Apps. This application has great precision in the calculation of the decibels in the environment and has already been used by more than ten million users. To make this comparison the PRO version of the application was acquired [25].

It is worth mentioning that the ideal is to use 3.3V as the reference voltage. The reason for this is that the 3.3 V is usually more stable than the 5 V which can vary up and down [26], especially when the NodeMCU is getting its power from the USB connection. The NodeMCU uses a 3.3V liner regulator, this calibrates the MAX4466's ADC output to map the 0-3.3V range to the analog input of the board.

The architecture of the embedded system after board mounting can be seen below. In Figure 6, on the left side, the sound module MAX4466, in the center the Wifi Esp8266 NodeMCU module, on the right a buzzer that acts as a siren to warn the users in the environment when the permitted noise limit is exceeded and finally just below, a USB connection for powering the embedded system, it is emphasized the use of a conventional mobile phone USB charger for power supply.

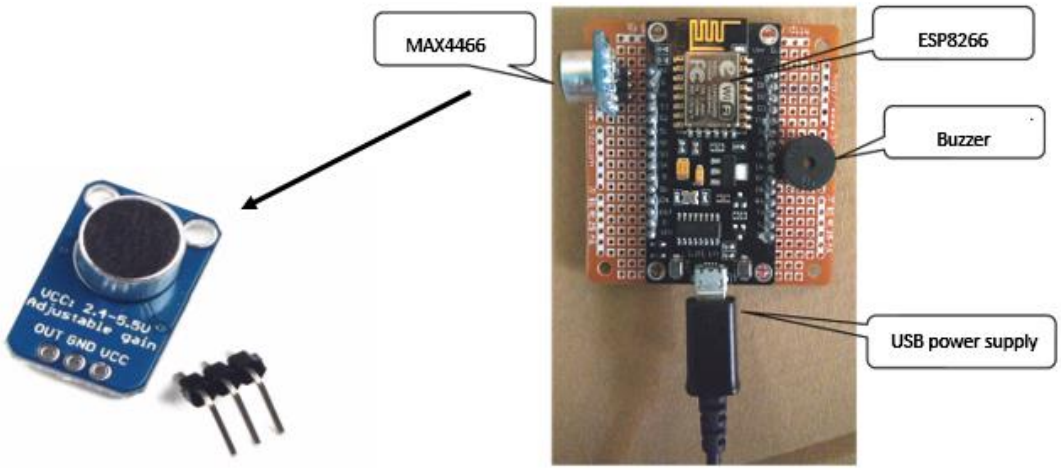

Figure 6. Embedded system architecture.

4. Results

For a presentation of the embedded system results, two versions for sending data to the Cloud platform from the Esp8266 NodeMCU WiFi were developed: using ThingSpeak platform and using the Wireless

Monitor platform.

To communicate the IoT module with the ThingSpeak platform, it is necessary to register and create a specific communication channel for the IoT module. The values received on the platform are presented in a graph that is publicly available on the web, as shown in Figure 7.

There are some limitations when using the ThingSpeak platform. Although it is easy to configure, it displays only the last values obtained, it has a minimum sending limit of fifteen seconds and it is not allowed to modify the platform and access all the values so that own graphics could be develop. All this can be done using the Wireless Monitor platform.

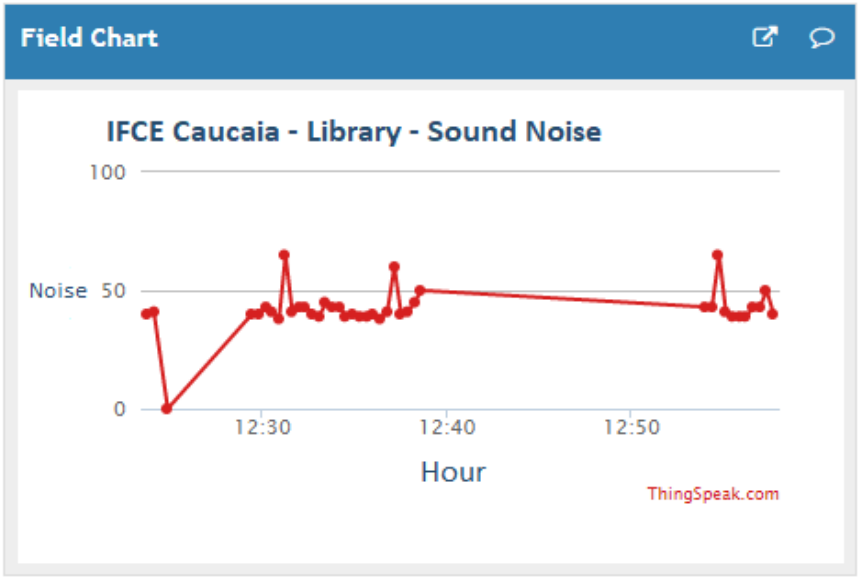

Figure 7. Results displayed on the ThingSpeak platform.

To achieve the communication between the embedded system and the Wireless Monitor platform, a plugin called Sound Monitor was created for the connection to the IoT NodeMCU device, as shown in Figure 8.

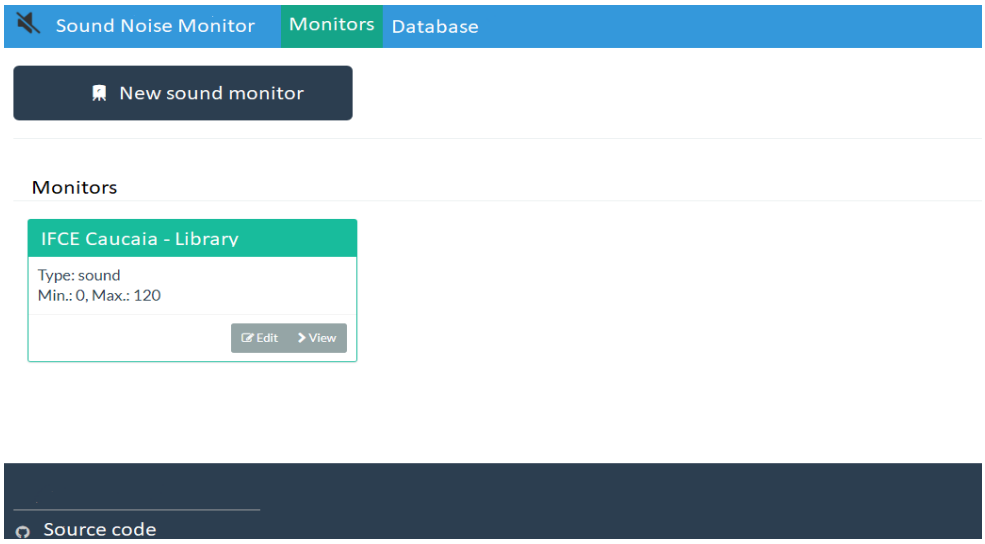

Figure 8. Screen for creating new Sound Monitor.

A developer who chooses to use the Wireless Monitor platform can either use it in the default framework or modify it by creating new screens, new graphical display guides as needed, and can also

perform direct queries to the database used by the platform [25]. the total control of all the data collected by the IoT modules and it is worth mentioning that it can be used by three different database management systems, MySQL, PostgreSql or Sqlite.

One of the needs that was observed in the development of this embedded system was to create the possibility of changing the noise limit allowed for the environment in which the embedded system would be applied, considering the different profiles of users of the environments. The Wireless Monitor platform enabled the creation of this new functionality, a new screen was developed with the option to change the noise level allowed for the environment as shown in Figure 9, with the objective of adapting the embedded system to the reality of any environment that will use it, or even so that in any eventual changes of the custom in the environment, such as a building reform, the siren would not play due to the noise level being greater than the normal limit.

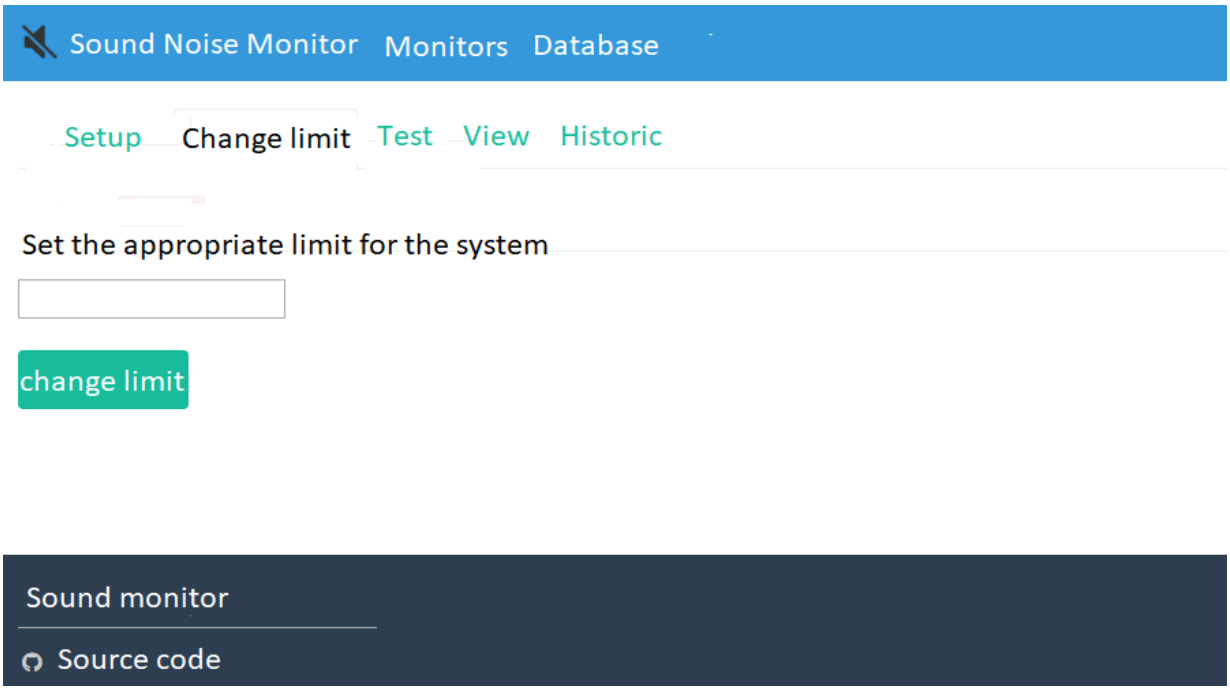

Figure 9: Change screen of the noise limit allowed in the environment.

Like the ThingSpeak platform, it was also possible to display graphs with the latest values obtained from the IoT device in the Wireless Monitor. On the left side of Figure 10, it is possible to see the last value received from the equipment and on the right side, it is possible to see the last 30 values received.

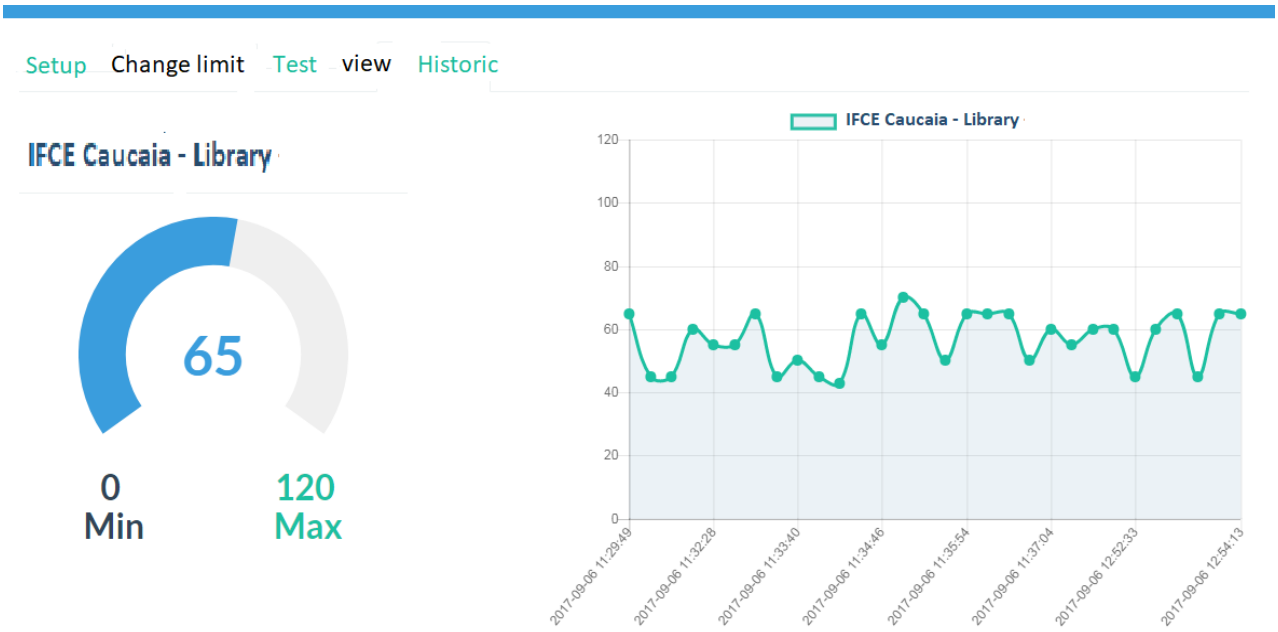

Figure 10. Screen showing values obtained.

5. Conclusion

IoT refers to the way electronic components communicate with others and with the outside world in an environment. With the application of this project in an educational institution library, it fits this concept, making communication with the outside world through the web using the IoT module ESP 8266 NodeMCU with embedded WiFi module described in this article and meeting the objectives, which was to use low cost equipment, free software and technologies.

In addition to the communication, the main objective of this project was achieved, because with the operation of the noise detection embedded system, monitoring in real time the levels of noise and alerting the people present in the area when the allowed limit was exceeded was done and a few times levels of noise beyond the limit established as suitable for the environment were recorded. There was also a re-education of users, who adapted themselves to the new reality established, providing a pleasant environment and conducive to concentration and reading during the studies.

This embedded system can be replicated for use in other libraries, or even in other areas, such as hospitals, clinics, schools, day care centers, that is, in places where noise levels must be controlled.

It is intended in future works, to develop new graphic models that can help the analysis of the data obtained through the embedded system, also to maintain the continuity of the dissemination of the project, to encourage other developers to replicate the project and also to suggest improvements.

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Robotics education in public schools using recycled materials and principles of Project-based Learning

Vinícius Ferreira da Silva[1], Sandro Cesar Silveira Jucá[1], Vitor Veras de Moura[1], Renata Imaculada Soares Pereira[2*], Solonildo Almeida da Silva[3]

[1] Computing Department, Federal Institute of Ceará (IFCE) - Maracanaú Campus, Brazil

[2] Electrical Engineering Department, Federal University of Ceará (UFC) - Pici Campus, Brazil

[3] Pedagogical Department, Federal Institute of Ceará (IFCE) - Maracanaú Campus, Brazil

* Corresponding Author: renata@dee.ufc.br; Tel. +5585 3366.9585

Abstract

The proposed project aims to implement an educational robotic teaching project in public schools. The developed robot uses the concepts of meta-recycling, which aims to encourage the sustainability and the reuse of electronic components to minimize garbage generation. The teaching technique used is the methodology of Project-based Learning (PBL), defined by developing projects based on a question, problem or task, which motivate students to create solutions applying theory to practice. PBL uses collaborative problem solving to significantly increase student interest and involves analyzing each student learning evolution independently. The project also promotes interdisciplinarity among the common areas taught in schools, making the learning process more dynamic and interactive.

Keywords: Robotics; Meta-recycling; Education; Project-based learning.

1. Introduction

Teaching techniques involving computational devices and educational technologies comes, over the years, gaining recognition and respect, both in academic and institutional circles. With this, robotics educational emerges as a tool to bring computational and educational concepts closer to the disciplines common to students [1].

Because of this, educational robotics is characterized by the promotion of interdisciplinarity, bringing together diverse areas of teaching, such as computing, electronics, physics, mathematics and others, considering the various components involved in the teaching process, such as motors, actuators and sensors. Generally, for educational robotics, is recommended that these components are controlled by hardware and free software, lowering costs for constructing the projects. Manipulating and programming the operation of the assembled robotic models, stimulate the logical reasoning and the construction of new concepts related to digital inclusion, bringing practice to theory.

Robotics is also characterized as a multidisciplinary science, involving subjects such as mechanics, electronics, hydraulics, pneumatics and computing. The methods covered by educational robotics instigate the student to question, think and seek solutions, allying theory to practice [2]. Thus, the use of educational

robotic activities demonstrates the possibility of concretely and contextually approaching the different concepts used in classroom practices, establishing connections between subjects, thus promoting interdisciplinarity and stimulating cooperative work [3].

Project-based learning (PBL) aims to work with students to solve real-world problems that have a significant impact on them, where they depend on cooperative action for solutions to such problems [4]. Thus, PBL can be defined using projects based on a question, problem or task that are motivating and captivating in teaching academic content to students [5, 6]. The PBL uses collaborative problem solving to significantly increase student motivation [7]. Currently, PBL is widely used as a teaching technique, where students unconditionally acquire content through motivation to want to solve a problem [8].

On the other hand, electronic waste (e-waste) is all the material that comes from electrical and e-waste such as solid waste, toxic components and heavy metals. Ferreira and Rodrigues [9] and the United Nations (UN) affirm that Brazil is the emerging country that produces the most e-waste in quantity. It is also the country that has the largest number of discarded refrigerators, cell phones, TVs and printers. The computer, which is a classic example of electronic that is discarded, after not being considered more useful, becomes more garbage. Thus, the reuse of these prevents them from being misused in the disposal, attacking the environment, as they are composed of toxic elements such as lead, mercury and cadmium.

The meta-recycling then appears in the need to use e-waste through its deconstruction or reuse to build new products. The principles of meta-recycling are based on the deconstruction of obsolete equipment, the use of free software, the use of open licenses and action in collaborators network, where anyone can collaborate by searching for means to reuse e-waste, ideas about the appropriation of technology geared towards social transformation. This concept encompasses a diverse range of actions, such as: the capture of used computers, where digital inclusion programs can use them for teaching and donating to low-income people, the operationalization of meta-recycling laboratories, the use of free software, reuse in didactic tools such as educational robotics and the creation of environments of circulation of information through the internet, passing through all kinds of experimentation and strategic and operational support to socially engaged projects [10].

During the research carried out among the related works, it was possible to perceive that one of the greatest difficulties for the understanding of educational robotics in schools is precisely the cost for the construction of practical projects. Considering this, the application of meta-recycling to robotics becomes a very positive point for the implementation of this theme in public schools.

The project aims to attract the interest of public school students with the concept of low-cost educational robotics along with meta-recycling. Practical experiments, coupled with the theory of conventional subjects such as physics and mathematics, for example, can contribute to students' learning, especially those who have more difficulty.

2. Bibliographic review

Educational Robotics empowers skills and builds a new thinking in students, until reaching the most important phase, which is to think comprehensively and how the concepts seen in class can influence their future. As a tool for technological inclusion, a microcontroller system, the SanUSBino [11], was developed.

So that the realization of the project and the beginning of this awareness take place, it became necessary for a field of technology closer and more current to the school reality, this field that came as an aid was Educational Robotics. The SanUSBino consists of a versatile and robust board, developed primarily for use in schools as a central controller for robots, is composed of a PIC18F2550 microcontroller.

The work environment should foster the development of autonomy, creativity and organization for group work. This way of building the robots, from recyclable material, allows the students to develop logical reasoning and creativity, so that each project is low-cost and presents a unique characteristic that reflects the engineering idea of each student. With this, in another project, was built a prototype of a wheelchair that overcomes obstacles, this consists of a system with sensors and microcontroller board using a PIC18F2550 microcontroller, using the SanUSB application where it was designed for facilitating the programming of microcontrollers via embedded USB interface [3].

In this context, another article presents the project of developing a low-cost robot, based on an open architecture controller and low-cost sensors and actuators, to be used as a tool for educational robotics in public schools with elementary and medium students to promote interdisciplinarity. The robot was developed using the Arduino development platform and some embedded electronic sensors [12].

Another related project implemented a proportional-derivative (PD) controller in a mobile autonomous robot built inside a software platform and open source, that improves the execution performance of the robot reducing errors in a path made with a black ribbon in a smooth white surface. The robot was able to follow the black line effectively, moving along the path smoothly [13].

In another work an educational robotic environment was developed, named Roboeduc [14]. The Roboeduc system is an environment built of parts for assembly of prototypes. For the assembly of prototypes, the LEGO® Mindstorms® Kit, which is built with high-cost components for data processing and transmission, actuators, sensors, parts for connection and transmission of motion was used.

The project proposed in the present paper, different from the ones mentioned, does not have a microcontroller, that is, the processing is done in an analogical way, allowing the reduction of the construction cost, since it also uses the concept of meta-recycling contributing to reduce the problem of e-waste and PBL, for improving teaching-learning. One of the main objectives of the present project is to instigate and awaken the students in the spirit of learning, joining the practice of educational robotics and PBL with the concept of meta-recycling for the deconstruction of old equipment and its use in new projects of digital inclusion. In Table 1, comparison between the related and the proposed project is made.

As can be seen in Table 1, the proposed project presented a lower cost compared to one of them and allows the development of this teaching tool, which favors the development of students' autonomy and the diffusion of the interdisciplinary concepts of this project using only analogical circuits, easier to use and to find in e-waste.

Table 1. Comparative table of the projects cited

Projects	Processing	Processor	Own development	Total cost
Amorim, A. F. [13]	Digital	ATmega328	Yes	Not specified
Filho, et al. [3]	Digital	PIC18F2550	Yes	Not specified
Isaac, et al. [11]	Digital	PIC18F2550	No	Not specified
Silva, A. F. [14]	Digital	Not specified	No	Not specified
Veiga, et al. [12]	Digital	ATmega328	Yes	$ 50.80 USD
Proposed Project	**Analogical**	**None**	**Yes**	**$ 7.53 USD**

3. Materials and methods

The mobile robot proposed in this work aims to follow a certain line of a circular path. This was possible through the reuse of electronic components taken out of printers and discarded computers. Figure 1 shows the materials and electronic components used for the construction of the mobile robot.

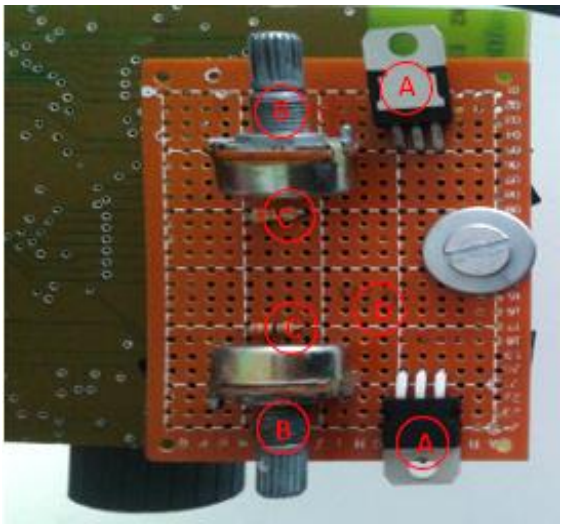

Figure 1. Circuit board with the components used in the proposed project.

For the construction of this project, two TIPs-122 (A) were used. TIP-122 is a high gain power transistor, which receives a very weak signal at the input (base) and transforms it into a powerful output signal collector or emitter [15]. Two 100k potentiometers (B) used to adjust the resistance to be passed to the LEDs, to increase or decrease the brightness intensity of both [16]. Two 360-ohm (C) resistors used primarily to reduce the current of the LEDs, and a printed circuit board (D) used to aggregate the electronic components of the circuit. Figure 2 shows an illustration of the lower part of the proposed prototype.

Figure 2. Bottom view of the robot.

In Figure 2 it is possible to notice other fundamental components for the operation of the mobile robot, being two LDRs (E) consisting of a light-dependent high resistance semiconductor, that upon receiving a large quantity of photons coming from the incident light of the LEDs (F), absorb the electrons that improve their conductivity, thus reducing their resistance [17], that is, when they are in contact with a great light intensity, the motor of the mobile robot will be activated and when there is low intensity of light, the engine will stop. The robot also consists of two 3V (G) motors, a 9V rechargeable battery (H), a switch to turn the robot on and off (I) and lastly a cut out plate used as the basis of the design. In Figure 3 it is possible to observe the robot from another perspective.

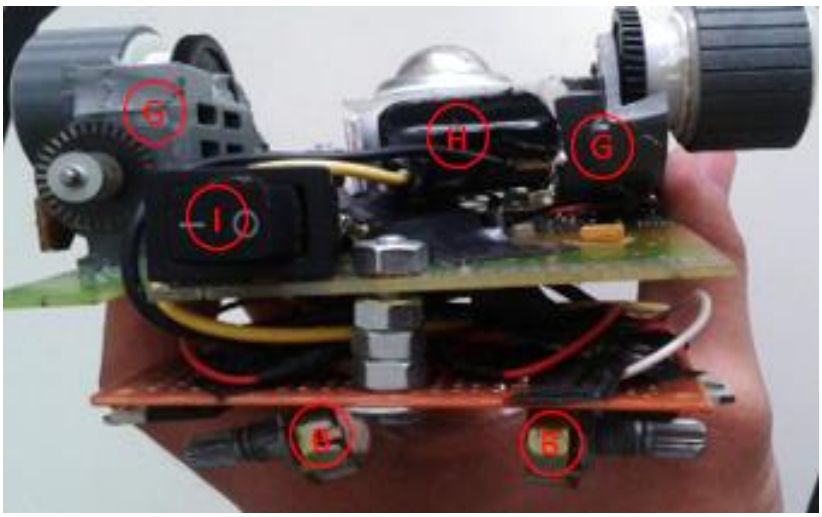

Figure 3. Robot Back View.

In Figure 4, the robot schematic circuit mounted on a protoboard is showed. Protoboard is a matrix of contacts and gives a better understanding of the electronic operation to the students during project development.

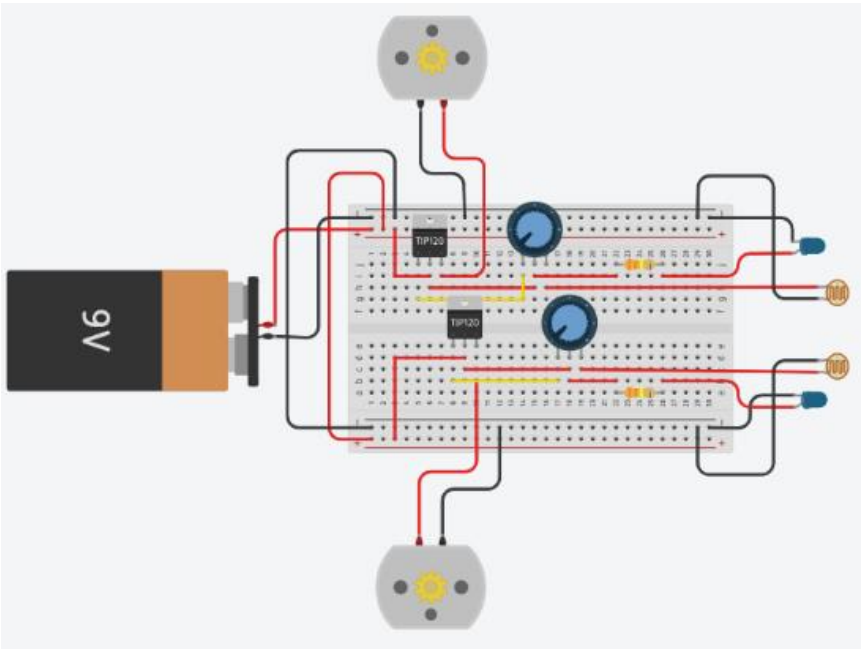

Figure 4. Schematic circuit of the proposed project mounted on protoboard.

4. Results and discussion

The robot achieved a very satisfactory performance and duly fulfilled its purpose, which was to follow a line in a circular path, as well as the operation of the circuit that was designed for any environment independent of brightness, having the possibility of reducing or increasing the luminosity of the LEDs, as well as the speed of the motors individually, as a way of adjusting their operation in a given environment. For the robot construction, it was possible to reuse electronic equipment and devices from e-waste, like old desktops. In Figure 5, it is possible to see the robot in the final phase, already tested, working correctly, where it was possible to reach the expected objectives of its operation.

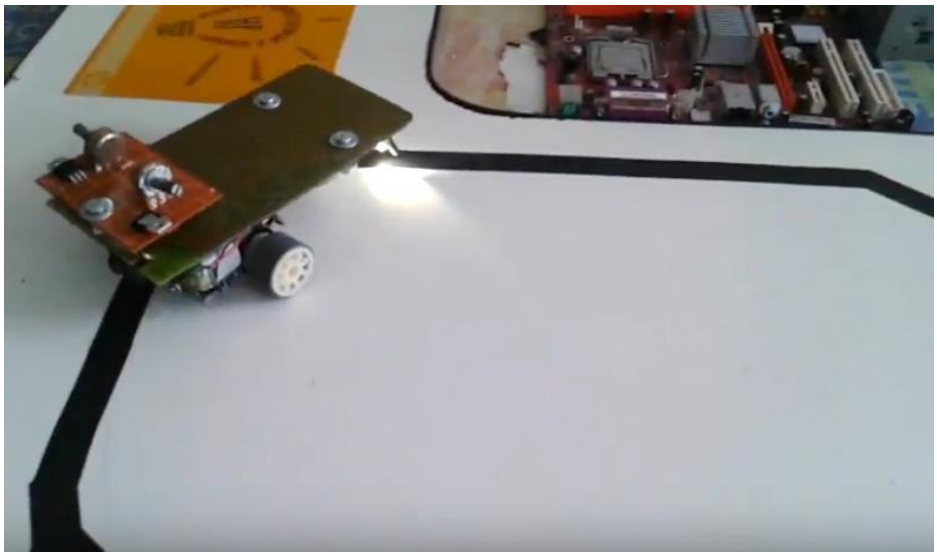

Figure 5. Operation of the line follower educational robot in a circular path.

5. Conclusion

As discussed in the proposed project, the understanding and use of educational robotics and meta-recycling in conjunction with the PBL in education can provide students with a more in-depth contact with the practice, together with theoretical concepts. These concepts, as well as the practical application of them, promoted interdisciplinarity in the classroom. This project was presented at the Idear Institute (Institute for Technological and Social Development) for students of public schools of the state of Ceará-Brazil, who aroused interest in deepening into the theme and developing other related projects.

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Knowledge of continent women on physiotherapy as a treatment of urinary incontinence

ENILDA MARTA CARNEIRO DE LIMA MELLO, HANNA HELLEN FERNANDES MEDEIROS, NIKELLY YORANNE DE AQUINO DE MATOS
CENTRO UNIVERSITÁRIO DE BRASILIA
Brazil

Abstract

Objective: *To identify the knowledge about physiotherapy as a treatment of urinary incontinence in continent women.*

Methods*: The study was characterized by a cross-sectional and quantitative study. A ten items questionnaire, created by the researchers, was used with related questions about women's health. The sample consisted of 60 continents women, aged between 20-90 years, divided into age groups, accommodating ten participants in each age delimitation as follows: 20-29, 30-39, 40-49, 50-59, 60-69, 70-90.*

Results: *The results showed that 65% of the women did not know about the physiotherapeutic treatment for UI, 28.33% had heard and 6.67% knew about it. The channels of knowledge selected by the volunteers who claimed to know or hear about physiotherapy in the UI were 18.18% media, 31.82% were people known, 45.45% were health professionals, and 4.55% were other unna/med forms. It was also found that women aged between 60 and 90 years have more knowledge on the subject (15%) than those aged 20 to 39 (5%) and 40 to 59 years (0%).*

Conclusion: *It is concluded, therefore, that continents women need more information regarding physical therapy treatment for urinary incontinence. In addition, this awareness should occur in a multidisciplinary way to cover a greater number of women and information providers, in view of the search for treatment early avoid greater complications.*

Keywords: Physiotherapy; Female pelvic floor; Urinary incontinence; Urogenital system

Introduction

All structures are essential in supporting and maintaining the pelvic organs in their physiological positions. The female pelvic floor is divided into three parts: bladder, anteriorly located, urethra, medially to the vagina and rectum, in the posterior region. It consists of support structures, pelvic fascia, pelvic diaphragm and urogenital diaphragm. The musculature is composed mostly of slow-twitch fibers and, to a lesser extent, fast twitch fibers.[1]

Pelvic Floor Muscles (PFM) are intended to support the pelvic organs and maintain physiological functions of storage and disposal of bladder and rectum excretory products. The risk of dysfunction of such

muscles as urinary incontinence, fecal incontinence and genital prolapse increases when PFM lose their integrity.[2]

Urinary incontinence (UI) is defined by the International Continence Society (ICS) as the complaint of involuntary loss of urine, creating a social and hygienic problem.[3,4] There are a few types: Effort Urinary Incontinence (EUI) is the loss of urine in sync with some kind of exertion, exercise, sneezing, or coughing. Urinary Incontinence of Urgency (UIU), where urinary loss arises from an intense urge to urinate, in which there is simultaneous contraction of the detrusor, which may be due to detrusor muscle hyperactivity or hypersensitivity. Mixed Urinary Incontinence (MUI), which is a combination of stress incontinence and urgency, among others.[5,6]

We may cite some risk factors that are associated with UI, such as age. Elderly women are considerably affected by UI as of menopause. Obesity also influences the development of UI, parity and type of parturition may favor UI.[7]

Treatment of UI can be surgical or conservative, such as physiotherapy, behavioral therapy and medication therapy.[8] The International Continence Society in 2005 recommended physiotherapy as cutting edge treatment for UI, but in Brazil few public services have the care and information appropriate to incontinent women. Physiotherapeutic treatment refers to the strengthening and re-education of the pelvic floor musculature through resources such as kinesiotherapy, electrostimulation, vaginal cones and hipopressive gymnastics.[8,9]

Physiotherapy aims to improve muscle contraction strength, promote a lumbopelvic static rearrangement and re-educate the abdominal muscles through exercises, devices and techniques, in order to strengthen the muscles needed to maintain urinary continence.[4,10]

Pelvic floor exercises are well studied in the treatment of pelvic dysfunctions and may provide modifications in morphological variables such as changes in trophism, muscle volume and length, as well as altering functional variables, such as changes in electromyographic activity, muscular strength and resistance.[11]

Transvaginal electrostimulation is an application of electric current through a probe placed in the vagina to directly stimulate the pelvic floor muscles to contract and relax, helping to strengthen the muscles. It may also help to control voiding urgency when using electrodes in the sacral or tibial region with action on the nerves and decreasing the irritability of the bladder.[12]

Hipopressive Gymnastics is also a physiotherapy's feature and aims to elevate both the abdominal organs and the pelvic floor muscles (PFM), and its difference in relation to other exercises with the same objective is that it does not require the patient to master the PFM. It is made by the combination of exercises of the abdominal musculature, PFM and pectoral, being realized in three phases: slow and deep diaphragmatic inspiration; complete expiration and diaphragmatic aspiration.[13]

The present study aimed to investigate if continents women have knowledge about the physiotherapeutic treatment for urinary incontinence, as well as to identify the channels of knowledge about the subject and to evaluate if the factors age and schooling interfere in the knowledge about the subject.

Methods

This project was approved by the Ethics and Research Committee of UniCEUB, with CAAE-65443817.7.0000.0023. The research is characterized by a cross-sectional and quantitative study. The researches created a questionnaire (Appendix A) composed of ten questions with the objective of investigating the knowledge of continent women about the physiotherapeutic treatment in urinary incontinence. Continent women were included in the study, with ages from 20 to 90 years old, divided into six groups. Ten participants were included in each age range as follows: 20-29, 30-39, 40-49, 50-59, 60-69 and 70-90. For the volunteers aged 60 and over, the Mini Mental State Examination (MMSE) (Annex B) was applied to evaluate the cognitive function of these elderly women, since, if they were compromised, they would be excluded from the study, being considered a minimum score of smaller than or equal to 24 points.

Pens, drawing boards, and the FICF (Free and Informed Consent Form) were provided with the questionnaire. The response time was free, rotating around 5 to 8 minutes, with no interference from the examiner. After the participant answered the questionnaire, she received an educational folder (Appendix B) which presents concepts related to urinary incontinence and illustrations of the female genital region. The folder also shows a design of the bladder filling and emptying process, and the Clinic School of UniCEUB, the Community Care Center, where there are professionals trained to treat, inform and / or prevent urinary incontinence, as well as other comorbidities that can affect the female genital system. Therefore, if future treatment is necessary, the volunteer will be properly targeted.

The questionnaire was applied in a period of one month in the streets of the Southern Commercial Sector. The exclusion criteria were: women who presented of urinary loss in the last month and elderly women without preserved cognition. Data were tabulated in the statistical program SPSS version 18.0 and analyzed using descriptive statistics resources (mean, median and standard deviation).

Results

The present study was composed by a 60 women sample, with a mean age of 50.02 years, being adjusted in six groups according to the age group, with ten volunteers in each group. Nine participants were excluded from the study, from which: three had a history of urinary loss in the last month and six that exceeded the pre-established number of ten women in each age group.

Figure 1 shows the knowledge classification of the volunteers, in percentages, where it can be observed that 65% of the participants do not know the physiotherapeutic treatment for urinary incontinence. Women who reported to cognize (6.67%) or heard about (28.33%) accounted for 35%, a low percentage when compared to volunteers who did not know the physiotherapeutic treatment for UI.

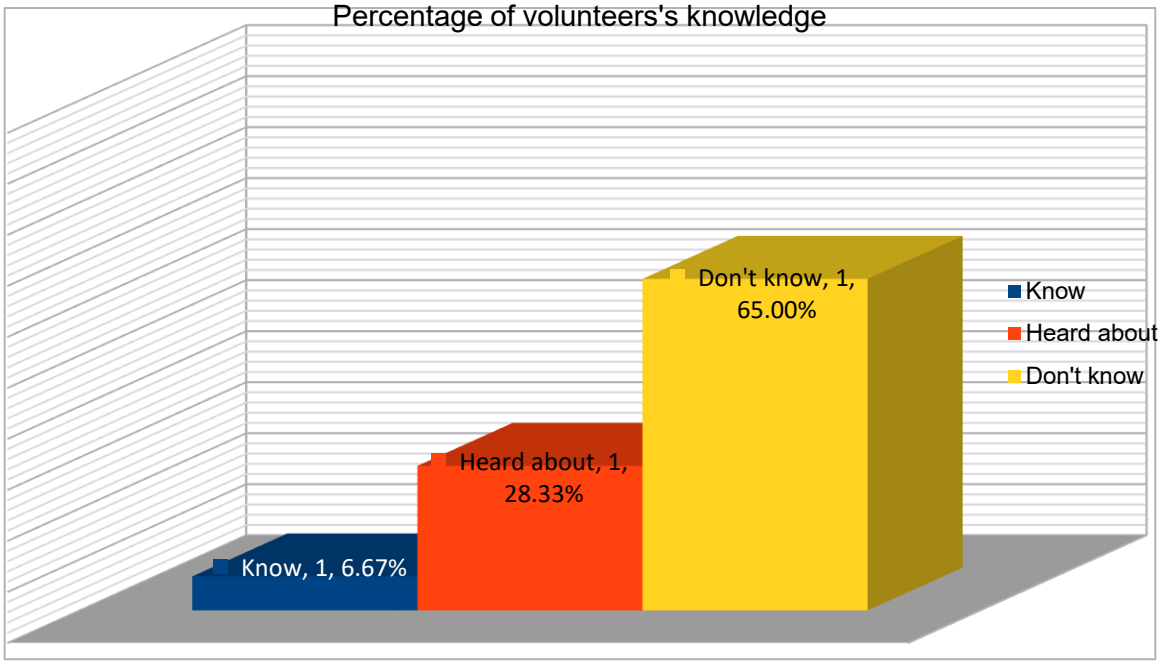

Figure 1. Percentage of knowledge of volunteers

Figure 2 shows absolute values for the "Know", "Heard about" and "Don't know" ranks for the groups aged 20-39 years, 40-59 years and 60-90 years. In this model, some groups were joined, where it was possible to indicate that women aged between 60 and 90 years have a tendency to know more about the physiotherapeutic treatment for UI than women framed in the age groups of 20 to 39 and 40 to 59 years old. This is an important fact that makes us consider that these participants frequently care about their health and seek more knowledge about related topics.

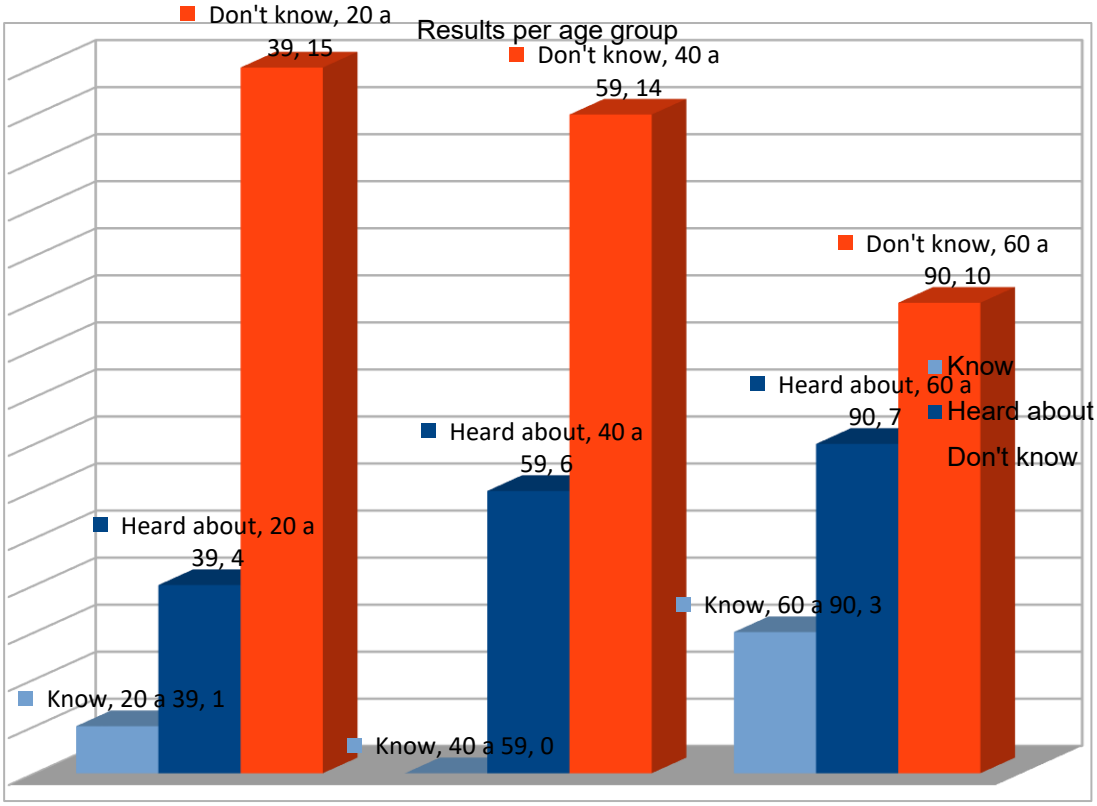

Figure 2. Results by age group

Figure 3 shows, in percentages, the knowledge channels most accessed by the volunteers. The best way to acquire understanding about this subject was through health professionals - 45.45% of respondents say that they have been instructed by these specialists.

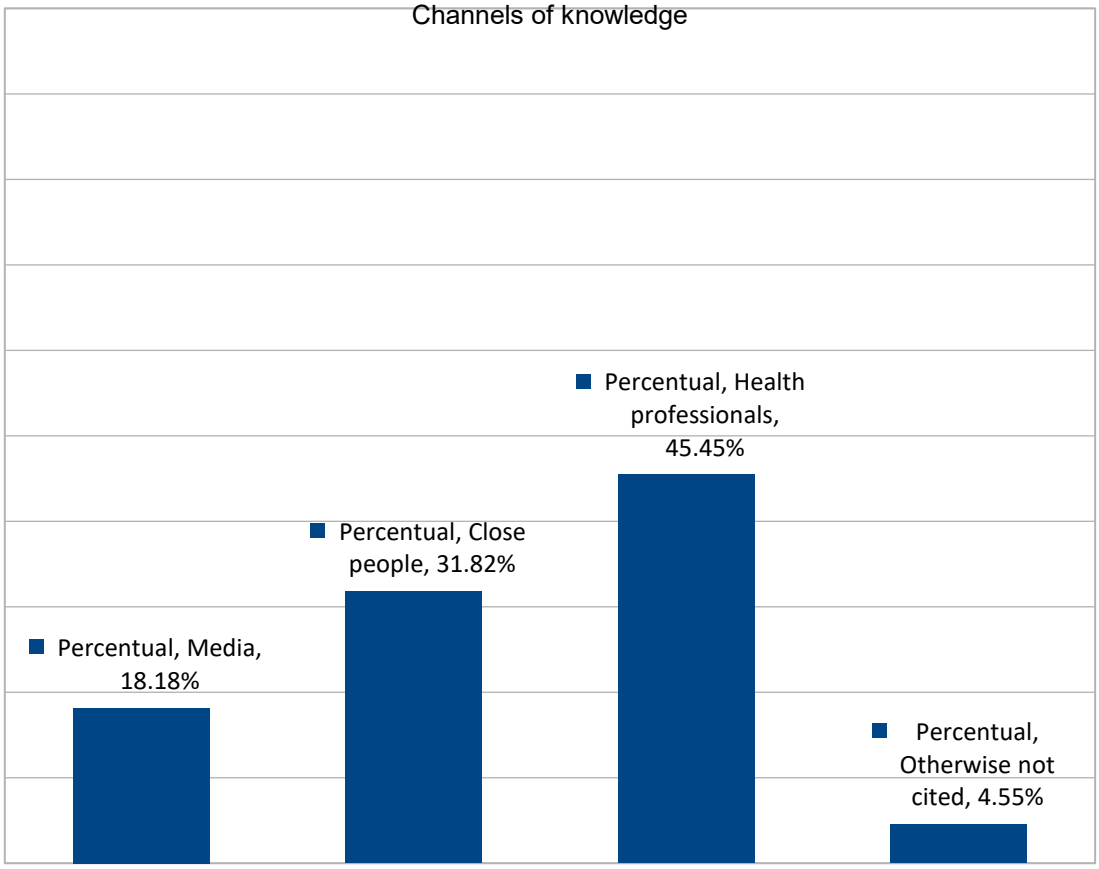

Figure 3. Knowledge channels about treatment

Figure 4 "Schooling degree vs knowledge" indicates the knowledge degree about the physiotherapeutic treatment for each level of schooling. It is concluded that women with incomplete higher education have more knowledge (2) than complete higher education women, since only one volunteer claims to know the physiotherapeutic treatment for UI. In relation to the lack of knowledge about the subject, the group of participants with complete higher education presented the highest value (15) when compared to the other groups - incomplete upper (4), high school (13), elementary school (6) and without schooling (1).

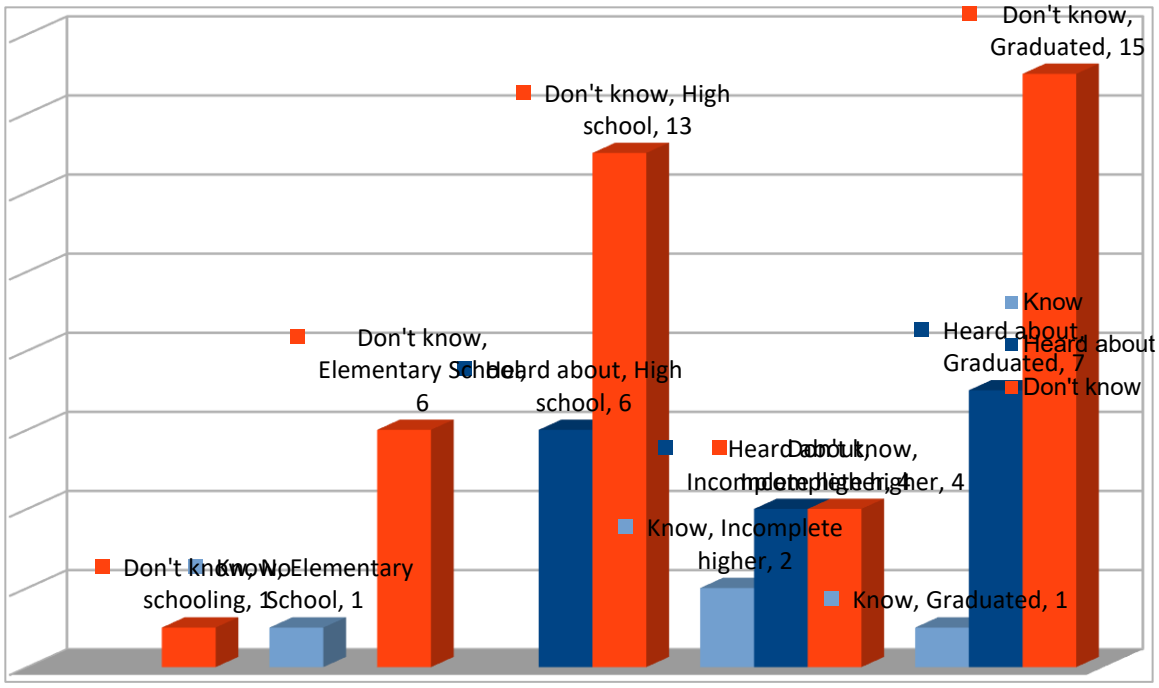

Figure 4. Schooling degree vs knowledge

Table 1 objectively demonstrates the absolute amount of results on the knowledge of physical therapy in UI in each age group. It is observed that the highest values are in the column "Don't know", which leads us to conclude that there is disinformation in all ages, being higher in the age group from 30 to 39 years (8), and lower in the 60 from 69 years (5) and 70 to 90 years (5). In the "Heard about" column, women aged between 60 and 69 years had the highest number among the age groups (4). Two participants aged 70 to 90 years stated that they knew about the subject, leading us to conclude that older volunteers are more knowledgeable about subjects related to the female urogenital system.

Table 1. Absolute values for knowledge degree by age group

Age group	Know	Heard about	Don't know
20 a 29	1	2	7
30 a 39	0	2	8
40 a 49	0	3	7
50 a 59	0	3	7
60 a 69	1	4	5
70 a 90	2	3	5
Total	4	17	39

Figure 5 presents the mean, median and standard deviation calculations for the "Know", "Heard about" and "Don't know" classifications, considering all age groups. The calculations confirm the results

presented previously, that is, the number of women who do not know the physiotherapy for UI in all age groups is greater than that of women who have heard or know about it.

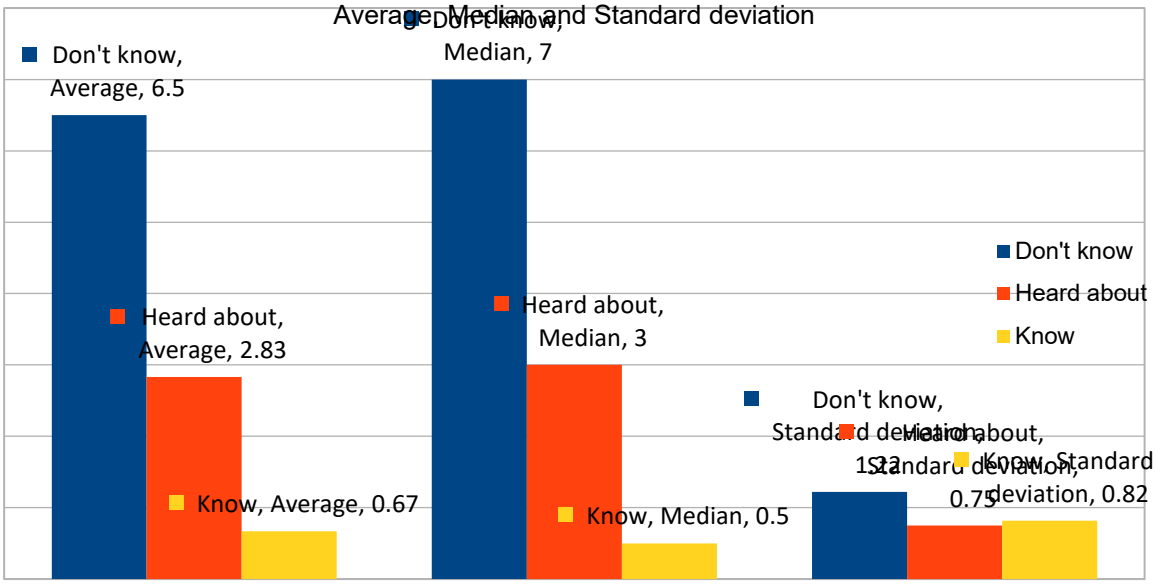

Figure 6. Averages, medians and standard deviations for each knowledge "degree"

Discussion

In agreement with this study, Henkes et al.[14] affirms that many women did not know any form of treatment or were only aware of the surgical procedure for UI. Costa's[15] study corroborates with the statistical data, as of the women studied in their study 17% are aware of the physiotherapeutic treatment and 83% do not know it.

Alves et al.[16] in their study, observes that when the subjects' age and the knowledge about the subject were analyzed, individuals between 50 and 59 years old showed more clarification on the subject when compared with the older ones.

Corroborating this result, Carneiro et al.[17] state that education about anatomy and disorders pelvic floor remains restricted to professionals and students of courses related to health. Poersch and Rosa[18] describe in their study that, in relation to the information place, 87.5% of the participants reported having obtained information from health posts, hospital or through their doctor, which also justifies the high percentage found in the present study.

In Carrara's et al.[19] study, the level of schooling seems to interfere with the knowledge about physiotherapeutic treatment, as the percentage of women with illiterate and primary education was low. This is consistent with the results of the present study, as the number of women with no schooling, elementary and middle school education is lower than the number of women with incomplete and complete higher education.

Carneiro et al.[17] confirm this result when affirming that there is a need to guide the population about the pelvic floor's anatomy, as well as the resources of physiotherapy for the treatment and prevention

of related disorders, leading to more information about urinary dysfunctions and pelvic disorders, and forms of intervention as conservative, behavioral and surgical treatments.

According to Souza et al.,[20] elderly women are more likely to suffer from UI due to several factors related to the pelvic floor, lack of detrusor's contractility or decreased urethral compliance. This may justify the data of this study, as they are more likely to develop urinary incontinence and because they live with people of the same age group who present the problem, they seek knowledge about it or are more interested in the subject.

Reinforcing the results of this study, Alves et al.[16] report that the studied population shows misinformation about the subject, where 38.3% of people do not know if physical therapy could be an effective treatment for UI. This leads to a reflection on the need to implement awareness policies, as well as the promotion of population's health in relation to physiotherapy as a form of treatment for urinary incontinence.

Conclusion

With the accomplishment of this study, it was possible to identify the high index of disinformation in relation to the physiotherapeutic intervention as a form of treatment for urinary incontinence, being it a health public problem which, in most cases, is treatable with conduits that soften and/or cure the presented symptoms. Urogynecological physiotherapy plays a fundamental role in the rehabilitation process of the pelvic floor muscles, with the use of kinesiotherapy, electrostimulation, adequate guidelines and other relevant procedures from physiotherapist. It is concluded, therefore, that the continent women need more information regarding to physiotherapeutic treatment for urinary incontinence. This awareness must take place in a multidisciplinary way to reach a larger number of women and provide the right information, because it is expected that women with prior knowledge seek early treatment, thereby reducing complications.

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APPENDIX A. Questionnaire on Urinary Incontinence

1. Name: _____

2. Age: _____

3. Weight: _____

4. Height: _____

5. Education:
( ) WITHOUT SCHOOLING
( ) ELEMENTARY SCHOOL
( ) HIGH SCHOOL
( ) COMPLETE HIGHER EDUCATION
( ) INCOMPLETE HIGHER EDUCATION

6. Ever pregnant? ( ) YES ( ) NO

7. Number of child-births:
( ) 1 NORMAL CHILD-BIRTH ( ) 2 OR MORE NORMAL CHILD-BIRTHS
( ) 1 CESAREAN DELIVERY ( ) 2 OR MORE CESAREAN DELIVERIES
( ) 1 ABORTION ( ) 2 OR MORE ABORTIONS
( ) NOT APPLICABLE

8. Do you know or have you heard about the physiotherapeutic treatment for Urinary Incontinence?
( ) KNOW ( ) HEARD ABOUT ( ) DON'T KNOW

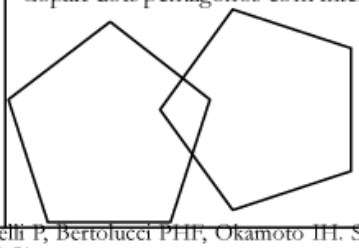
9. Where did the knowledge about physical therapy treatment come from?
( ) MEDIA (EX: TV, INTERNET, ETC)
( ) CLOSE PEOPLE
( ) THROUGH HEALTH PROFESSIONALS
( ) OTHERWISE NOT CITED
( ) DO NOT KNOW

10. Have you presented urinary loss in the last month?
( ) YES ( ) NO

APPENDIX B. EDUCATIONAL FOLDER

ANNEX B. Mini Mental State Examination (MMSE)


UniCEUB
Folder
Educativo
CONHEÇA SEU CORPO

Orientação temporal (5 pontos)	Qual a hora aproximada?
	Em que dia da semana estamos?
	Que dia do mês é hoje?
	Em que mês estamos?
	Em que ano estamos?
Orientação espacial (5 pontos)	Em que local estamos?
	Que local é este aqui?
	Em que bairro nós estamos ou qual é o endereço daqui?
	Em que cidade nós estamos?
	Em que estado nós estamos?
Registro (3 pontos)	Repetir: CARRO, VASO, TIJOLO
Atenção e cálculo (5 pontos)	Subtrair: 100-7 = 93-7 = 86-7 = 79-7 = 72-7 = 65
Memória de evocação (3 pontos)	Quais os três objetos perguntados anteriormente?
Nomear 2 objetos (2 pontos)	Relógio e caneta
REPETIR (1 ponto)	"Nem aqui, nem ali, nem lá"
Comando de estágios (3 pontos)	Apanhe esta folha de papel com a mão direita, dobre-a ao meio e coloque-a no chão
Escrever uma frase completa (1 ponto)	Escrever uma frase que tenha sentido
Ler e executar (1 ponto)	Feche seus olhos
Copiar diagrama (1 ponto)	Copiar dois pentágonos com interseção 

Fonte: Brucki SMD, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Sugestões para o uso do mini-exame do estado mental no Brasil. Arq Neuropsiquiatr. 2003; 61(3B):777-81.

Why Congress Needs to Act to Update Protection for Electronic Communications from Multiple and Extensive Threats from Around the World.

Frederick Greene
Eastern New Mexico University
Linda Naimi
Purdue University

Abstract

This article analyzes the extent that digital privacy acts are adequately protected by existing law. The authors look at the historical protection of these rights, and note that the last major piece of legislation in the area was 1986. An analysis of the changes in society from 1986 to the present indicates that changes to current law are long overdue. The authors review some recommended changes and call for Congress to act to update American laws related to electronic communication.

The last time Congress passed a major piece of legislation that radically altered electronic communications was over thirty years ago. Digital and electronic communications have evolved exponentially since the passage of the Electronic Communications Privacy Act of 1986. The internet was in its infancy. Email existed but was not generally available or used by the public, and was the exclusive province of geeks and nerds. Mobile technology barely existed and had extremely limited functionality. Social Networking had an entirely different meaning related to personal in-person relationships—clearly not the internet phenomena known as social networking today. "Cloud computing" was two words not typically found in the same sentence. In the ensuing years since 1986, digital communications have exploded. It is astounding to see the vast amounts of data and information available online. Along with that tremendous expansion, we have seen the rise of internet banking, ecommerce, and online shopping, accompanied by a rising wave of internet crime and intrusions into personal privacy. Private citizens have become increasingly concerned about their digital privacy.

Today, courts disagree on what the constitutional protections may be relative to electronic communications and surveillance. United States Circuit Courts have split on the question as to what sort of protections exist from police intrusion into communications as well as electronic surveillance of movement. Additionally, private corporations and other entities have unprecedented access to information that at one time was private. A greater threat exists from hackers and rogue actors that are willing to compromise and steal valuable information, and even compromise elections. Historically, the courts have used a fourth amendment analysis to determine what rights and privileges should be afforded to citizens regarding their digital privacy. Many modern scenarios present questions implicating how fourth amendment protections will be analyzed and implemented. The current statute appears to "miss the mark"

when it comes to protecting against the type of intrusions and violations of personal privacy that exist with present technology.

The world has changed significantly in the past thirty plus years. In that short timeframe electronic communications has blossomed in a multitude of ways. Thirty years ago very few people knew of the existence of the internet, cell phones, email, GPS, Social Networking, or cloud computing. Today these terms and technologies are an everyday part of most American's lives. Over thirty years ago Congress passed the Electronic Communications Privacy Act of 1986. This statute has only been revised in a few minor ways. The basic statute still exists as it did when enacted. The courts have heard and decided numerous cases and decisions concerning the above technologies without the benefit of new Congressional guidance as to how Fourth Amendment rights should be weighed and protected. Many decisions from various courts contradict decisions from other courts. The United States Supreme Court has weighed in on only a few sparse cases, and there is significant controversy as to what rights are protected versus which rights are not.

The US Supreme Court very early on recognized that for the right to be "secure in their persons, houses, papers and effects" to be effective, there naturally must occur a right to "privacy." Although the word privacy cannot be found in the United States Constitution, its presence can be found in numerous cases. The Supreme Court has indicated that the Right to Privacy is within the "penumbras" of the Bill of Rights (Oyama, 2006). Privacy has been defined in many ways, but it generally is "the right to be left alone." It is considered an individual, personal right (Lasprogata, King, & Pillay, 2004).

The right to privacy in many ways is like personal property that can be traded away or bargained away. In the absence of willingly trading or bargaining away the right, it is considered an enforceable right against others that would violate that right (Lasprogata, King, & Pillay, 2004). The first cases that dealt with this right of privacy were not in an electronic context but in cases involving the United States mail. These cases, long before federal law was passed regarding electronic communication, addressed privacy rights in mail delivered by the US Post Office. The concept of privacy as it relates to mail was first promulgated in a US Supreme Court case called Ex Parte Jackson as early as 1877 (Pikowsky, 2003). Ex Parte Jackson (96 US at 727) held that:

> [A] distinction is to be made between different kinds of mail matter, between what is intended to be kept free from inspection, such as letters, and sealed packages subject to letter postage; and what is open to inspection, such as newspapers, magazines, pamphlets, and other printed matter, purposely left in a condition to be examined. Letters and sealed packages of this kind in the mail are as fully guarded from examination and inspection, except as to their outward form and weight, as if they were retained by the parties forwarding them in their own domiciles.
>
> The constitutional guaranty of the right of the people to be secure in their papers against unreasonable searches and seizures extends to their papers, thus closed against inspection, wherever they may be. Whilst in the mail, they can only be opened and examined under like warrant, issued upon similar oath or affirmation, particularly describing the thing to be seized, as is required when papers are subjected to search in one's own household. No law of Congress can place in the hands

> of officials connected with the postal service any authority to invade the secrecy of letters and such sealed packages in the mail; and all regulations adopted as to mail matter of this kind must be in subordination to the great principle embodied in the Fourth Amendment of the Constitution (Pikowsky, 2003, p. quoting Ex Parte Jackson, 1877).

Later cases dealing with postal mail generally have held that there is a reasonable expectation of privacy in the mail that requires a warrant for a package or letter to be opened by law enforcement. In the case of United States v. Van Leeuwen, the United States Supreme Court upheld statutory provisions Congress passed that codified protection of the United States Mail from warrantless searches (Pikowsky, 2003).

The first case that ever dealt with the issue of electronic surveillance was decided by the US Supreme Court in 1928 in the case of Olmstead v. United States (Horn, 2002). This case was decided almost 50 years after the telephone was invented by Alexander Graham Bell. Unfortunately, the case held that warrantless wiretaps of telephones were not a violation Fourth Amendment rights (Horn, 2002). This interpretation ultimately led to an act of Congress to curtail the warrantless wiretapping of telephones.

The Communications Act of 1934 said that "no person not being authorized by the sender shall intercept any communication and divulge or publish the existence, contents, substance, purport, effect, or meaning of such intercepted communication to any person" (Horn, 2002). Federal agencies routinely got around this congressionally mandated prohibition by claiming that the statute required two acts to become applicable; namely interception and divulgence. Federal agencies made it a point to indicate that they were only intercepting not divulging the information, so the act should not apply to their activities.

Ironically, Justice Brandeis dissented in the Olmstead case and provided what is considered to be one of the most visionary quotes from the bench nearly 70 years ahead of its time. Brandeis' dissent said;

> Ways may someday be developed by which the Government, without removing papers from secret drawers, can reproduce them in court, and by which it will be enabled to expose to a jury the most intimate occurrences of the home.... Can it be that the Constitution affords no protection against such invasions of individual security" (Olmstead v. United States, 277 U.S. 438, 48 S. Ct. 564, 1928. P. 474)

The practice of ignoring a warrant requirement continued until 1937 when the Supreme Court indicated that the Wiretap Act prevented federal agencies from warrantless wiretaps even without their divulgence of the information (Horn, 2002).

Two more US Supreme Court decisions in the next decade played a major role in defining the rights that individuals had in electronic telecommunications. Berger v. New York, and Katz v. United States. The Berger decision struck down a New York statute that authorized governmental warrantless wiretapping. The court noted that conversations are protected under the US Constitution, and that seizure of these conversations amounts to a search (Horn, 2002).

The Katz decision affirmatively held that law enforcement had to obtain a search warrant based upon the usual probable cause standard to monitor telephone calls placed from a telephone booth (Oyama, 2006). These decisions were tempered by a later decision in United States v. Miller that held that these

privacy rights did not exist where the contents of a private communication is revealed to third parties (Oyama, 2006).

Much of what the Supreme Court decided in Berger and Katz was ultimately codified into law with the 1968 passage of Title III of the Omnibus Crime Control and Safe Streets Act. Certain provisions of this legislation are commonly referred to as the Wiretap Act (Mulligan, 2004).

The pattern that emerges shows that in the thirty (30) years since passage of the ECPA, the world had changed drastically. Digital and electronic communications have become the paramount and ubiquitous manner of communication worldwide. The importance and significance of digital communication presents an entirely new challenge that could not have been envisioned in past eras. The need for digital privacy rights have far outstripped the need in years past. Simultaneously, society recognized that terrorism presented a real threat to the peace and security Americans want and enjoy. After the dreadful events on September 11, 2001, Congress immediately passed the Patriot Act that increased law enforcement's ability to snoop, spy, and track any person's electronic and digital communication. In the aftermath of that massive expansion of surveillance rights, US citizens have been left with a weakened or non-existent level of protection in digital and electronic communication. This article recognizes the tenor of the times and frank assessment of the current state of affairs and future needs. To that extent, this paper identifies numerous problems, looks at some proposed solutions and makes the clarion call for change.

The purpose of this article is to analyze the current status of digital and electronic privacy protection laws. The analysis was intended to gauge the status of protection afforded digital and electronic communications today with the protection levels of digital, electronic and non-electronic communications in bygone decades. Although the protection levels may be the same, and courts may be enforcing modern-day electronic and digital communications privacy rights in a similar manner as communications in the past, we can see that the United States does not adequately protect electronic and digital privacy rights with present laws and judicial rulings.

If various types of communication common today in the expanded electronic world do not enjoy the same level of protection that communications, electronic and non-electronic, had in the past, then it is clear that the law has lagged behind the advancements in communications technology leaving electronic communication rights and associated data security rights vulnerable and unprotected.

Congress could not have conceived in 1986 when it passed the Electronic Communications Privacy Act (ECPA) that was designed to regulate access by the government to Internet communications and records that the world of electronic communications would have grown to the dimensions that it has grown to today. The very assumptions that existed in 1986 are no longer applicable. The Internet was barely operational in 1986. Now a substantial part of commerce worldwide is conducted through the Internet. Additionally, the idea of social media had not even been born yet. Social media now accounts for a huge percentage of traffic on the Internet. Congress could not have even understood that the world itself which shrink, metaphorically, when the ability to post something in the Middle East that could be instantly read in China that could be instantly commented on in North America. The idea that indications would be

worldwide and instantaneous was more of a science fiction idea, than the reality that has become. Some of the major flaws that Congress could not have foreseen with the dramatic reduction in the cost of electronic storage. Many of you like us, may remember when storage was extremely expensive. Because of the prohibitive cost of storage and hard drives, most computers in the early 1980's did not even have a hard drive. The way you saved information was from 5 ¼ floppy disk to 5 ¼ floppy disk. Many computers had two floppy disk drives specifically so that you could save information from one to the other. The first "Windows-based system" had a 40 MB hard drive. Most of us now carry in our pockets smart phones with anywhere from 64-512 GB storage capacity. A law that was written in 1986 when storage was at a premium, by necessity focused on real-time surveillance. The law heavily prohibits access to real-time data but is quite weak in enforcing access into stored records. The idea of stored records doesn't even make sense today. Not only do we store things on our individual devices, but we have access to unlimited storage in the cloud. The idea that there should be a distinction between the government or any other entity having access to real-time information versus stored information is now nonsensical. Yet the 1986 Electronic Communications Privacy Act is heavily based on that distinction. Any new law or any new protection has to recognize that privacy rights are not contingent upon the storage medium, but that privacy rights should be absolute.

Some of the major proposals that exist today for fixing the problem related to lack of privacy protections in electronic communications, are promulgated by what is known as the Digital Due Process Coalition. This coalition, including many companies that are household names, including; Apple Computer, Facebook, Alphabet Inc. (the owner of Google), Amazon, Adobe, AOL, eBay, Hewlett Packard, Microsoft, as well as the American Civil Liberties Union, to name a few. This Digital Due Process Coalition (digitaldueprocess.org) has as a motto, "modernizing surveillance laws for the Internet age." If you go to their website you can see that they have a comprehensive and extensive approach to updating privacy laws in the United States. They list as their guiding principle:

> To simplify, clarify, and unify the ECPA standards, providing stronger privacy protections for communications and associated data in response to changes in technology and new services and usage patterns, while preserving the legal tools necessary for government agencies to enforce the laws, respond to emergency circumstances and protect the public (digitaldueprocess.org)

The Digital Due Process Coalition promotes four major principles. They are as follows;

1. The government should obtain a search warrant based on probable cause before it can compel a service provider to disclose a user's private communications or documents stored online.
2. The government should obtain a search warrant based on probable cause before it can track, prospectively or retrospectively, the location of a cell phone or other mobile communications device.
3. Before obtaining transactional data in real time about when and with whom an individual communicates using email, instant messaging, text messaging, the telephone or any other communications technology, the government should demonstrate to a court that such data is relevant to an authorized criminal investigation.

4. Before obtaining transactional data about multiple unidentified users of communications or other online services when trying to track down a suspect, the government should first demonstrate to a court that the data is needed for its criminal investigation. (digitaldueprocess.org).

While these four major principles are certainly a step forward from the antiquated and non-existent coverage now afforded by the ECPA, it really only involves tinkering at the edges. The idea that our electronic privacy should be held hostage to mere notions of probable cause that judges can ascertain based upon the flimsiest of evidence, really does not provide adequate protection of Americans privacy rights.

Without privacy there can be no liberty, liberty and privacy are intricately tied together. Privacy encompasses the ability to be left alone. Without the ability to be left alone, a major aspect of liberty is compromised. We all need the ability to engage in our own affairs without the involvement of others. Whether this occurs inside the home, the workplace, our automobiles, or any other place we may be, it is important right to simply not be bothered. Without privacy this right cannot exist. Privacy must be protected for liberty to thrive.

In light of the astounding number of breaches to security that we see today, our digital privacy rights need to be expanded and protected. After more than thirty years, it is time for Congress to pass expansive new legislation that will protect our elections, business communications, private communications as well as all other forms of electronic communications.

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ORGANIZATIONAL AESTHETICS: Strategic Model for Knowledge Sharing in Entrepreneurial Organizations

Inara Antunes Vieira Willerding, Dr.*
Email: inara.antunes@gmail.com
Postgraduate Program in Engineering and Knowledge Management
Federal University of Santa Catarina
Florianópolis, SC, Brazil
Address: R. Vereador Osni Ortiga, 2037/21 – Lagoa da Conceição – Florianópolis/SC
Zip 88062-451
Phone: 55 48 99962 1744

Juliano Keller Alvez, Me.
Email: juliano@ceteg.net.br
CETEG Consultoria Empresarial Ltda.
Palhoça, SC, Brazil
Address: Rua Mário Lucena, 68/1002 – Centro – Lages/SC
Zip 88502-090
Phone: 55 49 99982 2091

Édis Mafra Lapolli, Dr.
Email: edispandion@gmail.com
Postgraduate Program in Engineering and Knowledge Management
Federal University of Santa Catarina
Florianópolis, SC, Brazil.
Address: Rua Duarte Schutel, 100/502 – Centro – Florianópolis/SC
Zip 88015-640
Phone: 55 48 99982 5258

Abstract

In response to the new challenges arising from an increasingly competitive and globalized environment, aimed at the Knowledge Era, where the value of the individual, his knowledge, and best practices become essential, managers with greater sensitivity and flexibility, aligned to entrepreneurial objectives, must be encouraged in the quest for knowledge sharing in order to encounter new opportunities and new processes of innovation. Therefore, the objective of the present research is to apply a strategic model for knowledge sharing in the light of organizational aesthetics and entrepreneurial management, developed by Willerding (2015), in an entrepreneurial organization that promotes knowledge sharing and change generation, opening the discussion on the possible impact of the aesthetic dimension on the ambiguity

and subtlety existing in the business routine. To achieve the proposed objective, the study is based on bibliographical and documentary research, and interviews. In general terms, the contribution of the model to the understanding of complexities, ambiguities, and subtleties, existing in the business daily routine, becomes evident, allowing a differentiated perspective in its management so that they can reach new conclusions about their performance, thus promoting a competitive differential and a greater socioeconomic development.

Keywords: Organizational aesthetics; Knowledge sharing; Entrepreneurial management.

1. Introduction

Management theories, along with the market, have undergone changes in their journey seeking for management models that outline a new organizational vision with easy access and technological distribution, composing a complex, dynamic, and competitive global environment.

Several conceptions emerged during this journey, and today the tendency is to build an understanding related to the importance of the integration between the individual and the organization in a strategic perspective.

Therefore, organizations need to adapt to the new conditions, integrating people, structures, and processes, by combining new practices in their management, achieving a greater influence on people's behavior, organizational culture, and management.

From this integrative vision, in the search for market consolidation: knowledge, attitudes, skills, and experiences, are understood as essential. The sum of intangible individual goods, as knowledge, attitudes, skills, and experiences, that add value to products and services, treasures the individual, and consequently organizational management, which currently stands as an important market indicator in the generation of competitive differential, being knowledge its powerful currency.

In this sphere, the individual in a contemporary environment assumes the role of agent and social actor, transformer and keeper of knowledge, that facing decisions and managerial actions, in the use of his competences, can acquire competitive advantage and surpass the competitors.

In this perspective, Willerding (2015, p.136) developed a model for knowledge sharing in the light of organizational aesthetics "because it understands that aesthetics assumes several organizational dimensions by its plurality in search of a good functioning and maintenance of the companies, focusing on the individual and his practices, through an environment that favors wellbeing".[1] The author starts from the assumption that the human being, when feeling good in the company, generates "new knowledge and the awakening of creative potential, emphasizing the interpersonal and corporate connections by facilitating knowledge sharing for the generation of greater quality, efficiency and effectiveness, both individual and organizational".[2]

[1] "por entender que a estética assume várias dimensões organizacionais por sua pluralidade em busca de um bom funcionamento e manutenção nas empresas, tendo como foco o indivíduo e suas práticas, por meio de um ambiente partidário ao bem-estar".

[2] "novos conhecimentos e ao despertar de potenciais criativos, enfatizando as conexões interpessoais e corporativas, facilitando o compartilhamento do conhecimento na geração de maior qualidade, eficiência e eficácia, tanto individual como organizacional".

Thus, this research aims to apply the model for knowledge sharing developed by Willerding (2015), in the light of organizational aesthetics and entrepreneurial management as a contribution to the implementation of knowledge management in entrepreneurial organizations.

For this purpose, the following research question arises: How does the model for knowledge sharing, in the light of organizational aesthetics and entrepreneurial management, contributes to the implementation of knowledge management in entrepreneurial organizations?

2. Methodological Procedures

The layout of the present study is exploratory and descriptive, also classified as fieldwork. It is understood as an exploratory and descriptive study because it seeks to identify, describe, and analyze the model for knowledge sharing, developed by Willerding (2015), in the light of organizational aesthetics and entrepreneurial management.

The research has a qualitative approach, according to Creswell (2010, p. 26) because it "[...] is a means to explore and understand the meaning that individuals or groups attribute to a social or human problem".[3]

Likewise, the study is classified as a bibliographic research, for procuring theoretical strength; and is also categorized as fieldwork, for conducting the research in an entrepreneurial organization with nine business units and one foundation. Following the study, the collection of data was done through bibliographical and documentary research, and semi-structured interviews.

Regarding the semi-structured interviews, this tool was used to collect data about the architecture of the company, and also to aid the selection of the surveyed subjects. Documentary research was also used, since documents of the company under study were used to better describe and understand it.

The selection of the subjects to be surveyed was possible through inquiries done to the managers of the organization, where they were requested to indicate employees, who in their opinion stand out, forming then the intentional sampling frame of the study with 35 subjects.

After the selection of the subjects, the data gathering started, in which semi-structured interviews were used as a tool to capture the empirical data, through 31 questions divided among the five factors to be observed: organizational culture, organizational structure, knowledge transfer strategy, idiosyncratic factor, and organizational aesthetics. These factors constitute the indicators for the knowledge sharing model developed by Willerding (2015).

Following the data collection, the interpretation, and analysis of the results collected from the empirical research was completed, using the content analysis technique to meet the research objectives, which according to Bardin (2009, p. 42) refers to the "technique of communications analysis, aiming to obtain, through objectives and systematic procedures for describing the content of the messages, indicators [...] that allow the inference of knowledge regarding the conditions of production/reception of these messages".[4]

[3] "[...] é um meio para explorar e entender o significado que os indivíduos ou os grupos atribuem a um problema social ou humano".

[4] "técnica de análise das comunicações, visando obter, por procedimentos objetivos e sistemáticos de descrição do conteúdo das mensagens, indicadores [...] que permitam a inferência de conhecimentos relativos às condições de produção/recepção destas mensagens".

3. Knowledge Sharing Model in the Light of Organizational Aesthetics

The model proposed by Willerding (2015) was developed under the lens of organizational aesthetics, aiming to foster an adequate environment that could motivate and stimulate the interaction between employees and the organization, in the search for individual and collective knowledge sharing, by means of socialization of the individual in a conscious and spontaneous action.
The model is oriented towards the objective of organizational aesthetics,

> The archetype was developed under the lens of organizational aesthetics because it understands that aesthetics assumes several organizational dimensions by its plurality in search of a good functioning and maintenance of the companies, focusing on the individual and his practices, through an environment that favors wellbeing, by feeling good in the organization for the generation of new knowledge and the awakening of creative potential, emphasizing the interpersonal and corporate connections, by facilitating knowledge sharing for the generation of greater quality, efficiency and effectiveness, both individual and organizational (Willerding, 2015, p.119).[5]

According to the author, organizational aesthetics stands out as a lens for organizational activities through a complex and dynamic economic scenario. This complexity, impelling companies to improve themselves technologically and to seek people with an entrepreneurial managerial profile for their environments, is oriented to marketing success.
In this context, organizational aesthetics collaborates effectively "as a facilitator of knowledge management, because through the understanding and appreciation of aesthetics and cognitive knowledge of the individuals, organizations come to understand the subjectivity existing in their environment" (Willerding, 2015, p.123).[6]
Organizational aesthetics allows the organization to analyze its variables through an investigation beyond the cognitive or logical-rational horizon, since, according to Gherardi (2005; p.14), "in daily organizational life, work, learning, innovation, communication, negotiation, conflict over goals, the self interpretation and history, are present in work practices as part of human existence".[7] In this perspective, states Schiavo (2010, p. 26) that "practice is characterized as being the fundamental element that connects know-how to doing, leading to the image of fabrication, manual work, and craftsmanship."[8]

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[5] O arquétipo foi desenvolvido sob a lente da estética organizacional por entender que a estética assume várias dimensões organizacionais por sua pluralidade em busca de um bom funcionamento e manutenção nas empresas, tendo como foco o indivíduo e suas práticas, por meio de um ambiente partidário ao bem-estar, ao se sentir bem na organização para a geração de novos conhecimentos e ao despertar de potenciais criativos, enfatizando as conexões interpessoais e corporativas, facilitando o compartilhamento do conhecimento na geração de maior qualidade, eficiência e eficácia, tanto individual como organizacional.

[6] "como facilitadora da gestão do conhecimento, pois, por meio da compreensão e valorização do conhecimento estético e cognitivo dos indivíduos, as organizações passam a compreender a subjetividade existente em seu ambiente".

[7] "na vida organizacional diária, trabalho, aprendizagem, inovação, comunicação, negociação, conflito sobre metas, sua interpretação e a história, estão presentes nas práticas de trabalho, como parte da existência humana".

[8] "a prática caracteriza-se por ser o elemento fundamental que conecta o conhecer ao fazer, conduzindo a imagem de fabricação, de trabalhos manuais, de habilidades artesanais".

Stratti (2007), a reference author of studies on organizational aesthetics, associates productive relations with aesthetics, having as proposition the singularity of each person's perception and its importance within the company. For the author, organizational aesthetics:

> [...] refers to a form of human knowledge, and specifically to the knowledge provided by the perceptive faculties of hearing, sight, touch, smell, and taste, and by the ability to make an aesthetic judgment. The latter makes it possible to evaluate whether something is pleasant or not, whether it corresponds to our taste or not, whether it "wraps" us or leaves us indifferent, or even if it is repugnant to us (Stratti 2007, p. 11).[9]

Aesthetics can be worked in a rational (objective), subjective, and empirical way, understanding and expanding "human knowledge, since beauty results from the special ability of man to perform it," not in an automatic, repetitive action, but through "one capable of transfiguring the materials to the point of achieving a revelatory power "(Leal, 2003, p.176).[10]

According to Hermann (2005, p. 31), aesthetics is not a result of cognition, it "relates to the transfiguration of objects, which involves all the senses of the subject, competing with each other and forcing the subject to deal with the new possibilities generated in the experience".[11] In this context, aesthetic experience is essential, "because what it causes in our senses and our imagination has an irresistible strength in the expansion of relations with the world, and even with ethics",[12] evidencing the ethical and rational sensitivity of the human being, contributing to the expansion of the individual's knowledge (Hermann, 2005, p. 31).

In the model developed by Willerding (2015, p. 120), guidelines were created for knowledge sharing in the light of organizational aesthetics, related to the eight essential variables for entrepreneurial management, having as a source of value the individual and the organization. According to Carneiro (2008), they are: Leadership with execution culture; Intra-entrepreneurship; Competency management; Knowledge management; Culture of innovation; Strategic planning; Variable remuneration policy; and Information technology. Also, in the precepts of Lemos (2008), he developed a heuristic model for the transfer of tacit knowledge in an organization by dividing it into two factors: "idiosyncratic (aimed at the individual through his intrinsic personal processes) and organizational (with a focus on organizational architecture, through interaction with co-workers and social relations in the organizational environment), both under the lens of organizational aesthetics."[13]

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[9] [...] diz respeito a uma forma de conhecimento humano e, especificamente, ao conhecimento fornecido pelas faculdades perceptivas da audição, da visão, do tato, do olfato e do paladar, e pela capacidade de fazer um juízo estético. Esta última permite avaliar se alguma coisa é agradável ou não, se corresponde ao nosso gosto ou não, se nos "envolve" ou nos deixa indiferentes, ou mesmo se nos repugna.

[10] "aquele capaz de transfigurar os materiais ao ponto de alcançar um poder revelatório".

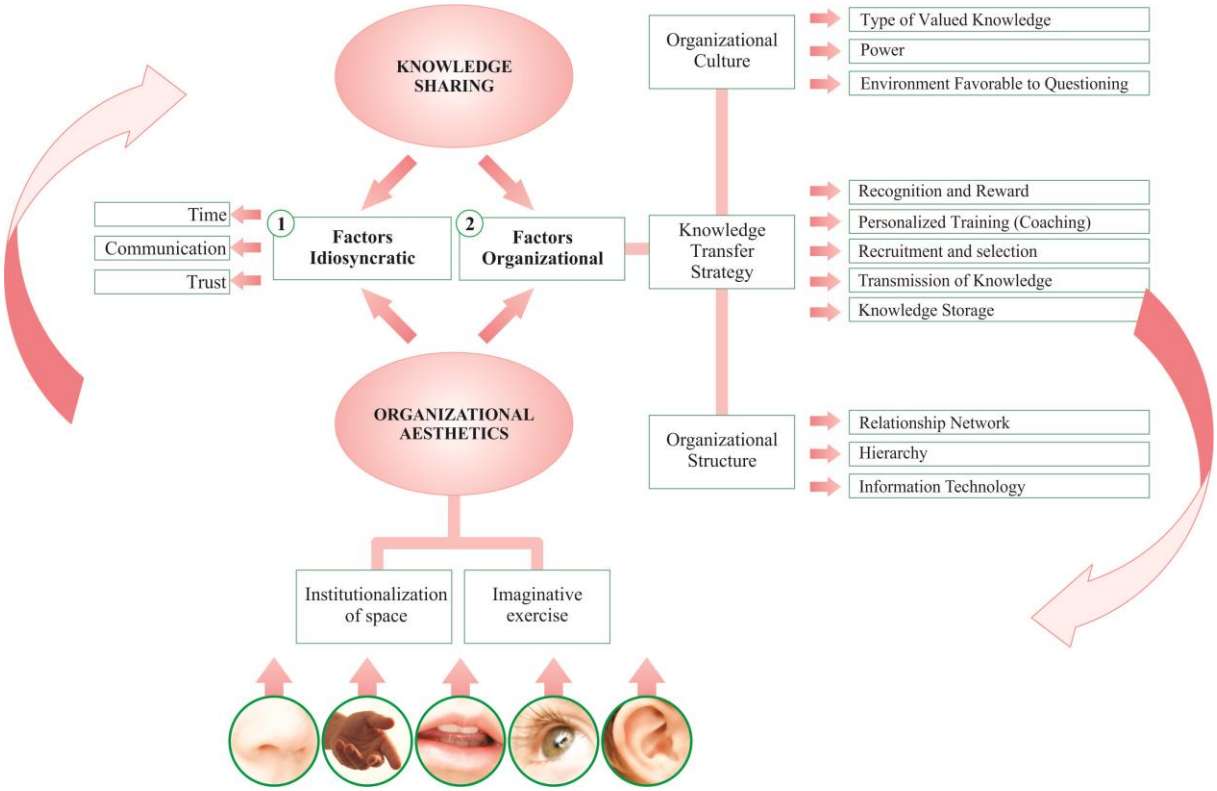
[11] "se relaciona com a transmodelagem dos objetos, que envolve todos os sentidos do sujeito, que competem entre si e forçam o sujeito a lidar com as novas possibilidades geradas na experiência".

[12] "pois o que ela provoca em nossos sentidos e nossa imaginação tem uma força irresistível na ampliação das relações com o mundo, inclusive com a ética".

[13] "idiossincrático (voltado para o indivíduo, por meio dos seus processos individuais intrínsecos) e o organizacional (com foco na arquitetura da organização, por meio da interação com os colegas de trabalho e das relações sociais no ambiente organizacional), ambos sob

The model created by Willerding (2015) encounters the one of the author, who considers essential to create favorable environments for sharing, and also to speak, listen, and act, freeing space for the employees' sensitivity and their wellbeing, to describe each other their experiences and practices, adding to the work the value of the knowledge they possess. The author also states that, for the execution of the model, the organization must have an entrepreneurial profile, because the fulfillment of its efficiency and effectiveness depends on a management focused on the individual, its social interaction, dynamism, and a contemporary vision of the market. Figure 1 shows the model developed for knowledge sharing.

Figure 1 – Model for Knowledge sharing in the light of organizational aesthetics



Source: Willerding, 2015, p. 137.

In the model, the idiosyncratic factors try to verify the variables pertinent to time, communication, and trust. With regard to time, the time availability in the company for knowledge sharing is verified, as well as the presence of a clear communication between the individual and the organization, preventing barriers and misunderstandings, and also, the existence of a communication flow in the work environment. The variable related to trust seeks to identify in the individual the feeling of confidence, since, according to the author, the presence of trust is necessary among employees for the development of interaction and for the shaping of knowledge sharing among them, because the greater the confidence feeling, the lower the barriers, the risks, and the uncertainties.

The organizational factors described in the model focuses on three biases: organizational culture, knowledge transfer strategy, and organizational structure, so that knowledge sharing may exist.

a lente da estética organizacional".

The organizational culture, according to the author, is reflected in management practices, which is essential for the development of the security and confidence feeling; therefore, fostering its human capital with a promising environment for the creation of stimuli, awakening creativity for new ideas and opportunities through clear and efficient communication. The indicators of this bias are related to: the type of valued knowledge, power, and environment favorable to questioning.

The type of valued knowledge in the archetype seeks to determine if the organization values the knowledge (opinions, ideas, and contributions) of its employees, managers, as well as work colleagues, for a better organizational performance.

The question considering power in the model seeks to find out if people in the company use knowledge as power, having the vision that if they share the knowledge they possess, they would lose respect, influence, or superiority over other members of the company; consequently becoming an obstacle for knowledge sharing.

The organizational factor focused on an environment favorable to questioning has the premise of learning whether the company "opens space for possible questionings, both related to the employee himself and also with reference to the practices of co-workers" (Willerding, 2015, p.124).[14]

The organizational bias focused on the knowledge transfer strategy has the premise of identifying the indicators: recognition and reward, recruitment and selection, training, knowledge transmission, and knowledge storage.

The indicator related to recognition and reward in the model seeks to verify if employees are stimulated, recognized and rewarded for their tasks, and for sharing their knowledge (tacit knowledge) among their colleagues. This indicator has the premise of checking if the organization in the recognition and reward process focuses its attention on the knowledge of the individual. According to the author, in view of the profile of the company and its employees, as well as the essential competencies required for its function, it becomes more efficient and effective to select and hire new talent for the company. The training, in turn, seeks to determine how the question of coaching (training) is attended in the organization, by considering the training they provide to its employees and the prioritization of shared knowledge obtained throughout the trainings.

On the other hand, the transmission of knowledge as a strategy for the knowledge sharing model, aims to verify with the company the reuse of knowledge already codified, as well as social interrelations, and also if knowledge sharing occurs especially through the interaction of employees.

The knowledge storage in the model seeks to determine the explicit knowledge existing in the company and how its use takes places; also, if the knowledge of the institution is effectively stored in its architecture or in its employees.

In turn, the bias pertinent to the organizational structure, contains as indicators the relationship network, hierarchy, and Information Technology (IT). For the author, IT aims to verify the organizational communication, the processes and the tools used for information; and consequently, how the knowledge transfer occurs in the interrelations, because when used, they can facilitate the information process by

[14] "abre espaço para possíveis questionamentos, tanto em relação ao próprio colaborador como também referentes às práticas dos colegas de trabalho".

admitting the sharing of visions or insights, understood in a quick and easy manner through various languages.

The relationship network indicator pursues to determine the location of the knowledge they need, whether it is in the company or in the individuals, so it may be used when the necessity emerges. The hierarchy has the purpose of identifying the existing bureaucracy in the organization, the transparency of the management, and if the knowledge transfer process is derived from the hierarchy that exists, because according to the author, this practice can generate obstacles, by hindering or inhibiting knowledge sharing, as well as the existing flexibility and complexity required to transfer knowledge.

The model also brings the two factors (idiosyncratic and organizational) under the lens of organizational aesthetics, having as its arena the variables: institutionalization of space and imaginative exercise. In relation to this, the institutionalization of space, through the look of aesthetics, seeks to verify the feelings aroused in response to the work environment, in order to capture the aesthetic judgment in relation to the organizational architecture and the work practices of the employee.

The imaginative exercise, in the light of organizational aesthetics, seeks to capture with the employees, through analogies, their activities and the environment in which they work, explaining "whether it is pleasant or not, engaging, indifferent, if it is fascinating or repulsive, uncomfortable, as well as to identify through the senses the relations between the employee and the organization" [15], according to Willerding (2015, p. 128).

This imaginative exercise seeks to understand the environment constructed and understood by the employee, through his/her sensorial-aesthetic knowledge based on memories, by the use of analogies allusive to the exercised routines, which may unfold feelings and perceptions directly connected to their senses and to their relation with the work and the organizational environment that they experience.

4. Application of the Model in an Entrepreneurial Organization

In order to apply the model, an entrepreneurial organization was selected, because in order to fulfill the objective of the present study it is essential to consider a company differentiated from traditional ones, with a focus on the individual, and with a dynamic market-oriented management, which materializes in the present study in a company from the area of communications, comprising nine business units and one foundation, centralizing its activities in knowledge and information.

The management applied in the company is divided into four axes: Product (products and services developed by the company, directly related to the end user), Market (everything related to the market, such as sales of products and services, focusing in agencies and clients), Management (administrative and financial area of the organization) and Institutional (interpersonal relationship, generators of strategies for the relationship with authorities and businessmen) – PMMI.

The PMMI organizational model refers to a self-renewing entrepreneurial management, since it opens space for its employees to act in a bold way, towards greater effectiveness in the search for new opportunities and innovation.

[15] "se é agradável ou não, envolvente, indiferente, se possui fascínio ou repulsão, desconforto, bem como identificar por meio dos sentidos as relações entre o colaborador e a organização".

Thus, when applying the Willerding model (2015), with respect to the idiosyncratic factors under the triad: time, communication, and trust, the employees' perceptions of the organization and its work is obtained, being able to exert motivational properties, and influence in a positive way their practices' quality and productivity.

Considering the time indicator, answers reveal that "time is turning into a restricted resource".[16] Through the answers, it was evidenced "that it is intrinsic to each one, that the company opens space, but that also depends on the attitude of the employee".[17] Moreover, it is "a restricted resource today, but it is extremely important to know how to manage it" (Willerding, 2015, p. 164-167).[18]

According to the reports, even though time was considered to be increasingly scarce, the company under study offers the availability and opportunity for knowledge sharing in the organization, through training, meetings, lectures, and often in the coffee break. However, it is essential for the employees to save this available time for their own development and to use it in the best possible way. It can also be noticed that for some employees the importance of this practice is still not clear, disregarding it in the use of their time, therefore, making knowledge sharing difficult; consequently neglecting employees' individual and collective development.

Regarding the communication indicator, it can be evidenced by the answers that it is held through a direct conversation, interacting socially. However, it was also noted that "many expect meetings or more formal situations to communicate and share knowledge".[19]

In this respect, it can be affirmed that "there is clarity in the existing language of the organization and among employees to share knowledge in a better way, avoiding barriers and misunderstandings in the message".[20] Also, communication "occurs in an easy and fluid way, there are some employees who wait for the right timing, in their opinion, with more formal environments for knowledge sharing, or IT tools".[21] Consequently, this may occur "because they do not feel comfortable with more informal social interactions in the organizational environment, or also because of the time factor" (Willerding, 2015, p. 167-168).[22]

The confidence indicator sought to describe the feeling of trust for the sharing of information and knowledge among co-workers. This indicator pursues to demonstrate the essentiality of the feeling of trust in the work environment, so barriers may not interfere in knowledge sharing, transferring a sense of security. It was demonstrated in the researched company that "confidence and safety with respect to work is quite strong, even though the company has this as a premise in its organizational architecture", as stated by Willerding (2015, p.170).[23]

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[16] "o tempo está se transformando em um recurso restrito".
[17] "que é intrínseco a cada um, que a empresa abre espaço, mas que depende também da atitude do colaborador".
[18] "um recurso restrito nos dias atuais, porém é de extrema importância saber administrá-lo".

[19] "muitos esperam reuniões ou situações mais formais para se comunicar e compartilhar conhecimentos".
[20] "há clareza na linguagem existente na organização e com colaboradores para melhor compartilhar o conhecimento, evitando barreiras e o não entendimento da mensagem".
[21] ocorrer de forma tranquila e com fluidez, há alguns colaboradores que esperam momentos mais oportunos, em sua visão, ambientes mais formais para o compartilhamento do conhecimento, ou por ferramentas de TI".
[22] "por não se sentirem à vontade para uma interação social informal mais ampliada no ambiente organizacional, ou também pelo fator tempo".
[23] "a confiança, a segurança com relação ao trabalho é bastante forte, sem melindres, ainda que a empresa tenha isso como premissa em sua arquitetura organizacional".

Organizational factors, according to the model of Willerding (2015), are focused on the triad: organizational culture, organizational structure, and knowledge transfer strategy.

Organizational culture conveys its importance in the process of knowledge sharing through the identity of the company, carrying in its practices relevant mental aspects that are consonant with its employees, cooperating with the harmonization of its environment, shown by the indicators: type of valued knowledge, power, and environment favorable to questioning.

Concerning the *type of valued knowledge*, it was verified that knowledge is valued and that employees are also prompted by the managers of the company to give suggestions and ideas, thus enhancing their human capital.

Regarding *power*, reports say that knowledge does not play the role of empowerment in the majority of respondents. However, one interviewee believes that knowledge is a form of empowerment, when acting in an individualized way: "[...] I consider myself to be quite self-taught, [...] and today our experience helps very much, and we still have a lot to improve. I believe that "[that knowledge is power within a company] (E_{32}).[24]

As for the *environment favorable to questioning*, it was verified that the organization allows questions "without any difficulty. In fact, respondents commented that it is normal to access it easily, it is simple, straightforward, without mortifications or constraints" (Willerding, 2015, p. 175).[25]

This fact allows employees, when they feel confident and valued for their questions, to be able to contribute with more clarity and determination with their tacit knowledge, allowing the best management of possible doubts and solutions in the context of the organization, as well as the search for the commitment of everyone in favor of the best solution or strategy of the organization (Willerding, 2015, pp. 176-177).[26]

The organizational factor, focused on the knowledge transfer strategy, allows relating management strategies, cooperating with the process of knowledge sharing through the indicators: recognition and reward of employees, training, storage procedures and transmission of knowledge.

It has been verified through the *recognition and reward* indicator that in the organization there is no reward plan that aims at results with a monetary benefit, but it involves promotions, feedback, and awards in some of the areas. This indicator showed dissatisfaction in the employees of the company about the reward processes, provoking a discontent, limiting the sharing of organizational knowledge. This question, under aesthetics, needs to be revised to later potentiate it.

In the *recruitment and selection* indicator, it was identified that the organization "cares about the recruitment and selection of its employees and the knowledge they have, since it is easier to select and hire talent for the functions of the company once they already have the expertise"[27], according to Willerding,

[24] "[...], eu me considero assim, muito autodidata, [...], e hoje a experiência que temos ajuda muito, e ainda tem muito para melhorar. Eu acredito que sim".

[25] "sem nenhuma dificuldade. Inclusive, os entrevistados comentam que a facilidade do acesso para isso é normal, é simples, direto, sem rodeios ou constrangimentos".

[26] colaboradores, ao se sentirem confiantes e valorizados por seus questionamentos, poderão contribuir com mais clareza e determinação com seus conhecimentos tácitos, possibilitando o melhor encaminhamento para possíveis dúvidas e soluções no contexto da organização, como também a busca pelo comprometimento de todos em prol da melhor solução ou estratégia da organização.

[27] "se preocupa com o recrutamento e a seleção de seus colaboradores e os conhecimentos que possui, pois fica mais fácil selecionar e contratar talentos para as funções da empresa quando já se tem a expertise".

(2015, p. 159). However, recruitment and selection is still done by the indications of managers and employees.

With regard to the *personalized training (coaching)* indicator, it is observable that "the company spends efforts to attend this issue, together with its managers, by verifying what is the market offering and its importance for employees and for the company", as affirmed by Willerding (2015, p. 183).[28]

In the *transmission of knowledge* indicator, it was evidenced by the reports that it happens in an easy and direct way, since the studied organizational environment fosters good social relations, as well as the confidence feeling of employees, related to an open and flexible business culture, avoiding barriers for knowledge sharing. According to the author (2015, p. 186), "the flow of communication, information and knowledge in their environment are vital to the good practices of the organization and also to the development and improvement of its employees".[29]

Regarding the *knowledge storage*, the research identified that the organization has already explicit knowledge, since organizational knowledge is within the people, where knowledge is stored in the mind of the individual, not being evident the reuse of codified knowledge. It was also evidenced that some employees seek knowledge in the "Internet, to acquire and share knowledge with their team, and also in courses",[30] as stated by Willerding (2015, p.187).

The following organizational factor refers to the *structure*, which seeks to contribute to knowledge sharing through the indicators: relationship network, hierarchy, and information technology.

Through the *relationship network* indicator, it is possible to identify that the organizational structure welcomes an active relationship, thus allowing its employees to share and transfer their knowledge.

In the *hierarchy* indicator, the majority of the interviewees identified the existence of a hierarchy. Moreover, "this hierarchy is not quite vertical, thus solving more quickly the difficulties encountered in the daily routine; and both the sharing of information and knowledge are passed on with more speed",[31] according to Willerding (2015, p. 191).

Considering the *Information Technology*, the reports allow the awareness that the company uses "IT tools, for example, WhatsApp, email, radio, telephone, in the daily work practices. This fact is evidenced by the profile of the researched organization, that is, a company that develops its activities in the field of communication" (Willerding, 2015, p. 194).[32]

4.1 Idiosyncratic and organizational factors under the lens of organizational aesthetics

These factors under the lens of organizational aesthetics aim to identify "through the feelings and senses of the employee, questions related to sensitivity, intuition, insights, and perceptions to understand their relationship with the researched company, being essential for the understanding of the architecture of the

[28] "a empresa despende olhares para esse quesito e, junto aos seus gestores, verificam o que vem sendo oferecido no mercado e a importância para o seu colaborador e para a empresa".

[29] "o fluxo de comunicação, a informação e o conhecimento em seu ambiente são vitais para as boas práticas da organização e também para o desenvolvimento e aprimoramento de seus colaboradores".

[30] "internet, para adquirir e compartilhar com sua equipe, e também de cursos".

[31] "que essa hierarquização não possui tanta verticalização, resolvendo, assim, as dificuldades encontradas no dia a dia com mais rapidez, e tanto o compartilhamento de informação como o conhecimento são repassados com mais velocidade".

[32] "ferramentas de TI, por exemplo, *WhatsApp*, *e-mail*, rádio, telefone, no dia a dia das práticas de trabalho. Fato esse evidenciado devido ao perfil da organização pesquisada, ou seja, empresa que desenvolve suas atividades no ramo da comunicação".

organization",[33] in the arena of the variables: institutionalization of space through the framework of sight; and imaginative exercise through the framework of smell, taste, touch, and sound (Willerding, 2015, pp. 170-171).

It was identified through the *institutionalization of space*, when the surveyed subjects were evaluated on how they see their work in the company, expressions such as: it evolves a lot; could improve; in constant growth; I love what I do, but I try to improve; it is evolving; a rush, a madness; I have been running a lot and producing little; I'm addicted to my work; and, I'm picky with myself; are some statements that express the feeling of contentment. Additionally, an overwhelming feeling was also identified because of the various functions the employees fulfill.

Respondents were also questioned about how they joined the company, revealing that most of the interviewees arrived by reference. This question, in some interviewees, generated a feeling of discomfort due to the climate created by the presence of other work colleagues. Therefore, it becomes necessary for the organization to be attentive, along with the *recruitment and selection* indicator, to achieve greater effectiveness of organizational performance.

The surveyed subjects were also asked about their feelings when arriving at the company, the memories of that day, and if they reached their expectations focusing on what was their perception and their aesthetic judgment.

There were "sensory feelings, such as: scared; terrified; I had no idea what to do; butterflies in the stomach; surprised; shocked; fear of change; a "thump"; trembling legs and could hardly walk; tremor; cold sweat; monotony; composing several speeches" (Willerding, 2015, p. 200).[34] In contrast, the aesthetic judgments exposed by the interviewees of the company were extremely promising.

These feelings are connected to the ongoing practices, to their beliefs, and also to the unexpected facts, thus generating uncomfortable sensations, namely: "being afraid, feeling impacted, and being surprised by situations that were often different from those they imagined",[35] affirms Willerding (2015, p. 201). However, comfortable and pleasant sensations have also been reported, such as: "a strong encouragement; feeling welcomed; joyful; happy; experiencing something pleasant; confortable; feeling excited; full of expectations; feeling positively challenged; anxious; marveled; satisfied; with their expectations being achieved and attended by the company ",[36] according to the author (2015, p.120).

Regarding the question related to the organizational environment, in relation to what respondents would change in the environment in which they work, its base is found in the structure and physical space, since they refer to the growth of the company and its physical limitation to a small -"tight"- space, thus, generating the feeling of discomfort and unpleasantness.

In addition, the respondents discussed over the feelings of the team with whom they work and the relationship they have among co-workers, where the majority assured that their team is excellent,

[33] "por meio do sentimento e dos sentidos do colaborador, questões relacionadas a sensibilidade, intuição, *insights*, percepções para compreender a sua relação com a empresa pesquisada, essenciais para compreender a arquitetura da organização".

[34] "sentimentos sensoriais, como: assustador, apavorado, não tinha ideia do que fazer; frio na barriga, surpreso, impactante, medo do novo, um "baque", as pernas tremiam e quase não conseguia caminhar, tremor, o suar frio, monotonia, compõem vários discursos".

[35] "ter medo, sentir impacto e estar surpreso com as situações que imaginavam muitas vezes serem diferentes das que vivenciaram".

[36] "um forte ânimo, se sentir acolhido, alegre, feliz, do gostar, de se sentir bem, ter emoção, de estar cheio de expectativa, sentimento de desafio, de ansiedade, de estar maravilhado, satisfeito, com suas expectativas sanadas, atendidas pela empresa".

attributing the feelings of wellbeing, realization and tranquility. Also, they expressed how they would proceed in relation to the integration of a new co-worker, helping him/her to learn about his/her function, which proves their proactivity in knowledge sharing and the presence of a strong socialization in the company. Nevertheless, one respondent declared his dislike towards teaching. "This behavior may be a problem related to what the company and its leaders design as management and culture, or perhaps, it is a conflict with the organizational culture so clear in relation to knowledge sharing",[37] says Willerding (2015, p. 207).

The research also sought, through the imaginative exercise, to look for "the multi-detected, constructed and sensed nature; keeping the aesthetic knowledge close to the source of experiences already embodied and aesthetically perceived through the senses" (Willerding, 2015, pp. 209-210). [38] This exercise seeks to evidence the senses already incorporated in the individual, using analogies of previously experienced sensations that were codified by the cognitive knowledge of the employee.

In this perspective, it was possible through the framework of smell, taste, touch and sound, to understand the environment constructed by the employees, protected by their memories and imaginations, by explaining analogies to refer to ongoing practices that are connected to their bodies, minds and feelings.

The framework of smell implicates the sensations of aromas, encoded by feelings. "It is one of the factors that allow the individual to understand and relate to the environment, and it also serves as an important tool to alert against feelings that can generate barriers through displeasure, discomfort, and repulsion" (Willerding, 2015, p. 210).[39]

Therefore, when arguing about the smell of the workplace, there were reports related to: "many people gathered together; pleasant goals; tranquility and peace; work; joy; pleasantness; friendship; companionship; comfort; warmth [...] machines; documents; new books; paper; chocolate; [...] hurry; responsibility; coffee; growth and development; information; achievement; wetland; happiness; flowers; satisfaction" (Willerding, 2015, p. 210).[40]

These perceptions are related to the sensation felt by the cognitive knowledge of each subject, intrinsic "to the way of perceiving, interpreting and symbolizing the feelings associated with their wellbeing and their form of pleasure".[41] However, there were also explanations related to the displeasures referring: old things, outdated.

The framework of taste, of the palate, manifested the sensation embodied through the senses of the surveyed subjects, by traveling through the flavors and displeasures of their feelings (sensations). Thus, the reports indicated feelings such as: "sweet; which I love; sweet and sometimes bitter; satisfaction; fulfillment; joy;

[37] "Esse comportamento talvez seja um problema em relação ao que a empresa e seus líderes vêm desenhando como gestão e como cultura, ou talvez um embate à cultura organizacional tão evidente a respeito do compartilhamento de conhecimento".
[38] "a natureza multidetectada, construída e sentida, mantendo o conhecimento estético próximo da fonte de experiências já corporificada e sentida de forma estética, por meio dos sentidos".
[39] "É um dos fatores que admitem ao indivíduo compreender e se relacionar com o meio ambiente, e que também servem como importante ferramenta de alerta contra sentimentos que possam gerar barreiras por meio do desagradável, do desconforto e da repulsão".
[40] "muita gente junta, metas prazerosas, tranquilidade e paz, trabalho, alegria, agradável, amizade, companheirismo, conforto, aconchego [...] máquinas, documentos, livro novo, papel, chocolate, [...] pressa, responsabilidade, [...] café, crescimento e desenvolvimento, informação, realização, terra molhada, felicidade, flores, satisfação".
[41] "à forma de perceber, de interpretar e de simbolizar os sentimentos associados com o seu bem-estar e a sua forma de prazer".

wine; rice, *feijão* and *farofa*[42]; coffee; sushi; pizza; life; contentment; and tequila" (Willerding, 2015, p. 212).[43]

On the other hand, the framework of the sense of touch seeks the tactile sensation, perceived by the touch, which may intervene the human capacity of creating the aesthetic judgment, "providing feelings like security, affection, regard; as well as ambiguity, rareness, emptiness, interferences, unpleasantness, and inaccuracies" (Willerding, 2015, 213).[44] Some statements were highlighted in the reports, such as: "it is hard, you have to succeed", "some days are hard, some others are easy, more or less with a bittersweet connotation", identifying "the feeling of wellbeing; satisfaction for being part of the organization, the management team, and the co-workers, including the most diverse descriptions of feelings (aesthetic judgment)" (Willerding, 2015, p. 214).[45]

The framework of sound is perceived by hearing, through the projection of sound, "sound intensity or volume, rhythm that to affects the proper functioning of organisms and life in general; being able to cause various types of discomfort and dysfunctions" (Willerding, 2015, p. 214). [46]

Consequently, the sound verified in the surveyed organization reflects satisfaction, wellbeing, the dynamism of everyday life, the aggressiveness of the market, being "like a sailboat, where the working employee is the wind that always travels forward with pleasure and determination, in search of the meaning of doing the right thing and to be heading towards the right direction" (Willerding, 2015, 216). [47]

4. Conclusion

The application of the strategic model for knowledge in the light of organizational aesthetics was possible through the involvement of organizational life and the employees, their environment, and their daily work practices. When verifying the importance of each factor created by the model, it was perceived a strong social interaction in the organizational environment, by developing feelings of security, confidence, joy, happiness, and satisfaction, by the existing teams in the different business units of the surveyed organization.

Additionally, there were also evident, in certain moments, feelings of discontent, discomfort, or displeasure, which, through the lens of aesthetics, need to be reexamined in order to prevent the appearance of barriers and blockages in the process of knowledge sharing. Nonetheless, the feelings of pleasure and satisfaction in the company act as facilitators for knowledge sharing and for good practices.

Given the context, Willerding's model (2015) has brought to the limelight the importance of time, communication, and trust for knowledge sharing and other factors oriented towards the organization,

[42] Typical Brazilian dishes with beans and other grains (TN: translator's note).
[43] "doce, que eu adoro, doce e às vezes amargo, gosto de satisfação, realização, alegria, vinho, arroz, feijão e farofa, café, sushi, pizza, vida, contentamento e tequila".
[44] "proporcionando sentimentos, como segurança, afeto, carinho, como também sensação de ambiguidade, o indeterminado, lacunas, intercepções, incômodo e imprecisões".
[45] "é duro, tem que bater", "os dias são ásperos, outros são lisos, mais ou menos com a mesma conotação do amargo e do doce", identificando "o sentimento de bem-estar, de satisfação em fazer parte da organização, da equipe que gerencia, de seus colegas de trabalho, nas mais diversas descrições de sentimentos (juízo estético)".
[46] "intensidade sonora ou volume, ritmo que permite afetar o funcionamento apropriado do organismo e da vida em geral, causando vários tipos de desconforto e disfunções".
[47] "como um barco à vela, onde o colaborador com seu trabalho é o vento que leva sempre em frente com prazer e determinação, em busca do significado de estar fazendo o certo e na direção certa".

considered under its culture, structure, and knowledge transfer strategies, in the light of organizational aesthetics.

When capturing the subjectivity of employees, through the sensory field of the individual, this research broadens the horizons of action of the organizations, allowing a differentiated perspective in their management so that they may reach new conclusions, thus, promoting a competitive differential and a greater socioeconomic development. Also, strong social interaction in the organizational environment awakens a swirl of feelings, sharing the language of the senses, inherent to the human being, as an arena of feelings capable of revealing thoughts and ideas for a better interpretation and understanding of the feelings of employees, in relation to the inherent framework of their experiences and perceptions, by decrypting enigmas.

Enigmas are sensed by the peculiarity of each worker, as an integral part of organizational life, and the more their senses are interpreted, the more it will be possible to advance in the mysteries of the business world, enabling the generation of competitive differential when promoting the desire to share knowledge, prioritizing human features, such as sensitivity, cognition, creativity, imagination, critical thinking, and self-reflection, for the transformation of organizational practices.

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ACCOUNTANTS TOWARDS THE ACCOUNTING OF KNOWLEDGE: An analysis of the results of the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants

Doctor José Antonio DE FRANÇA, Accountant and Economist, Professor of the Department of Accounting and Actuarial Sciences at University of Brasilia, Brazil.
e-mail: franca@itecon.com.br and franca@unb.br

Doctor Clésia Camilo Pereira, Accountant, Professor of the Department of Accounting and Actuarial Sciences at University of Brasilia, Brazil.
e-mail: clesia@unb.br>

Doctor Eduardo Tadeu VIEIRA, Accountant, Director of the Faculty of Economics, Administration, Accounting and Public Management at University of Brasilia, Professor of the Department of Accounting and Actuarial Sciences at University of Brasilia, Brazil.
e-mail: eduardot61@hotmail.com eduardot@unb.br

Abstract

This article analyses the results of the first technical qualification exam for the creation of the National Register of Forensic Accountants (NRFA or CNPC, acronym in Portuguese) in Brazil, conducted by the Brazilian Federal Council of Accounting (BFCA or CFC, acronym in Portuguese) in 2017. Forensic accounting as a specialized knowledge in accounting presents the paradox of the demand for multidisciplinary knowledge as requirement for assisting in the dispute involving equity interest. In this respect, this research aims to investigate the degree of spatial concentration of the performance and the level of knowledge in forensic accounting, separated by geographic region and federation unit (FU), based on the results of the first exam for the creation of the CNPC. The analysis is supported on the assessment of the candidates' performance, in the exam's tests, by using the clustering method. The results present robust evidences that it is necessary to improve continuing professional education and show that the highest spatial concentration of performance and level of specialized knowledge are in the South Region and in the Federal District of Brazil, contradicting the premise that they would be in the Southeast Region, as it is the most developed one in Brazil.

Keywords: Forensic accounting; concentration of performance; knowledge specialization; exam of technical qualification; paradox of expertise.

1. Introduction

Knowledge as an intangible asset is a basic requirement for the sustainable development of an

economic activity of a given culture and of a society. Both the level of knowledge and the spatial concentration of its application are the approaches of this article to assess forensic accounting expertise in Brazil. Forensic accounting as a specialized activity does not dismiss multidisciplinary knowledge as a necessary attribute to assist in the resolution of disputes involving equity interest. The spatial concentration of performance in a specialized activity is a consequence of the economic or industrial agglomeration that occur with the growth of cities (Glaeser, 1999), and forensic accounting is one of the satellite activities of such agglomeration.

Due to the role played by forensic accounting in the scope of the urban agglomeration, the Brazilian Federal Council of Accounting (BFCA or CFC, acronym in Portuguese), in 2017, understood that accountants, in order to occupy the position of forensic accountants, must attest their knowledge by passing a technical qualification exam. This scenario serves as grounds for this article, which fosters a reflection about the technical knowledge of Brazilian accountants, from the results of the first exam of technical qualification for the creation of the National Register of Forensic Accountants ((NRFA or CNPC, acronym in Portuguese).

The reflection calls for an analysis of the spatial concentration of performance and the level of knowledge shown by the accountants sitting for the technical qualification exam, and it incorporates studies developed by the economics of knowledge. According to these studies, knowledge does not exist all by itself, but it is the most powerful engine of production of an individual, which enables them to subdue nature and force it to satisfy their wishes, it is a passport to conquer citizenship and economic development, as discussed by Marshall (1890), Lundvall and Johnson (1994), OECD (1981), Field (2001) and Lundvall (2004).

Both the NRFA and the previously created National Register of Independent Auditors (NRIA or CNAI, acronym in Portuguese) are relevant indicators of the accounting profession to those who use any accounting services, as these registers require continuing education, which is lifelong education, as discussed by Field (2001). A third indicator is the requirement to take the sufficiency exam to act as a professional accountant.

Because forensic accountants are both specialists and multidisciplinary professionals, which indicates a paradox, they must combine specific technical knowledge with knowledge from other areas, such as law, economics, business, mathematics and technology. Regardless the identification of how comprehensive such knowledge is, this first exam must be considered as a minimum requirement, bearing in mind that it focuses on specific knowledge. The need for multidisciplinary areas of knowledge is dictated by the demand for services like the valuation of equity assets, the assessment of fair value in financial instruments, calculations of compensations, validations of routine and process, among others.

Given the spatial geography of the demand to take the technical qualification exam and the results published by the Brazilian Federal Council of Accounting (BFCA or CFC, acronym in Portuguese), this article's motivation is centered on understanding the degree of spatial concentration of the forensic accounting activity as well as on the concept of "region", as addressed by Isard, Schooler and Vietorisz (1959) and Cookie and Leydesdorff (2006).

In this respect, the research problem is developed to identify and investigate the geographic region

(region) and federation unit (FU) with the highest concentration of performance in forensic accounting and the highest level of technical knowledge shown in the results of the first technical qualification exam for the creation of the CNPC.

The methods proposed to obtain answers to the research questions are **(a)** to organize the candidates' applications by federation unit (FU) and region; **(b)** to cluster the candidates by the performance *status* (pass, fail, absent) in accordance with the publication of the exam's results; and **(c)** to obtain and assess the performance *status*, by region and FU, for each task of the exam. These objectives, supported on the clustering method (Haddad, 1977; IPEA, 2001, p. 318-319), and adapted for the accounting of knowledge, are sufficient to answer the research problem.

The result expected from this first exam is the spatial concentration of the performance of accountants who wish to join CNPC in the Southeast region, the most developed one in Brazil. This result shows similar characteristics to those present in agglomerations studies in regional and sectoral development, as discussed by Lodder (1974), Haddad (1977) and Ferreira (1996). The CNPC acts as a reference of technical-professional qualification of accountants prepared to work with forensic accounting and best serve the demands of society.

The research results are relevant to the area literature because, by using the clustering method, they show how accounting knowledge is distributed over the Brazilian territory and how this level of knowledge meets the demands to exercise the forensic accounting specialty. However, it is the first exam with such characteristics and, because of this, there are not any previous data, so it is not reasonable to generalize the predominance of the results.

Thus, given the motivation that stimulates the investigation on forensic accounting knowledge, this article is structured as follows: **2. Theoretical discussion**, which dialogues with the main contributions of the area literature for the topic; **3. Preliminary methodology**, which presents models used in relating research that contribute to enrich the area literature; **4. Methodology**, which describes the model expected to meet the investigation presented as the research problem**; 5. Description of data and analysis of results**, which presents and analyzes the answers of the tests collected by applying the model, and answer the research problem; **6. Conclusion**, which summarizes the research findings as well as its main contributions; and lastly, the **References**, where the related studies that contribute to science and to this article are listed.

2. Theoretical discussion

This section discusses results of research studies with similar objects to the one of the present article, which contribute to foster the area literature and to give grounds to the proposed investigation. The discussion is divided into the following subsections: **(a)** the purpose of the technical qualification exam;

2.1 The purpose of the technical qualification exam

The regulation of the Brazilian accounting system, under the Brazilian Federal Council of Accounting (BFCA or CFC, acronym in Portuguese) responsibility, as manager of the CFC/CRCs (Regional Accounting Councils) system, encompasses the professional activity in all specialties of the accounting profession (Decree-Law no. 9,295/1946). To take up this task, CFC has established the sufficiency exam,

through Resolution 853/99, regulated by CFC's Resolution no. 1,301/10, to assess the minimum capacity for professional practice of those graduating in accounting.

Regardless of the capacity shown in the sufficiency exam when graduating in accounting, as of the first decade of the 2000s, the CFC has established the technical qualification exam for accountants specialized in Auditing (Resolution no. 1,019/05) and, more recently, the technical qualification exam for accountants specialized in Forensic Accounting (Resolution no. 1,502/16).

These Resolutions have created two registers of specialists, Resolution no.1,019/05 created the National Register of Independent Auditors (NRIA or CNAI, acronym in Portuguese) and Resolution no. 1,502/16 created the National Register of Forensic Accountants (NRFA or CNPC, acronym in Portuguese). Each register has the purpose of showing society which professionals have proved to have the minimum capacity required to conduct and execute the duties of their specialty.

Resolution no. 1,502/16 provides the legal framework for CNPC's exam, the object of this article. The first exam was held in 2017 and its content was extracted from the Brazilian Code of Civil Procedure (Law no. 13,105/15), from technical regulations aligned with the accounting conceptual framework, Resolution no. 1,374/11, and from other norms intrinsic to the profession.

However, in addition to meeting the regimental demands of the accounting profession, the technical qualification exam, as a requirement for the admission in the specialty, demands maintenance of knowledge through continuing education. Continuing education meets an important requirement of knowledge, which is the lifelong education, as discussed by Field (2001). This discussion retakes the debate regarding the rights to citizenship, strengthened as of the First World War. This debate goes back to the Bolshevik Russian revolution and to the United Kingdom's official statement that adult education is a permanent necessity, as it is an essential attribute for exercising citizenship, as the writer argues.

2.2 Knowledge promoting regional and sectoral development

Knowledge society is the boost of development that leads individuals to the several *statuses* of citizenship. For no other reason would Marshall (1890), in the introductory section of book IV addressing the agents of production, land, labor, capital and organization, declare that knowledge is the individual's most powerful engine of production because it enables them to subdue nature and force it to satisfy their wishes.

Knowledge production stands out as a competitivity advantage in management and procedure leadership. On this matter, Lundvall and Johnson (1994), when discussing the aspects of remembering and forgetting, declare that human knowledge does not exist all by itself. It is coded into the central nervous system of human beings and may get lost quite easily and quickly. They also presume that, in general, for institutional and epistemological reasons, learning is cumulative, in such a way that the stock of knowledge is increasing over time. However, if not actively used, knowledge can deteriorate and, depending on the context, can be quickly destroyed.

When studying the economics of knowledge, Lundvall (2004) addresses matters like private/public, local/global, tacit/codified knowledge. Based on this approach, he questions: what constitutes the knowledge base? At what level can we locate and define a knowledge base? What are the specificities of

local and sector specific knowledge bases? How stable is the knowledge base? To find an answer to these questions, he introduces themes like: basic concepts related to knowledge and learning; the contribution of economic analysis to the understanding of production, mediation and use of knowledge; new economic trends and the formation of a "learning economy". However, since there are not swift responses to these inquiries, the writer contrasts the neoclassic school with the Austrian school and concludes that the Austrian economists treat learning as a fundamental process in the analysis of market transactions, and that knowledge and learning play a relevant role in economic development.

The agglomerations of specialists, which include forensic accountants, is associated to OECD's (1981) statement, present in the 1980 Frascati Manual, that says that the technological and scientific activities developed by UNESCO comprise systematic activities which are closely concerned with the generation, advancement, dissemination and application of scientific and technical knowledge in all fields of science and technology. In addition, they also include research and development, technical and scientific education, training and scientific and technological services. In this declaration, forensic accounting as a service stands out in the application of knowledge.

Cooke and Leydesdorff (2006), discussing the construction of advantage in regional development based on the economics of knowledge, approach conceptual matters regarding the term "region". They state that "region" has its origin in the Latin *region,* which stems from *regere*, meaning "to govern". Comprehensively, they state that "region" means the governance of policies to assist processes of economic development. Restrictively, "region" is an administrative division of a country.

In the study *Industrial Complex Analysis and Regional Development* applied in Puerto Rico, Isard, Schooler and Vietorisz (1959) comment the discussion about the concept of region among researchers. In this discussion, the prevailing understanding is that region must be conceived as a unit of area with a significant problem to be studied, which may vary depending on the researcher's stance and on other characteristics at a given situation.

Glaeser (1999) discusses the role of cities in the acquisition of skills and learning opportunities of individuals, in the process of urban agglomeration. The discussed model predicts that the accumulation of human capital is beneficiated by the exchange of experiences among individuals as well as by increases in wages. Lastly, the author discusses that economies of scale offered by urban areas may allow that better schools be built in big cities, hence, facilitating formal education.

3. Preliminary methodology

Agglomeration models are used to assess levels of concentration and specialization of activities or sectors within the context of a region or sector.

Haddad (1977) uses measures of location and specialization to study employment in Brazil, classifying them as sectoral measures and specialization measures. Within this classification, he uses as sectoral measure the location quotient (LQ) and as specialization measure the specialization quotient (SQ).

Location Quotient (LQ)

$$LQ_{ij} = \frac{\frac{E_{ij}}{E_{*j}}}{\frac{E_{i*}}{E_{**}}}$$

Where:

$E_{ij} = employment\ in\ sector\ i\ of\ region\ j;$

$E_{*j} = employment\ in\ all\ sectors\ i\ of\ region\ j;$

$E_{i*} = employment\ in\ sector\ i\ of\ all\ regions;$

$E_{**} = employment\ in\ all\ sectors\ of\ all\ regions.$

Specialization Quotient (SQ)

$$SQ_{ij} = \frac{\sum_i (|iej - ie*|)}{2}$$

Where:

$$iej = \frac{E_{ij}}{\sum_i E_{ij}}; \quad jei = \frac{E_{ij}}{\sum_j E_{ij}}$$

For spatial concentration of an activity higher that the regional mean (LQ > 1) and for specialized knowledge equivalent to the regional mean (SQ → 0).

Lodder (1974), when discussing locational patterns and regional development, understands the agglomeration effect as the existence of a driving force unit capable of attracting other units that favor the settlement of the population and the development of complementary activities, such as the service activity force. From this effect, then, the concept of agglomeration economies arises, like the existence of a place that concentrates economic activity, complementary activities and services in general, with an efficient network of transport, communication and working force.

Ferreira (1996) analyses the network of cities in the State of Minas Gerais in Brazil from the perspective of relocation of São Paulo's industry. In this analysis, through the location quotient, he compares the performance of several sectors of industry, trade and services of many towns. He observes that when this quotient is used in the tertiary sector, it measures the need for services and trade in a region in comparison to the need in Brazil and, like in Haddad (1977), he describes the following model:

$$LQ = \frac{r/R}{br/BR}$$

Where ***r*** is sector *i* of location *j*; ***R*** is the sum of all sectors *i's* of location *j*; ***br*** is the sum of sector ***i*** of Brazil (or the largest area of reference); ***BR*** is the sum of all sectors of Brazil (or the largest area of reference).

In the methodology sector, both quotients, LQ and SQ, are adapted to measure the spatial concentration of performance and the level of knowledge of forensic accountants and of the forensic accounting activity in Brazil, by regional agglomeration and federation unit (FU).

4. Methodology

The methodology used is descriptive, not parametric, supported on the analyses of data from the exam and on sectoral indicators like the location quotient and the specialization quotient. These indicators define the levels of spatial concentration of performance and of knowledge equality/inequality of the applicants to the register of specialist in forensic accounting.

4.1 Model of location quotient (LQ)

LQ is obtained as described in Equation (1) and measures the level of specialization (i) by federation unit (FU) in Brazil. The numerator measures the level of specialization of the FU with respect to the region where the FU is located. The denominator measures the participation of the total amount of specializations in comparison to all specializations. An LQ > 1 means that the FU is more specialized than the region, the opposite being LQ < 1. The model is adapted from the work of Haddad (1977), Cruz et all. (2001) and Ferreira (1996), where each performance *status* is classified as specialization.

$$LQ_{i,j,r} = \frac{\frac{A_{i,j,r)}}{A_r}}{\frac{A_{i,j}}{A}} = \frac{A_{i,j,r)}}{A_r} * \left(\frac{A_{i,j}}{A}\right)^{-1} \qquad (1)$$

The quotient produced in Equation (1) creates a matrix LQ_{jxr} with ***j*** and ***r*** varying as follows:

$$\boldsymbol{LQ_{jxr}} = \begin{cases} j = 1,2,3,\ldots,27 \\ r = 1,2,\ldots,5 \end{cases} = \boldsymbol{A_{jr}} = \begin{bmatrix} \boldsymbol{A_{11}} & \cdots & \boldsymbol{A_{15}} \\ \vdots & \ddots & \vdots \\ \boldsymbol{A_{271}} & \cdots & \boldsymbol{A_{275}} \end{bmatrix}$$

Where:

$A_{i,j,r} = passing\ performance\ \boldsymbol{i}\ in\ FU\ \boldsymbol{j}\ of\ the\ region\ (r)$;

$A_r = passing\ performance\ \boldsymbol{i}\ in\ all\ FUs\ \boldsymbol{j}\ of\ the\ region\ (r)$;

$A_{i,j} = passing\ performance\ \boldsymbol{i}\ \ in\ all\ regions\ (r)$;

$A = \ total\ sum\ of\ performance\ statuses\ \boldsymbol{i}\ in\ Brazil$;

$i = performance\ status\ (passing\ e\ failing)$;

$j = FU$;

$r = geographic\ region$; and

$A = all\ performance\ statuses.$

4.2 Specialization Quotient (SQ)

SQ measures equality/inequality of knowledge ***i*** of region ***r*** with respect to knowledge ***i*** of all regions, as Equation (2) shows. The first term of the sum indicates the participation of knowledge ***i*** of FU ***j*** in region ***r***. the second term informs the participation of knowledge ***i*** in the total of knowledge.

$If\ SQ \to 0, the\ level\ of\ knowledge\ of\ the\ region\ gets\ closer\ to\ the\ general\ level.$

Otherwise,

$If\ SQ \to 1, the\ level\ of\ knowledge\ in\ the\ region\ gets\ distant\ from\ the\ general\ level.$

$$SQ_{i,j,r} = \frac{1}{2}\sum_{i}\left|\frac{E_{i,j,r)}}{E_r} - \frac{E_j}{E}\right| \qquad (2)$$

The quotients produced in Equation (2) create the matrix SQ_{jxr} with $\boldsymbol{j}$ and $\boldsymbol{r}$ varying as follows:

$$\boldsymbol{SQ_{27x5}} = \begin{cases} j = 1,2,3,\ldots,27 \\ r = 1,2,\ldots,5 \end{cases} = \boldsymbol{E_{jr}} \begin{bmatrix} \boldsymbol{E_{11}} & \cdots & \boldsymbol{E_{15}} \\ \vdots & \ddots & \vdots \\ \boldsymbol{E_{271}} & \cdots & \boldsymbol{E_{275}} \end{bmatrix}$$

The signals of spatial concentration of performance measured by the $\boldsymbol{LQ}$ and of level of specialized knowledge measured by $\boldsymbol{SQ}$ go in opposite directions. If the level of $\boldsymbol{LQ}$ is elevated, the level of $\boldsymbol{SQ}$ will be low, and vice versa, to show that a high concentration of performance implies in a high level of specialized knowledge.

4.3 LQ and SQ combination

LQ and SQ combination conveys, by region/FU, the level of spatial concentration of performance and of equality/inequality of specialized knowledge.

The matrix shown in Table 1 represents the indicators of location and specialization for all 27 FUs distributed in all 5 regions.

Table 1: combination of matrixes of location quotients and specialization quotients.

FU (j)	Regions (r)				
	1	2	3	4	5
1	$A_{11};E_{11}$	$A_{12};E_{12}$	$A_{13};E_{13}$	$A_{14};E_{14}$	$A_{15};E_{15}$
2	$A_{21};E_{21}$	$A_{22};E_{22}$	$A_{23};E_{23}$	$A_{24};E_{24}$	$A_{25};E_{25}$
3	$A_{31};E_{31}$	$A_{32};E_{32}$	$A_{33};E_{33}$	$A_{34};E_{34}$	$A_{35};E_{35}$
4	$A_{41};E_{41}$	$A_{42};E_{42}$	$A_{43};E_{43}$	$A_{44};E_{44}$	$A_{45};E_{45}$
...	...	...	...	...	...
...	...	...	...	...	...
27	$A_{271};E_{271}$	$A_{272};E_{272}$	$A_{273};E_{273}$	$A_{274};E_{274}$	$A_{275};E_{275}$

Source: the authors.

A = location quotient; E = specialization quotient.

In brief, without losing the general meaning, both matrixes combined could be represented as follows:

$$Signalizing\ of\ the\ matrixes: \begin{cases} A_{j,r} = \uparrow\downarrow \\ E_{j,r} = \downarrow\uparrow \end{cases};\ or\ if\ A_{j,r}\uparrow, E_{j,r}\downarrow;\ or\ if\ A_{j,r}\downarrow;\ E_{j,r}\uparrow$$

This inverse combination of direction of both matrixes shows that, if there is a concentration of performance, there is a higher level of specialized knowledge, as $\boldsymbol{LQ}$ being closer to one is a higher concentration of performance and $\boldsymbol{SQ}$ being closer to zero is a higher level of knowledge.

5. Description of data and analysis of results

This section presents the data and the results of the first technical qualification exam for forensic

accountants in Brazil. The analysis is performed through descriptive statistics, location quotient and specialization quotient as defined in equations (1) and (2) in the methodology section. The data are shown by number of enrolled candidates, federation unit and region. The exam was composed of two tests: a multiple-choice test and an essay test. The multiple-choice test assessed technical knowledge in specific topics and the essay one assessed the ability to communicate and convey ideas by writing parts of forensic reports. 60% is the passing score, which corresponds to 30 points in each test. APPENDIX 1 lists all candidates by performance.

5.1 Description of data

Tables 2 and 3 show the primary data, by federation unit and region, of the candidates' performance. The data in Table 2 display enrolled candidates' performance in three status: pass, fail and absent, by region and FU. The total number of candidates who enrolled in the exam to become part of the select group of experts was 745, but only 133 of those passed, which corresponds to 17.85% of the total. Among those who enrolled but did not pass, 402 failed the exam and 210 were absent, which corresponds to 53.96% and 28.19%, respectively.

Table 2: Performance status of candidates in the first technical qualification exam to create the national register of forensic accountants in Brazil by region and federation unit in 2017

Region/FU	ENR	PASS	FAIL	ABS	Region/FU	ENR	PASS	FAIL	ABS
Center-West	**86**	**17**	**40**	**29**	**Southeast**	**364**	**58**	**214**	**92**
DF	41	9	18	14	ES	20	3	9	8
GO	22	4	9	9	MG	50	5	28	17
MS	5	2	1	2	RJ	65	9	40	16
MT	18	2	12	4	SP	229	41	137	51
North	**41**	**6**	**18**	**17**	**Northeast**	**100**	**18**	**55**	**27**
AC	2	0	2	0	AL	8	1	6	1
AM	9	1	4	4	BA	21	5	8	8
AP	4	2	0	2	CE	14	2	8	4
PA	18	2	9	7	MA	7	3	3	1
RO	5	1	1	3	PB	5	0	2	3
RR	1	0	1	0	PE	27	4	17	6
TO	2	0	1	1	PI	6	0	5	1
South	**154**	**34**	**75**	**45**	RN	7	3	3	1
RS	52	9	27	16	SE	5	0	3	2
SC	44	11	19	14	**BRAZIL**	**745**	**133**	**402**	**210**
PR	58	14	29	15	**BRAZIL**	**1,00**	**0,1785**	**0,5396**	**0,2819**

Source: own work

ENR=enrolled candidates; **PASS**=passing performance status; **FAIL**=failing performance status; **ABS**=absent; **FU**=federation unit; **Region**=geographical region.

The data in Table 2 show that the Southeast region stands out from other regions with 48.86% (364/745*100) of the total of enrolled candidates. From those, only 15.93% (58/745*100) scored above the minimum required to pass the exam's tests, which corresponds to 43.61% (58/133*100) of the total number of approved candidates. As for the candidates that were not approved, 28.72% (214/745*100) failed and 12.35% (214/745*100) were absent.

Table 3 shows the performance of the approved candidates, by total of candidates, in the multiple-choice and in the essay tests. The small number of approved candidates (17.85%) and the weak performance in both tests suggest the need for a reflection on the efficacy of continuing education programs, considering that these candidates had been approved in the sufficiency exam, which has the purpose of attesting that those graduating in accounting sciences are competent to work as accounting professionals.

Table 3: Performance of passing candidates by test

Performanc e (score)	**Candidates by test**		**Performanc e (score)**	**Candidates by test**	
	Multiple-choice test	**Essay test**		**Multiple-choice test**	**Essay test**
30.0	9	34	36.0	8	4
30.5	0	18	37.0	13	6
31.0	21	11	37.5	0	2
31.5	0	8	38.0	7	3
32.0	19	4	39.0	8	1
32.5	0	5	39.5	0	3
33.0	10	6	40.0	8	3
33.5	0	5	41.0	1	0
34.0	12	8	43.0	1	0
34.5	0	6	45.0	1	0
35.0	13	4	46.0	1	1
35.5	0	1	48.0	1	0

Source: the authors

The data in Table 3 show that the modal performance in the essay test is 30 points, which is the minimum passing score, with a frequency of 34 candidates and which corresponds to 26% (34/133*100) of those approved. In the multiple-choice test, the modal performance is 31 points, with the frequency of 21 candidates, which is 15.79% (21/133*100) of those approved. The comparison of the performances ranging from 30 to 35 in the two tests shows that 82% of the candidates are in this range in the essay test, and 63%, in the multiple-choice test. This poor performance in both tests, but mainly in the essay test, which required writing parts of a forensic report, suggest the need for adequate continuing education programs to improve specialists' technical knowledge.

5.2 Descriptive statistics

Table 4 below shows descriptive statistics estimators by test for the performance of candidates who passed and who failed the exam. The absent candidates have not been considered for this analysis. As has already been stated in the previous section, the minimum score to pass the exam is 30 on a 50 point scale in each test.

Table 4: Descriptive statistics for the performance of the 535 candidates who passed and who failed in the first technical qualification exam to create the national register of forensic accountants in Brazil by region and federation unit in 2017

	Passing candidates scores			Failing candidates scores		
Estimators	**Multiple-choice test**	**Essay test**	**Exam final score**	**Multiple-choice test**	**Essay test**	**Exam final score**
Mean	34.67	32.70	67.38	27.10	3.99	31.10
Median	34	31.5	67	27	0	27
Mode	31	30	65	29	0	29
Standard deviation	3.60	3.06	4.78	5.01	8.42	12.32
Coeffcient of variation	0.10	0.09	0.07	0.18	2.10	0,4
p25	32	30	63.5	24	0	24
p75	37	34.5	70.5	30	0	30
min	30	30	60	11	0	11
max	48	46	80	44	29	66
Observations	133	133	133	402	402	402

Source: the authors

The performance of the approved candidates is between the *min/max* limits of 30 and 48 in the multiple-choice test, 30 and 46 in the essay test, and final score of 60 and 80. In the first quartile (25%), the performance was minimal, considering that the maximum score is 50 points. The scores in the last quartile (>p75) are between 37 and 48 points, in the multiple-choice test, and between 34.5 and 46 points, in the essay test. These limits suggest that the approved candidates need to strive to master the content of continuing education courses to mitigate the deficiencies evidenced by the exam results. For these candidates, the greatest score concentration, assessed by statistical mode, was 31 points in the multiple-choice test, with 21 candidates, 30 points in the essay test, as shown in Table 3.

Considering the candidates that failed, the greatest score concentration (statistical mode) was 29 points in the multiple-choice test and zero in the essay test. These results show that the level of knowledge and technical capacity of most of the candidates in the market is insufficient to meet professional working requirements.

The score spread presents minimal dispersion, as shown by the coefficient of variation. This score cohesion in each test with their respective mean is leveled down because of the poor performance of the candidates.

5.3 Spatial concentration of performance in the exam by region and federation unit

Table 5 below shows the concentration of passing and failing performances, by region and FU,

measured by the *Location Quotient (LQ)*, as modeled by Equation (1), demonstrated in the methodology section.

The model typifies a QL >1 as suggesting that the region or the **FU** has greater performance concentration.

Considering the passing performance, the South region, with an LQ=1.2547, presents greater concentration of passing candidates than the other regions, followed by the Center-West and North regions. The FUs with higher performance concentration are DF and SP. These results are in accordance with Haddad (1997).

Regarding the failing performance, the region with higher concentration is the Southeast, followed by the Northeast, and the FU with higher concentration is SP, followed by PA.

However, the number of enrolled candidates needs to be considered in order to understand fully the region/FU performance status with a QL showing greater or smaller concentration. For example, the **FU** PA had 18 enrolled candidates, while DF and SP had 41 and 229, respectively.

Table 5: Location Quotient (LQ) of the performance of regions/FUs

REGION/FU	LQpass	LQfail	REGION/FU	LQpass	LQfail
Center-West	**1,1997**	**0,9339**	**Southeast**	**0,8578**	**1,0471**
DF	0,6351	0,4203	ES	0,0444	0,0440
GO	0,2823	0,2101	MG	0,0739	0,1370
MS	0,1411	0,0233	RJ	0,1331	0,1957
MT	0,1411	0,2802	SP	0,6063	0,6703
North	**1,0056**	**0,9981**	**Northeast**	**0,9919**	**1,0027**
AC	-	0,1109	AL	0,0551	0,1094
AM	0,1676	0,2218	BA	0,2755	0,1458
AP	0,3352	-	CE	0,1102	0,1458
PA	0,3352	0,4991	MA	0,1653	0,0547
RO	0,1676	0,0555	PB	-	0,0365
RR	-	0,0555	PE	0,2204	0,3099
TO	-	0,0555	PI	-	0,0912
South	**1,2547**	**0,9157**	RN	0,1653	0,0547
RS	0,3321	0,3297	SE	-	0,0547
SC	0,4059	0,2320	**BRAZIL**	0,2486	0,7514
PR	0,5167	0,3541			

Source: the author.

LQpass=passing performance location quotient; **LQfail**=failing performance location quotient; **FU**=federation unit; **Region**=geographical region.

The results in Table 5 also show that in 6 of the 27 FUs (22.2%) no candidate passed the exam, and that in 3 FUs (11.1%) the passing performance is smaller than 0.06, which is a low performance concentration.

5.4 Level of specialized knowledge by region/FU

Table 6 below shows the level of knowledge in forensic accounting measured by the specialization quotient (***CS***), by region and FU, for the passing and failing performance statuses. The coefficient, as defined by the model demonstrated in Equation (2), typifies that ***CS*** tending to 1 (CS→1) conveys that the level of knowledge is farther from the region mean; when ***CS*** tends to zero (CS→0), the interpretation is the opposite, i.e., the level of knowledge is closer to that of the region.

Confirming the model, with respect to the passing performance status, the **FU** that is closer to the regional mean is DF, followed by SP, both with ***CS*** below 0.05. In relation to the geographical regions, those showing levels of knowledge closer to this mean are the South and the Center-West, with ***CS*** 0.2169 and 0.3481, respectively. These results confirm Haddad (1977). Regarding the failing performance status, the region and the **FU** that are farther from the mean are the Northeast, with ***CS > 3***, and MS, with ***CS 0.3669***.

Table 6: Specialization quotient by region and FU for passing and failing performances

REGION/FU	CSpass	CSfail	REGION/FU	CSpass	CSfail
Center-West	**0,3481**	**1,1519**	**Southeast**	**0,3906**	**1,1094**
DF	0,0454	0,2178	ES	0,1188	0,3592
GO	0,0892	0,2968	MG	0,1151	0,3242
MS	0,1068	0,3669	RJ	0,1078	0,3022
MT	0,1068	0,2704	SP	0,0489	0,1239
North	**0,7451**	**2,2549**	**Northeast**	**0,9954**	**3,0046**
AC	0,1243	0,3340	AL	0,1174	0,3346
AM	0,1035	0,2924	BA	0,0901	0,3209
AP	0,0826	0,3757	CE	0,1106	0,3209
PA	0,0826	0,1882	MA	0,1038	0,3552
RO	0,1035	0,3549	PB	0,1243	0,3620
RR	0,1243	0,3549	PE	0,0969	0,2593
TO	0,1243	0,3549	PI	0,1243	0,3415
South	**0,2169**	**0,7831**	RN	0,1038	0,3552
RS	0,0830	0,2518	SE	0,1243	0,3552
SC	0,0738	0,2885	**BRAZIL**	**0,1243**	**0,3757**
PR	0,0601	0,2427			

Source: the authors.

CSpass= passing performance specialization quotient; **CSfail**= failing performance specialization quotient; **FU**=federation unit; **Region**=geographical region.

The results displayed in Table 6 support, conclusively, that the FUs with lower inequality in level of knowledge, considering passing and failing performance statuses, are still far from the regional mean and, therefore, still far from zero. However, it is possible to reason that this inequality is also a result of the high proportion of absent candidates, as shown in Table 1.

5.5 Spatial concentration of performance and specialization by region and FU

Table 7 compares the levels of performance and specialization concentration, as measured by ***LQ*** and ***CS***, respectively. The data used in this comparison were sourced from Tables 4 and 5 above.

The horizontal comparison of these data reveal that the performance concentration moves in the opposite direction to the level of specialized knowledge. Thus, a high ***LQpass*** affects a low ***CSpass*** or a high ***LQfail*** affects a low ***CSfail*** and vice versa. However, the direction of this move was expected because a high concentration of performance conveys a high level of knowledge, as defined in subsection 4.2 above.

Table 7: Comparative demonstration of performance concentration with the level of specialized knowledge

REGION/FU	LQpass	LQfail	CSpass	CSfail	REGION/FU	LQpass	LQfail	CSpass	CSfail
Center-West	**1,200**	**0,934**	**0,348**	**1,152**	**Southeast**	**0,858**	**1,047**	**0,391**	**1,109**
DF	0,635	0,420	0,045	0,218	ES	0,044	0,044	0,119	0,359
GO	0,282	0,210	0,089	0,297	MG	0,074	0,137	0,115	0,324
MS	0,141	0,023	0,107	0,367	RJ	0,133	0,196	0,108	0,302
MT	0,141	0,280	0,107	0,270	SP	0,606	0,670	0,049	0,124
North	**1,006**	**0,887**	**0,745**	**2,255**	**Northeast**	**0,992**	**1,003**	**0,995**	**3,005**
AC	-	0,111	0,124	0,334	AL	0,055	0,109	0,117	0,335
AM	0,168	0,222	0,103	0,292	BA	0,276	0,146	0,090	0,321
AP	0,335	-	0,083	0,376	CE	0,110	0,146	0,111	0,321
PA	0,335	0,499	0,083	0,188	MA	0,165	0,055	0,104	0,355
RO	0,168	0,055	0,103	0,355	PB	-	0,036	0,124	0,362
RR	-	0,055	0,124	0,355	PE	0,220	0,310	0,097	0,259
TO	-	0,055	0,124	0,355	PI	-	0,091	0,124	0,341
South	**1,255**	**0,916**	**0,217**	**0,783**	RN	0,165	0,055	0,104	0,355
RS	0,332	0,330	0,083	0,252	SE	-	0,055	0,124	0,355
SC	0,406	0,232	0,074	0,289	**BRAZIL**	**0,249**	**0,751**	**0,124**	**0,376**
PR	0,517	0,354	0,060	0,243					

Source: the authors.

LQpass=passing performance location quotient; **LQfail**=failing performance location quotient; **CSpass**= passing performance specialization quotient; **CSfail**= failing performance specialization quotient; **FU**=federation unit; **Region**=geographical region

In summary, the performance concentration index measured by ***LQ*** and the level of knowledge index measured by ***SQ*** are inversely complementary and this confirms these indexes' theory that dictates that the higher the performance concentration, the higher the level of specialized knowledge.

In this context, the evidence obtained by applying the model shows that the South region has the highest concentration of performance and simultaneously the highest level in specialized knowledge. The ***FU*** that presents both these attributes is ***DF***. At first, these results contradict the expectations of this research because the Southeast ***region*** and the ***FU*** SP are the most developed ones in Brazil and, therefore, this ***region*** and this ***FU*** were expected to have the highest concentration of performance and the highest level of specialization, nevertheless the results are in accordance with Glaeser (1999).

6. Conclusion

This article presented the results of the research on the first technical qualification exam for the creation of the National Register of Forensic Accountants (NRFA or CNPC, acronym in acronym in Portuguese) conducted by the Brazilian Federal Council of Accounting (BFCA or CFC, acronym in Portuguese) in 2017. These results were drawn based on the performance of candidates that answered multiple-choice and essay questions in the exam. The research problem requires identifying, by ***region*** and ***FU***, levels of spatial concentration of performance and of specialized knowledge. The main evidences revealed by the research are summarized below:

(a) from the total of enrolled candidates, 28.19% were absent from the exam; the score of 53.96% was lower than the minimum required for approval in one or in both tests; and only 17.85% were approved in the exam by obtaining the minimum passing score; in 6 of the 27 FUs (22.2%) no one was approved; and in 3 (11.1%) the performance concentration of the approved candidates was lower than 0.10, which suggests the need for special attention to the syllabus of continuing education programs;

(b) the South region has the greatest concentration of the passing performance status with an ***LQ*** >1.2 and is also the most specialized with a level of knowledge of 0.22, in which it is followed by the Center-West and Southeast regions, with 0.35 and 0.39, respectively;

(c) the North region presents the lowest loss of performance with an ***LQ*** of 0.89, and the South region presents the lowest level of knowledge inequality with a ***SQ*** of 0.78;

(d) the spatial concentration of the level of knowledge measured by ***LQ*** and the specialized knowledge measured by ***SQ*** act as inversely complementary given that a high ***LQ*** implies a low ***SQ***, as dictated by the theory. This behavior conveys that high performance corresponds to a high level of knowledge;

(e) the candidates' performance in the essay test was 19% worse than that of the multiple-choice test. The score 30 in the essay test was the most frequent, occurring 34 times; in the multiple-choice test, the score 31 occurred 21 times and was the most frequent.

(f) in addition to the important conclusion that the performance in the exam was low, in a point scale from 0 to 50, with 30 as the minimum passing grade in each of the tests, multiple-choice and essay, most approved candidates had the lowest passing scores in both tests.

The findings of this research are robust and call to a reflection on the effectiveness of continuing education and on the comprehensiveness of the sufficiency exam given the low degree of approval in the qualification exam. On the other hand, the findings are bound to stimulate further research on the level of knowledge of accountants in other specialties required by the BFCA to offer qualified services to society. However, it must also be considered that the data comprise a single exam and therefore the results are isolated and must not be generalized.

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Appendix

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
1	35,00	30,00	65,00	SUCCESSFUL
2	38,00	34,00	72,00	SUCCESSFUL
3	32,00	34,50	66,50	SUCCESSFUL
4	31,00	30,00	61,00	SUCCESSFUL
5	34,00	46,00	80,00	SUCCESSFUL
6	33,00	30,50	63,50	SUCCESSFUL
7	37,00	40,00	77,00	SUCCESSFUL
8	40,00	30,00	70,00	SUCCESSFUL
9	40,00	30,50	70,50	SUCCESSFUL
10	35,00	31,50	66,50	SUCCESSFUL
11	33,00	30,50	63,50	SUCCESSFUL
12	37,00	30,00	67,00	SUCCESSFUL
13	30,00	31,00	61,00	SUCCESSFUL
14	37,00	31,00	68,00	SUCCESSFUL
15	30,00	34,00	64,00	SUCCESSFUL
16	40,00	30,00	70,00	SUCCESSFUL
17	35,00	31,50	66,50	SUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
18	32,00	36,50	68,50	SUCCESSFUL
19	35,00	35,00	70,00	SUCCESSFUL
20	30,00	30,00	60,00	SUCCESSFUL
21	30,00	30,00	60,00	SUCCESSFUL
22	33,00	30,00	63,00	SUCCESSFUL
23	37,00	30,50	67,50	SUCCESSFUL
24	31,00	30,50	61,50	SUCCESSFUL
25	35,00	33,00	68,00	SUCCESSFUL
26	36,00	33,50	69,50	SUCCESSFUL
27	34,00	36,50	70,50	SUCCESSFUL
28	48,00	30,00	78,00	SUCCESSFUL
29	37,00	33,00	70,00	SUCCESSFUL
30	31,00	37,50	68,50	SUCCESSFUL
31	31,00	32,50	63,50	SUCCESSFUL
32	31,00	32,50	63,50	SUCCESSFUL
33	40,00	31,50	71,50	SUCCESSFUL
34	31,00	30,50	61,50	SUCCESSFUL
35	38,00	35,00	73,00	SUCCESSFUL
36	39,00	33,00	72,00	SUCCESSFUL
37	32,00	31,50	63,50	SUCCESSFUL
38	31,00	31,00	62,00	SUCCESSFUL
39	39,00	31,50	70,50	SUCCESSFUL
40	37,00	30,00	67,00	SUCCESSFUL
41	33,00	34,50	67,50	SUCCESSFUL
42	35,00	30,00	65,00	SUCCESSFUL
43	34,00	37,00	71,00	SUCCESSFUL
44	40,00	30,50	70,50	SUCCESSFUL
45	31,00	39,00	70,00	SUCCESSFUL
46	34,00	30,00	64,00	SUCCESSFUL
47	38,00	38,00	76,00	SUCCESSFUL
48	35,00	31,00	66,00	SUCCESSFUL
49	30,00	30,00	60,00	SUCCESSFUL
50	36,00	40,00	76,00	SUCCESSFUL
51	32,00	30,00	62,00	SUCCESSFUL
52	41,00	30,50	71,50	SUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
53	45,00	30,50	75,50	SUCCESSFUL
54	46,00	31,50	77,50	SUCCESSFUL
55	39,00	31,50	70,50	SUCCESSFUL
56	32,00	39,50	71,50	SUCCESSFUL
57	30,00	34,00	64,00	SUCCESSFUL
58	33,00	31,00	64,00	SUCCESSFUL
59	32,00	31,50	63,50	SUCCESSFUL
60	39,00	37,00	76,00	SUCCESSFUL
61	36,00	32,50	68,50	SUCCESSFUL
62	37,00	36,00	73,00	SUCCESSFUL
63	32,00	32,00	64,00	SUCCESSFUL
64	37,00	33,50	70,50	SUCCESSFUL
65	34,00	30,00	64,00	SUCCESSFUL
66	30,00	30,00	60,00	SUCCESSFUL
67	35,00	30,00	65,00	SUCCESSFUL
68	35,00	34,00	69,00	SUCCESSFUL
69	31,00	30,00	61,00	SUCCESSFUL
70	36,00	40,00	76,00	SUCCESSFUL
71	32,00	30,00	62,00	SUCCESSFUL
72	32,00	35,50	67,50	SUCCESSFUL
73	34,00	32,00	66,00	SUCCESSFUL
74	33,00	35,00	68,00	SUCCESSFUL
75	33,00	30,00	63,00	SUCCESSFUL
76	30,00	36,50	66,50	SUCCESSFUL
77	32,00	30,50	62,50	SUCCESSFUL
78	38,00	34,50	72,50	SUCCESSFUL
79	30,00	30,50	60,50	SUCCESSFUL
80	39,00	37,00	76,00	SUCCESSFUL
81	34,00	30,50	64,50	SUCCESSFUL
82	37,00	30,00	67,00	SUCCESSFUL
83	32,00	31,00	63,00	SUCCESSFUL
84	32,00	39,50	71,50	SUCCESSFUL
85	31,00	30,00	61,00	SUCCESSFUL
86	31,00	31,00	62,00	SUCCESSFUL
87	31,00	34,00	65,00	SUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
88	39,00	33,50	72,50	SUCCESSFUL
89	31,00	36,00	67,00	SUCCESSFUL
90	33,00	30,00	63,00	SUCCESSFUL
91	32,00	33,00	65,00	SUCCESSFUL
92	37,00	30,00	67,00	SUCCESSFUL
93	39,00	32,50	71,50	SUCCESSFUL
94	35,00	30,00	65,00	SUCCESSFUL
95	40,00	33,50	73,50	SUCCESSFUL
96	37,00	34,50	71,50	SUCCESSFUL
97	31,00	30,00	61,00	SUCCESSFUL
98	31,00	32,00	63,00	SUCCESSFUL
99	36,00	32,50	68,50	SUCCESSFUL
100	32,00	34,00	66,00	SUCCESSFUL
101	38,00	30,00	68,00	SUCCESSFUL
102	32,00	33,00	65,00	SUCCESSFUL
103	37,00	35,00	72,00	SUCCESSFUL
104	36,00	31,00	67,00	SUCCESSFUL
105	37,00	30,00	67,00	SUCCESSFUL
106	36,00	37,50	73,50	SUCCESSFUL
107	34,00	30,50	64,50	SUCCESSFUL
108	34,00	34,00	68,00	SUCCESSFUL
109	31,00	30,50	61,50	SUCCESSFUL
110	31,00	30,00	61,00	SUCCESSFUL
111	31,00	34,50	65,50	SUCCESSFUL
112	32,00	39,50	71,50	SUCCESSFUL
113	34,00	30,50	64,50	SUCCESSFUL
114	34,00	38,00	72,00	SUCCESSFUL
115	32,00	34,00	66,00	SUCCESSFUL
116	32,00	32,00	64,00	SUCCESSFUL
117	35,00	30,00	65,00	SUCCESSFUL
118	36,00	34,50	70,50	SUCCESSFUL
119	33,00	30,00	63,00	SUCCESSFUL
120	38,00	36,00	74,00	SUCCESSFUL
121	31,00	31,00	62,00	SUCCESSFUL
122	39,00	31,00	70,00	SUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
123	31,00	30,00	61,00	SUCCESSFUL
124	40,00	30,50	70,50	SUCCESSFUL
125	35,00	30,00	65,00	SUCCESSFUL
126	40,00	38,00	78,00	SUCCESSFUL
127	33,00	33,00	66,00	SUCCESSFUL
128	34,00	30,00	64,00	SUCCESSFUL
129	31,00	31,00	62,00	SUCCESSFUL
130	43,00	36,00	79,00	SUCCESSFUL
131	35,00	30,50	65,50	SUCCESSFUL
132	38,00	33,50	71,50	SUCCESSFUL
133	32,00	30,50	62,50	SUCCESSFUL
134	0,00	0,00	0,00	ABSENT
135	0,00	0,00	0,00	ABSENT
136	0,00	0,00	0,00	ABSENT
137	0,00	0,00	0,00	ABSENT
138	0,00	0,00	0,00	ABSENT
139	0,00	0,00	0,00	ABSENT
140	0,00	0,00	0,00	ABSENT
141	0,00	0,00	0,00	ABSENT
142	0,00	0,00	0,00	ABSENT
143	0,00	0,00	0,00	ABSENT
144	0,00	0,00	0,00	ABSENT
145	0,00	0,00	0,00	ABSENT
146	0,00	0,00	0,00	ABSENT
147	0,00	0,00	0,00	ABSENT
148	0,00	0,00	0,00	ABSENT
149	0,00	0,00	0,00	ABSENT
150	0,00	0,00	0,00	ABSENT
151	0,00	0,00	0,00	ABSENT
152	0,00	0,00	0,00	ABSENT
153	0,00	0,00	0,00	ABSENT
154	0,00	0,00	0,00	ABSENT
155	0,00	0,00	0,00	ABSENT
156	0,00	0,00	0,00	ABSENT
157	0,00	0,00	0,00	ABSENT

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
158	0,00	0,00	0,00	ABSENT
159	0,00	0,00	0,00	ABSENT
160	0,00	0,00	0,00	ABSENT
161	0,00	0,00	0,00	ABSENT
162	0,00	0,00	0,00	ABSENT
163	0,00	0,00	0,00	ABSENT
164	0,00	0,00	0,00	ABSENT
165	0,00	0,00	0,00	ABSENT
166	0,00	0,00	0,00	ABSENT
167	0,00	0,00	0,00	ABSENT
168	0,00	0,00	0,00	ABSENT
169	0,00	0,00	0,00	ABSENT
170	0,00	0,00	0,00	ABSENT
171	0,00	0,00	0,00	ABSENT
172	0,00	0,00	0,00	ABSENT
173	0,00	0,00	0,00	ABSENT
174	0,00	0,00	0,00	ABSENT
175	0,00	0,00	0,00	ABSENT
176	0,00	0,00	0,00	ABSENT
177	0,00	0,00	0,00	ABSENT
178	0,00	0,00	0,00	ABSENT
179	0,00	0,00	0,00	ABSENT
180	0,00	0,00	0,00	ABSENT
181	0,00	0,00	0,00	ABSENT
182	0,00	0,00	0,00	ABSENT
183	0,00	0,00	0,00	ABSENT
184	0,00	0,00	0,00	ABSENT
185	0,00	0,00	0,00	ABSENT
186	0,00	0,00	0,00	ABSENT
187	0,00	0,00	0,00	ABSENT
188	0,00	0,00	0,00	ABSENT
189	0,00	0,00	0,00	ABSENT
190	0,00	0,00	0,00	ABSENT
191	0,00	0,00	0,00	ABSENT
192	0,00	0,00	0,00	ABSENT

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
193	0,00	0,00	0,00	ABSENT
194	0,00	0,00	0,00	ABSENT
195	0,00	0,00	0,00	ABSENT
196	0,00	0,00	0,00	ABSENT
197	0,00	0,00	0,00	ABSENT
198	0,00	0,00	0,00	ABSENT
199	0,00	0,00	0,00	ABSENT
200	0,00	0,00	0,00	ABSENT
201	0,00	0,00	0,00	ABSENT
202	0,00	0,00	0,00	ABSENT
203	0,00	0,00	0,00	ABSENT
204	0,00	0,00	0,00	ABSENT
205	0,00	0,00	0,00	ABSENT
206	0,00	0,00	0,00	ABSENT
207	0,00	0,00	0,00	ABSENT
208	0,00	0,00	0,00	ABSENT
209	0,00	0,00	0,00	ABSENT
210	0,00	0,00	0,00	ABSENT
211	0,00	0,00	0,00	ABSENT
212	0,00	0,00	0,00	ABSENT
213	0,00	0,00	0,00	ABSENT
214	0,00	0,00	0,00	ABSENT
215	0,00	0,00	0,00	ABSENT
216	0,00	0,00	0,00	ABSENT
217	0,00	0,00	0,00	ABSENT
218	0,00	0,00	0,00	ABSENT
219	0,00	0,00	0,00	ABSENT
220	0,00	0,00	0,00	ABSENT
221	0,00	0,00	0,00	ABSENT
222	0,00	0,00	0,00	ABSENT
223	0,00	0,00	0,00	ABSENT
224	0,00	0,00	0,00	ABSENT
225	0,00	0,00	0,00	ABSENT
226	0,00	0,00	0,00	ABSENT
227	0,00	0,00	0,00	ABSENT

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
228	0,00	0,00	0,00	ABSENT
229	0,00	0,00	0,00	ABSENT
230	0,00	0,00	0,00	ABSENT
231	0,00	0,00	0,00	ABSENT
232	0,00	0,00	0,00	ABSENT
233	0,00	0,00	0,00	ABSENT
234	0,00	0,00	0,00	ABSENT
235	0,00	0,00	0,00	ABSENT
236	0,00	0,00	0,00	ABSENT
237	0,00	0,00	0,00	ABSENT
238	0,00	0,00	0,00	ABSENT
239	0,00	0,00	0,00	ABSENT
240	0,00	0,00	0,00	ABSENT
241	0,00	0,00	0,00	ABSENT
242	0,00	0,00	0,00	ABSENT
243	0,00	0,00	0,00	ABSENT
244	0,00	0,00	0,00	ABSENT
245	0,00	0,00	0,00	ABSENT
246	0,00	0,00	0,00	ABSENT
247	0,00	0,00	0,00	ABSENT
248	0,00	0,00	0,00	ABSENT
249	0,00	0,00	0,00	ABSENT
250	0,00	0,00	0,00	ABSENT
251	0,00	0,00	0,00	ABSENT
252	0,00	0,00	0,00	ABSENT
253	0,00	0,00	0,00	ABSENT
254	0,00	0,00	0,00	ABSENT
255	0,00	0,00	0,00	ABSENT
256	0,00	0,00	0,00	ABSENT
257	0,00	0,00	0,00	ABSENT
258	0,00	0,00	0,00	ABSENT
259	0,00	0,00	0,00	ABSENT
260	0,00	0,00	0,00	ABSENT
261	0,00	0,00	0,00	ABSENT
262	0,00	0,00	0,00	ABSENT

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
263	0,00	0,00	0,00	ABSENT
264	0,00	0,00	0,00	ABSENT
265	0,00	0,00	0,00	ABSENT
266	0,00	0,00	0,00	ABSENT
267	0,00	0,00	0,00	ABSENT
268	0,00	0,00	0,00	ABSENT
269	0,00	0,00	0,00	ABSENT
270	0,00	0,00	0,00	ABSENT
271	0,00	0,00	0,00	ABSENT
272	0,00	0,00	0,00	ABSENT
273	0,00	0,00	0,00	ABSENT
274	0,00	0,00	0,00	ABSENT
275	0,00	0,00	0,00	ABSENT
276	0,00	0,00	0,00	ABSENT
277	0,00	0,00	0,00	ABSENT
278	0,00	0,00	0,00	ABSENT
279	0,00	0,00	0,00	ABSENT
280	0,00	0,00	0,00	ABSENT
281	0,00	0,00	0,00	ABSENT
282	0,00	0,00	0,00	ABSENT
283	0,00	0,00	0,00	ABSENT
284	0,00	0,00	0,00	ABSENT
285	0,00	0,00	0,00	ABSENT
286	0,00	0,00	0,00	ABSENT
287	0,00	0,00	0,00	ABSENT
288	0,00	0,00	0,00	ABSENT
289	0,00	0,00	0,00	ABSENT
290	0,00	0,00	0,00	ABSENT
291	0,00	0,00	0,00	ABSENT
292	0,00	0,00	0,00	ABSENT
293	0,00	0,00	0,00	ABSENT
294	0,00	0,00	0,00	ABSENT
295	0,00	0,00	0,00	ABSENT
296	0,00	0,00	0,00	ABSENT
297	0,00	0,00	0,00	ABSENT

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
298	0,00	0,00	0,00	ABSENT
299	0,00	0,00	0,00	ABSENT
300	0,00	0,00	0,00	ABSENT
301	0,00	0,00	0,00	ABSENT
302	0,00	0,00	0,00	ABSENT
303	0,00	0,00	0,00	ABSENT
304	0,00	0,00	0,00	ABSENT
305	0,00	0,00	0,00	ABSENT
306	0,00	0,00	0,00	ABSENT
307	0,00	0,00	0,00	ABSENT
308	0,00	0,00	0,00	ABSENT
309	0,00	0,00	0,00	ABSENT
310	0,00	0,00	0,00	ABSENT
311	0,00	0,00	0,00	ABSENT
312	0,00	0,00	0,00	ABSENT
313	0,00	0,00	0,00	ABSENT
314	0,00	0,00	0,00	ABSENT
315	0,00	0,00	0,00	ABSENT
316	0,00	0,00	0,00	ABSENT
317	0,00	0,00	0,00	ABSENT
318	0,00	0,00	0,00	ABSENT
319	0,00	0,00	0,00	ABSENT
320	0,00	0,00	0,00	ABSENT
321	0,00	0,00	0,00	ABSENT
322	0,00	0,00	0,00	ABSENT
323	0,00	0,00	0,00	ABSENT
324	0,00	0,00	0,00	ABSENT
325	0,00	0,00	0,00	ABSENT
326	0,00	0,00	0,00	ABSENT
327	0,00	0,00	0,00	ABSENT
328	0,00	0,00	0,00	ABSENT
329	0,00	0,00	0,00	ABSENT
330	0,00	0,00	0,00	ABSENT
331	0,00	0,00	0,00	ABSENT
332	0,00	0,00	0,00	ABSENT

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
333	0,00	0,00	0,00	ABSENT
334	0,00	0,00	0,00	ABSENT
335	0,00	0,00	0,00	ABSENT
336	0,00	0,00	0,00	ABSENT
337	0,00	0,00	0,00	ABSENT
338	0,00	0,00	0,00	ABSENT
339	0,00	0,00	0,00	ABSENT
340	0,00	0,00	0,00	ABSENT
341	0,00	0,00	0,00	ABSENT
342	0,00	0,00	0,00	ABSENT
343	0,00	0,00	0,00	ABSENT
344	34,00	25,50	59,50	UNSUCCESSFUL
345	25,00	0,00	25,00	UNSUCCESSFUL
346	25,00	0,00	25,00	UNSUCCESSFUL
347	17,00	0,00	17,00	UNSUCCESSFUL
348	31,00	18,00	49,00	UNSUCCESSFUL
349	25,00	0,00	25,00	UNSUCCESSFUL
350	25,00	0,00	25,00	UNSUCCESSFUL
351	25,00	0,00	25,00	UNSUCCESSFUL
352	29,00	0,00	29,00	UNSUCCESSFUL
353	31,00	0,00	31,00	UNSUCCESSFUL
354	34,00	22,00	56,00	UNSUCCESSFUL
355	33,00	25,50	58,50	UNSUCCESSFUL
356	15,00	0,00	15,00	UNSUCCESSFUL
357	30,00	0,00	30,00	UNSUCCESSFUL
358	31,00	0,00	31,00	UNSUCCESSFUL
359	30,00	20,50	50,50	UNSUCCESSFUL
360	31,00	4,00	35,00	UNSUCCESSFUL
361	24,00	0,00	24,00	UNSUCCESSFUL
362	28,00	0,00	28,00	UNSUCCESSFUL
363	20,00	0,00	20,00	UNSUCCESSFUL
364	24,00	0,00	24,00	UNSUCCESSFUL
365	24,00	0,00	24,00	UNSUCCESSFUL
366	27,00	0,00	27,00	UNSUCCESSFUL
367	27,00	0,00	27,00	UNSUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
368	23,00	0,00	23,00	UNSUCCESSFUL
369	20,00	0,00	20,00	UNSUCCESSFUL
370	41,00	21,00	62,00	UNSUCCESSFUL
371	28,00	0,00	28,00	UNSUCCESSFUL
372	18,00	0,00	18,00	UNSUCCESSFUL
373	31,00	13,50	44,50	UNSUCCESSFUL
374	30,00	0,00	30,00	UNSUCCESSFUL
375	28,00	0,00	28,00	UNSUCCESSFUL
376	23,00	0,00	23,00	UNSUCCESSFUL
377	27,00	0,00	27,00	UNSUCCESSFUL
378	28,00	0,00	28,00	UNSUCCESSFUL
379	22,00	0,00	22,00	UNSUCCESSFUL
380	27,00	0,00	27,00	UNSUCCESSFUL
381	27,00	0,00	27,00	UNSUCCESSFUL
382	24,00	0,00	24,00	UNSUCCESSFUL
383	22,00	0,00	22,00	UNSUCCESSFUL
384	16,00	0,00	16,00	UNSUCCESSFUL
385	30,00	0,00	30,00	UNSUCCESSFUL
386	27,00	0,00	27,00	UNSUCCESSFUL
387	29,00	0,00	29,00	UNSUCCESSFUL
388	28,00	0,00	28,00	UNSUCCESSFUL
389	28,00	0,00	28,00	UNSUCCESSFUL
390	23,00	0,00	23,00	UNSUCCESSFUL
391	23,00	0,00	23,00	UNSUCCESSFUL
392	26,00	0,00	26,00	UNSUCCESSFUL
393	28,00	0,00	28,00	UNSUCCESSFUL
394	33,00	9,00	42,00	UNSUCCESSFUL
395	30,00	0,00	30,00	UNSUCCESSFUL
396	15,00	0,00	15,00	UNSUCCESSFUL
397	24,00	0,00	24,00	UNSUCCESSFUL
398	31,00	25,00	56,00	UNSUCCESSFUL
399	24,00	0,00	24,00	UNSUCCESSFUL
400	26,00	0,00	26,00	UNSUCCESSFUL
401	31,00	22,50	53,50	UNSUCCESSFUL
402	27,00	0,00	27,00	UNSUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
403	24,00	0,00	24,00	UNSUCCESSFUL
404	29,00	0,00	29,00	UNSUCCESSFUL
405	29,00	0,00	29,00	UNSUCCESSFUL
406	23,00	0,00	23,00	UNSUCCESSFUL
407	26,00	0,00	26,00	UNSUCCESSFUL
408	23,00	0,00	23,00	UNSUCCESSFUL
409	24,00	0,00	24,00	UNSUCCESSFUL
410	26,00	0,00	26,00	UNSUCCESSFUL
411	21,00	0,00	21,00	UNSUCCESSFUL
412	24,00	0,00	24,00	UNSUCCESSFUL
413	30,00	0,00	30,00	UNSUCCESSFUL
414	16,00	0,00	16,00	UNSUCCESSFUL
415	28,00	0,00	28,00	UNSUCCESSFUL
416	24,00	0,00	24,00	UNSUCCESSFUL
417	34,00	28,50	62,50	UNSUCCESSFUL
418	24,00	0,00	24,00	UNSUCCESSFUL
419	29,00	0,00	29,00	UNSUCCESSFUL
420	29,00	0,00	29,00	UNSUCCESSFUL
421	26,00	0,00	26,00	UNSUCCESSFUL
422	27,00	0,00	27,00	UNSUCCESSFUL
423	30,00	0,00	30,00	UNSUCCESSFUL
424	40,00	16,00	56,00	UNSUCCESSFUL
425	27,00	0,00	27,00	UNSUCCESSFUL
426	22,00	0,00	22,00	UNSUCCESSFUL
427	24,00	0,00	24,00	UNSUCCESSFUL
428	29,00	0,00	29,00	UNSUCCESSFUL
429	27,00	0,00	27,00	UNSUCCESSFUL
430	27,00	0,00	27,00	UNSUCCESSFUL
431	29,00	0,00	29,00	UNSUCCESSFUL
432	27,00	0,00	27,00	UNSUCCESSFUL
433	32,00	23,50	55,50	UNSUCCESSFUL
434	25,00	0,00	25,00	UNSUCCESSFUL
435	16,00	0,00	16,00	UNSUCCESSFUL
436	27,00	0,00	27,00	UNSUCCESSFUL
437	27,00	0,00	27,00	UNSUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
438	30,00	18,00	48,00	UNSUCCESSFUL
439	26,00	0,00	26,00	UNSUCCESSFUL
440	20,00	0,00	20,00	UNSUCCESSFUL
441	25,00	0,00	25,00	UNSUCCESSFUL
442	25,00	0,00	25,00	UNSUCCESSFUL
443	22,00	0,00	22,00	UNSUCCESSFUL
444	28,00	0,00	28,00	UNSUCCESSFUL
445	24,00	0,00	24,00	UNSUCCESSFUL
446	32,00	22,00	54,00	UNSUCCESSFUL
447	29,00	0,00	29,00	UNSUCCESSFUL
448	11,00	0,00	11,00	UNSUCCESSFUL
449	28,00	0,00	28,00	UNSUCCESSFUL
450	27,00	0,00	27,00	UNSUCCESSFUL
451	24,00	0,00	24,00	UNSUCCESSFUL
452	30,00	0,00	30,00	UNSUCCESSFUL
453	27,00	0,00	27,00	UNSUCCESSFUL
454	40,00	18,00	58,00	UNSUCCESSFUL
455	29,00	0,00	29,00	UNSUCCESSFUL
456	27,00	0,00	27,00	UNSUCCESSFUL
457	22,00	0,00	22,00	UNSUCCESSFUL
458	26,00	0,00	26,00	UNSUCCESSFUL
459	29,00	0,00	29,00	UNSUCCESSFUL
460	24,00	0,00	24,00	UNSUCCESSFUL
461	27,00	0,00	27,00	UNSUCCESSFUL
462	29,00	0,00	29,00	UNSUCCESSFUL
463	34,00	14,50	48,50	UNSUCCESSFUL
464	24,00	0,00	24,00	UNSUCCESSFUL
465	29,00	0,00	29,00	UNSUCCESSFUL
466	25,00	0,00	25,00	UNSUCCESSFUL
467	21,00	0,00	21,00	UNSUCCESSFUL
468	25,00	0,00	25,00	UNSUCCESSFUL
469	39,00	23,00	62,00	UNSUCCESSFUL
470	37,00	29,00	66,00	UNSUCCESSFUL
471	26,00	0,00	26,00	UNSUCCESSFUL
472	28,00	0,00	28,00	UNSUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
473	26,00	0,00	26,00	UNSUCCESSFUL
474	34,00	25,50	59,50	UNSUCCESSFUL
475	30,00	0,00	30,00	UNSUCCESSFUL
476	33,00	20,00	53,00	UNSUCCESSFUL
477	26,00	0,00	26,00	UNSUCCESSFUL
478	23,00	0,00	23,00	UNSUCCESSFUL
479	26,00	0,00	26,00	UNSUCCESSFUL
480	30,00	0,00	30,00	UNSUCCESSFUL
481	29,00	0,00	29,00	UNSUCCESSFUL
482	32,00	26,00	58,00	UNSUCCESSFUL
483	40,00	24,50	64,50	UNSUCCESSFUL
484	37,00	26,50	63,50	UNSUCCESSFUL
485	37,00	15,50	52,50	UNSUCCESSFUL
486	27,00	0,00	27,00	UNSUCCESSFUL
487	30,00	0,00	30,00	UNSUCCESSFUL
488	26,00	0,00	26,00	UNSUCCESSFUL
489	20,00	0,00	20,00	UNSUCCESSFUL
490	29,00	0,00	29,00	UNSUCCESSFUL
491	33,00	24,00	57,00	UNSUCCESSFUL
492	20,00	0,00	20,00	UNSUCCESSFUL
493	29,00	0,00	29,00	UNSUCCESSFUL
494	22,00	0,00	22,00	UNSUCCESSFUL
495	32,00	5,50	37,50	UNSUCCESSFUL
496	30,00	0,00	30,00	UNSUCCESSFUL
497	20,00	0,00	20,00	UNSUCCESSFUL
498	26,00	0,00	26,00	UNSUCCESSFUL
499	34,00	18,50	52,50	UNSUCCESSFUL
500	21,00	0,00	21,00	UNSUCCESSFUL
501	32,00	0,00	32,00	UNSUCCESSFUL
502	24,00	0,00	24,00	UNSUCCESSFUL
503	23,00	0,00	23,00	UNSUCCESSFUL
504	30,00	0,00	30,00	UNSUCCESSFUL
505	23,00	0,00	23,00	UNSUCCESSFUL
506	27,00	0,00	27,00	UNSUCCESSFUL
507	19,00	0,00	19,00	UNSUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
508	26,00	0,00	26,00	UNSUCCESSFUL
509	20,00	0,00	20,00	UNSUCCESSFUL
510	30,00	28,00	58,00	UNSUCCESSFUL
511	35,00	21,50	56,50	UNSUCCESSFUL
512	23,00	0,00	23,00	UNSUCCESSFUL
513	15,00	0,00	15,00	UNSUCCESSFUL
514	29,00	0,00	29,00	UNSUCCESSFUL
515	30,00	0,00	30,00	UNSUCCESSFUL
516	30,00	0,00	30,00	UNSUCCESSFUL
517	29,00	0,00	29,00	UNSUCCESSFUL
518	25,00	0,00	25,00	UNSUCCESSFUL
519	24,00	0,00	24,00	UNSUCCESSFUL
520	27,00	0,00	27,00	UNSUCCESSFUL
521	29,00	0,00	29,00	UNSUCCESSFUL
522	14,00	0,00	14,00	UNSUCCESSFUL
523	32,00	23,50	55,50	UNSUCCESSFUL
524	31,00	0,00	31,00	UNSUCCESSFUL
525	22,00	0,00	22,00	UNSUCCESSFUL
526	24,00	0,00	24,00	UNSUCCESSFUL
527	19,00	0,00	19,00	UNSUCCESSFUL
528	34,00	27,50	61,50	UNSUCCESSFUL
529	36,00	23,00	59,00	UNSUCCESSFUL
530	30,00	0,00	30,00	UNSUCCESSFUL
531	28,00	0,00	28,00	UNSUCCESSFUL
532	31,00	22,00	53,00	UNSUCCESSFUL
533	30,00	15,50	45,50	UNSUCCESSFUL
534	35,00	26,50	61,50	UNSUCCESSFUL
535	36,00	17,50	53,50	UNSUCCESSFUL
536	28,00	0,00	28,00	UNSUCCESSFUL
537	24,00	0,00	24,00	UNSUCCESSFUL
538	30,00	0,00	30,00	UNSUCCESSFUL
539	29,00	0,00	29,00	UNSUCCESSFUL
540	27,00	0,00	27,00	UNSUCCESSFUL
541	35,00	20,50	55,50	UNSUCCESSFUL
542	31,00	12,50	43,50	UNSUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
543	28,00	0,00	28,00	UNSUCCESSFUL
544	27,00	0,00	27,00	UNSUCCESSFUL
545	26,00	0,00	26,00	UNSUCCESSFUL
546	24,00	0,00	24,00	UNSUCCESSFUL
547	24,00	0,00	24,00	UNSUCCESSFUL
548	29,00	0,00	29,00	UNSUCCESSFUL
549	30,00	0,00	30,00	UNSUCCESSFUL
550	34,00	16,00	50,00	UNSUCCESSFUL
551	17,00	0,00	17,00	UNSUCCESSFUL
552	31,00	25,00	56,00	UNSUCCESSFUL
553	29,00	0,00	29,00	UNSUCCESSFUL
554	24,00	0,00	24,00	UNSUCCESSFUL
555	34,00	25,00	59,00	UNSUCCESSFUL
556	28,00	0,00	28,00	UNSUCCESSFUL
557	25,00	0,00	25,00	UNSUCCESSFUL
558	22,00	0,00	22,00	UNSUCCESSFUL
559	32,00	19,00	51,00	UNSUCCESSFUL
560	23,00	0,00	23,00	UNSUCCESSFUL
561	26,00	0,00	26,00	UNSUCCESSFUL
562	24,00	0,00	24,00	UNSUCCESSFUL
563	23,00	0,00	23,00	UNSUCCESSFUL
564	22,00	0,00	22,00	UNSUCCESSFUL
565	29,00	0,00	29,00	UNSUCCESSFUL
566	38,00	19,50	57,50	UNSUCCESSFUL
567	33,00	6,50	39,50	UNSUCCESSFUL
568	30,00	0,00	30,00	UNSUCCESSFUL
569	22,00	0,00	22,00	UNSUCCESSFUL
570	29,00	0,00	29,00	UNSUCCESSFUL
571	27,00	0,00	27,00	UNSUCCESSFUL
572	38,00	15,50	53,50	UNSUCCESSFUL
573	26,00	0,00	26,00	UNSUCCESSFUL
574	22,00	0,00	22,00	UNSUCCESSFUL
575	29,00	0,00	29,00	UNSUCCESSFUL
576	24,00	0,00	24,00	UNSUCCESSFUL
577	22,00	0,00	22,00	UNSUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
578	27,00	0,00	27,00	UNSUCCESSFUL
579	25,00	0,00	25,00	UNSUCCESSFUL
580	29,00	0,00	29,00	UNSUCCESSFUL
581	24,00	0,00	24,00	UNSUCCESSFUL
582	23,00	0,00	23,00	UNSUCCESSFUL
583	34,00	23,00	57,00	UNSUCCESSFUL
584	22,00	0,00	22,00	UNSUCCESSFUL
585	33,00	12,00	45,00	UNSUCCESSFUL
586	29,00	0,00	29,00	UNSUCCESSFUL
587	23,00	0,00	23,00	UNSUCCESSFUL
588	27,00	0,00	27,00	UNSUCCESSFUL
589	31,00	17,00	48,00	UNSUCCESSFUL
590	29,00	0,00	29,00	UNSUCCESSFUL
591	17,00	0,00	17,00	UNSUCCESSFUL
592	33,00	20,00	53,00	UNSUCCESSFUL
593	26,00	0,00	26,00	UNSUCCESSFUL
594	22,00	0,00	22,00	UNSUCCESSFUL
595	24,00	0,00	24,00	UNSUCCESSFUL
596	29,00	0,00	29,00	UNSUCCESSFUL
597	25,00	0,00	25,00	UNSUCCESSFUL
598	22,00	0,00	22,00	UNSUCCESSFUL
599	27,00	0,00	27,00	UNSUCCESSFUL
600	25,00	0,00	25,00	UNSUCCESSFUL
601	31,00	12,50	43,50	UNSUCCESSFUL
602	25,00	0,00	25,00	UNSUCCESSFUL
603	29,00	0,00	29,00	UNSUCCESSFUL
604	25,00	0,00	25,00	UNSUCCESSFUL
605	31,00	26,00	57,00	UNSUCCESSFUL
606	23,00	0,00	23,00	UNSUCCESSFUL
607	27,00	0,00	27,00	UNSUCCESSFUL
608	18,00	0,00	18,00	UNSUCCESSFUL
609	24,00	0,00	24,00	UNSUCCESSFUL
610	27,00	0,00	27,00	UNSUCCESSFUL
611	34,00	23,00	57,00	UNSUCCESSFUL
612	28,00	0,00	28,00	UNSUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
613	28,00	0,00	28,00	UNSUCCESSFUL
614	21,00	0,00	21,00	UNSUCCESSFUL
615	21,00	0,00	21,00	UNSUCCESSFUL
616	30,00	0,00	30,00	UNSUCCESSFUL
617	20,00	0,00	20,00	UNSUCCESSFUL
618	18,00	0,00	18,00	UNSUCCESSFUL
619	22,00	0,00	22,00	UNSUCCESSFUL
620	30,00	28,00	58,00	UNSUCCESSFUL
621	24,00	0,00	24,00	UNSUCCESSFUL
622	28,00	0,00	28,00	UNSUCCESSFUL
623	28,00	0,00	28,00	UNSUCCESSFUL
624	27,00	0,00	27,00	UNSUCCESSFUL
625	36,00	25,00	61,00	UNSUCCESSFUL
626	26,00	0,00	26,00	UNSUCCESSFUL
627	23,00	0,00	23,00	UNSUCCESSFUL
628	26,00	0,00	26,00	UNSUCCESSFUL
629	30,00	0,00	30,00	UNSUCCESSFUL
630	34,00	22,50	56,50	UNSUCCESSFUL
631	37,00	14,00	51,00	UNSUCCESSFUL
632	37,00	14,50	51,50	UNSUCCESSFUL
633	32,00	12,00	44,00	UNSUCCESSFUL
634	29,00	0,00	29,00	UNSUCCESSFUL
635	23,00	0,00	23,00	UNSUCCESSFUL
636	30,00	24,00	54,00	UNSUCCESSFUL
637	35,00	21,50	56,50	UNSUCCESSFUL
638	30,00	0,00	30,00	UNSUCCESSFUL
639	36,00	25,50	61,50	UNSUCCESSFUL
640	32,00	17,50	49,50	UNSUCCESSFUL
641	32,00	17,00	49,00	UNSUCCESSFUL
642	28,00	0,00	28,00	UNSUCCESSFUL
643	24,00	0,00	24,00	UNSUCCESSFUL
644	37,00	26,50	63,50	UNSUCCESSFUL
645	35,00	22,50	57,50	UNSUCCESSFUL
646	25,00	0,00	25,00	UNSUCCESSFUL
647	32,00	12,50	44,50	UNSUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
648	35,00	15,00	50,00	UNSUCCESSFUL
649	32,00	0,00	32,00	UNSUCCESSFUL
650	38,00	26,50	64,50	UNSUCCESSFUL
651	44,00	9,50	53,50	UNSUCCESSFUL
652	30,00	0,00	30,00	UNSUCCESSFUL
653	19,00	0,00	19,00	UNSUCCESSFUL
654	35,00	0,00	35,00	UNSUCCESSFUL
655	29,00	0,00	29,00	UNSUCCESSFUL
656	35,00	16,50	51,50	UNSUCCESSFUL
657	21,00	0,00	21,00	UNSUCCESSFUL
658	22,00	0,00	22,00	UNSUCCESSFUL
659	22,00	0,00	22,00	UNSUCCESSFUL
660	21,00	0,00	21,00	UNSUCCESSFUL
661	30,00	0,00	30,00	UNSUCCESSFUL
662	26,00	0,00	26,00	UNSUCCESSFUL
663	23,00	0,00	23,00	UNSUCCESSFUL
664	22,00	0,00	22,00	UNSUCCESSFUL
665	22,00	0,00	22,00	UNSUCCESSFUL
666	28,00	0,00	28,00	UNSUCCESSFUL
667	27,00	0,00	27,00	UNSUCCESSFUL
668	23,00	0,00	23,00	UNSUCCESSFUL
669	26,00	0,00	26,00	UNSUCCESSFUL
670	24,00	0,00	24,00	UNSUCCESSFUL
671	29,00	0,00	29,00	UNSUCCESSFUL
672	21,00	0,00	21,00	UNSUCCESSFUL
673	33,00	26,50	59,50	UNSUCCESSFUL
674	27,00	0,00	27,00	UNSUCCESSFUL
675	25,00	0,00	25,00	UNSUCCESSFUL
676	28,00	0,00	28,00	UNSUCCESSFUL
677	30,00	0,00	30,00	UNSUCCESSFUL
678	28,00	0,00	28,00	UNSUCCESSFUL
679	25,00	0,00	25,00	UNSUCCESSFUL
680	25,00	0,00	25,00	UNSUCCESSFUL
681	25,00	0,00	25,00	UNSUCCESSFUL
682	24,00	0,00	24,00	UNSUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
683	19,00	0,00	19,00	UNSUCCESSFUL
684	19,00	0,00	19,00	UNSUCCESSFUL
685	26,00	0,00	26,00	UNSUCCESSFUL
686	35,00	0,00	35,00	UNSUCCESSFUL
687	36,00	25,00	61,00	UNSUCCESSFUL
688	29,00	0,00	29,00	UNSUCCESSFUL
689	24,00	0,00	24,00	UNSUCCESSFUL
690	19,00	0,00	19,00	UNSUCCESSFUL
691	35,00	22,00	57,00	UNSUCCESSFUL
692	27,00	0,00	27,00	UNSUCCESSFUL
693	22,00	0,00	22,00	UNSUCCESSFUL
694	27,00	0,00	27,00	UNSUCCESSFUL
695	27,00	0,00	27,00	UNSUCCESSFUL
696	25,00	0,00	25,00	UNSUCCESSFUL
697	26,00	0,00	26,00	UNSUCCESSFUL
698	20,00	0,00	20,00	UNSUCCESSFUL
699	28,00	0,00	28,00	UNSUCCESSFUL
700	36,00	12,00	48,00	UNSUCCESSFUL
701	30,00	0,00	30,00	UNSUCCESSFUL
702	24,00	0,00	24,00	UNSUCCESSFUL
703	30,00	0,00	30,00	UNSUCCESSFUL
704	32,00	25,50	57,50	UNSUCCESSFUL
705	29,00	0,00	29,00	UNSUCCESSFUL
706	34,00	20,00	54,00	UNSUCCESSFUL
707	20,00	0,00	20,00	UNSUCCESSFUL
708	29,00	0,00	29,00	UNSUCCESSFUL
709	23,00	0,00	23,00	UNSUCCESSFUL
710	29,00	0,00	29,00	UNSUCCESSFUL
711	30,00	0,00	30,00	UNSUCCESSFUL
712	30,00	17,00	47,00	UNSUCCESSFUL
713	27,00	0,00	27,00	UNSUCCESSFUL
714	30,00	0,00	30,00	UNSUCCESSFUL
715	26,00	0,00	26,00	UNSUCCESSFUL
716	28,00	0,00	28,00	UNSUCCESSFUL
717	30,00	0,00	30,00	UNSUCCESSFUL

APPENDIX 1: Results of enrolled Candidates in the first technical qualification exam for the creation of the Brazilian National Register of Forensic Accountants in 2017

SEQ	Multiple_choice test	Essay test	Performance score	Status
718	26,00	0,00	26,00	UNSUCCESSFUL
719	19,00	0,00	19,00	UNSUCCESSFUL
720	28,00	0,00	28,00	UNSUCCESSFUL
721	27,00	0,00	27,00	UNSUCCESSFUL
722	22,00	0,00	22,00	UNSUCCESSFUL
723	22,00	0,00	22,00	UNSUCCESSFUL
724	25,00	0,00	25,00	UNSUCCESSFUL
725	26,00	0,00	26,00	UNSUCCESSFUL
726	33,00	0,00	33,00	UNSUCCESSFUL
727	17,00	0,00	17,00	UNSUCCESSFUL
728	28,00	0,00	28,00	UNSUCCESSFUL
729	20,00	0,00	20,00	UNSUCCESSFUL
730	25,00	0,00	25,00	UNSUCCESSFUL
731	27,00	0,00	27,00	UNSUCCESSFUL
732	23,00	0,00	23,00	UNSUCCESSFUL
733	16,00	0,00	16,00	UNSUCCESSFUL
734	37,00	25,00	62,00	UNSUCCESSFUL
735	20,00	0,00	20,00	UNSUCCESSFUL
736	29,00	0,00	29,00	UNSUCCESSFUL
737	22,00	0,00	22,00	UNSUCCESSFUL
738	27,00	0,00	27,00	UNSUCCESSFUL
739	22,00	0,00	22,00	UNSUCCESSFUL
740	29,00	0,00	29,00	UNSUCCESSFUL
741	22,00	0,00	22,00	UNSUCCESSFUL
742	26,00	0,00	26,00	UNSUCCESSFUL
743	28,00	0,00	28,00	UNSUCCESSFUL
744	26,00	0,00	26,00	UNSUCCESSFUL
745	29,00	0,00	29,00	UNSUCCESSFUL

Human Values in Students from A Higher Education Institution

Israel Alberto Cisneros Concha Ph.D.
alberto.cisneros@correo.uady.mx
Professor of the Faculty of Education
Autonomous University of Yucatan, Mexico

Nora Verónica Druet Domínguez Ph.D.
ddoming@correo.uady.mx
Professor and Administrative Secretary of
Autonomous University of Yucatan, Mexico

Gladis Ivette Chan Chi Ph.D.
ivette.chan@correo.uady.mx
Professor of the Faculty of Education
Autonomous University of Yucatan, Mexico

Abstract

The purpose of this study was to identify the preference level of the human values that students from a higher education institution endorse during August 2016-June 2017 school year, based on the Portrait Value Questionnaire. For this purpose, the basic values of Benevolence, Universalism, Stimulation, Power, Security, Tradition, Hedonism, Self-Direction, Achievement, and Conformity were studied. The study was exploratory, following a nonexperimental cross-sectional design. The sample was composed of 321 students from a higher education institution in Mexico. 67.6% (217) of the students were female, whereas 32.4% (104) were male. Their ages ranged from 18 to 30 years old. The Portrait Value Questionnaire devised by Shalom Schwartz was administered to them. The most important findings revealed that the basic values of Hedonism, Benevolence, and Self-Direction were highly preferred by the students, whereas the basic value of Achievement scored a preference level below the average. These findings highlighted the importance of identifying the portrait values of university students, so higher education institutions can establish appropriate strategies and actions that foster the students' development in order to make them professionals with values.

Keywords: values, university students, higher education, professional training.

INTRODUCTION

The World Declaration on Education for All (UNESCO, 1990) emphasizes on giving an education that meets the demands of the surroundings and needs of all children, youths, and adults that is suitable for their life. Besides this, in the Report of the International Commission for Education for the Twenty-First

Century, one of the four pillars that the education throughout life should have is the one of learning to know which emphasizes on the individual who learns every day through his own knowledge, combining personal and exterior elements (UNESCO, 1996)

Barba and Alcántara (2003) underline that México, in its jurisdiction, proclaims that the institutions of higher education should include values and objectives deriving from the third article of the Mexican Constitution and the seventh one of the General Law of Education, which are also the foundations for the curriculum design. In addition, they also state that national organizations, like ANUIES (the National Association of Universities and Institutions of Higher Education), and international ones like UNESCO suggest adding to the curriculum human aspects in the professions, highlighting the morality of education.

Furthermore, the National Development Plan 2013-2018 emphasizes that every student should master the disciplines and values that characterize the different professions (Gobierno Federal, 2013) because the plans and syllabus must meet the twenty first century challenges which include developing life competencies in the people (p. 43).

Different Mexican universities emphasize in their Institutional Development Plans or on their Educational Models the need of training professionals with competencies that will be useful throughout their lives and that allows them to respond to the social needs of their milieu.

In this sense, the Universidad Nacional Autónoma de México (UNAM, 2016) establishes in its Institutional Development Plan of 2015-2019 that one of the main challenges of the university is the training of citizens with capabilities, expertise, and attitudes to enter successfully to the work force and contribute in the improvement of their country.

On the other hand, in the northern part of the country, the Universidad Autónoma de Nuevo León (UANL, 2016) developed their Institutional Development Plan 2012-2020 that consists of programs and activities that foster a responsibility towards the society. Through the fulfillment of the three main functions of the university (teaching, research and extension) and with the participation of every member of the its population, it becomes a priority to serve the society with quality in order to improve its human development and to minimize the negative impact of its activities in different social contexts.

By the same token, the Universidad Autónoma de Yucatán, in its Institutional Development Plan 2014-2022, indicates that education in this university shall follow a humanistic approach in the knowledge and values given to its students, so they can perform responsible actions in their community. In addition, this university emphasizes values such as equity, quality, social responsibility, academic rigor, legality, honesty, ethics, respect, modesty and tolerance, which are to be followed by its students, professors, university authorities, and assistant and administrative staff.

Moreover, Arango, Clavijo, Puerto and Sánchez (2014) conducted a research with a quantitative approach, in a non-experimental design, descriptive and correlational study, that had the purpose of determining the relationship between the academic training, empathy, values and socially responsible behaviors of students in the first, fifth, and tenth semesters of the different academic programs of the Luis Amigó University Foundation (by its Spanish acronym FUNLAM) in Colombia. The sample was 234 students of ten traditional programs of the FUNLAM. It was found among the results that the participants claim to be socially responsible in Self-Care, Ecology/Environment and Respect for shared spaces. In other

words, the FUNLAM students assert more frequently that they tend to be conscious about their surroundings and shared spaces as well as being interested in their own processes of mental and physical health. Furthermore, it was also found that the university training influences the development of these behaviors because in the first semesters the students claim to be socially responsible but it is actually in the last semester (tenth semester) that their behaviours tend to be more related to Work Responsibility, Volunteering, Social Help, Citizenship and Ecology/Environment. According to the results of this research, the conclusion is that the academic training provides some sort of development and strengthening of socially responsible behaviors in the students that were part of the sample.

Similarly, Kepowics (2003) carried out a research project using a qualitative method in order to find the relationship between the explicit values in a university project and the values that students had by the end of their university studies. Students from three different degrees in two schools from the Universidad de Guanajuato were selected for the project. The first part of it involved an analysis of the ideas and values included in the mission of the university, and hence, in its iterations on the curricular projects and graduate profiles. During the second stage, the graduates' characteristics were inquired, finding that there was a total of 98 students (43 male and 55 female). After examining the graduate profiles from the three different degrees, it was found that values are not pressed enough in them.

The inclusion of values is not very accurate and when compared to the space and time allotted to the development of competencies and professional knowledge, it is rather limited. Having this in mind it is possible to state that the scope of the graduate profiles is not complete, if the mission of the university is to be considered. The participants of this study mentioned that this was the first time that they reflected upon these topics, and that it was rather difficult for them to answer some questions. In the same way, it was possible to assert that the values included in the curricular projects are reflected as students' dreams and ideals to some extent, making them an undeniably important element.

In the same way, the research conducted by Quijano and Lorenzo (2012) studied the perception of university undergraduates regarding their values. Quijano and Lorenzo did this through the administration of the Value Reaction Test (Test de Reacción Valorativa) from García adapted by Casares and Collado to a sample of 400 participants. Among the findings, their values scale was reported in the following order: moral, individual, ecological, affective, physical, intellectual, esthetic, instrumental, social, and lastly, religious. Also, differences based on gender were found because women preferred the esthetic, moral and religious values while men were more inclined to the instrumental ones.

Thus, it can be concluded that there is a need for schools to foster the development of humanistic values in order for students to feel encouraged to fulfill their own personal aspirations (Druet, 2008). This can be done through environments and spaces where they can advance their human potential according to the values that universities establish in their educational model and that can solve the problems that the society demands.

In this way, the training institution must heed a proper identification of students' beliefs, perceptions, and conceptions, so as to establish a bond with those that are part of their professions (Gómez, 2008).

Additionally, universities must take into account the development of professionals with the potential to face challenges of the modern world, gain technological and scientific knowledge, and to have values for

their proper performance in society. Therefore, universities must join together professional competencies with personal characteristics for job success (Arana, 2006).

Hence, it is important to consider that professionals' values are based on a wide variety of experiences and knowledge that are developed through their time in school. Due to this, a competent development of values is required, for which purpose is fundamental to identify the portrait value of students undergoing university studies, making possible to set action strategies that allow them to take up the necessary values for their work as professionals.

OBJECTIVES

General Objective

Identify the preference level of the students' values of an institution of higher education during the school year August 2016 through June 2017, on the basis of the Portrait Values Questionnaire.

METHODOLOGY

A. Type of Study

An exploratory study, which consists in examining a topic or a research problem that has not been studied much or of which there are many questions or has not been studied before, was conducted. Therefore, this study provides information through the Portrait Values Questionnaire to have a broader understanding and knowledge of the portrait values that the university students endorse that can contribute to their professional training (Hernández, Fernández y Baptista, 2014).

B. Design

A non-experimental cross-sectional exploratory design was used. It was a non-experimental one because no variable was manipulated and the phenoma was observed in its natural context. At the same time, it is a cross-sectional exploratory design because the intention was to understand a variable at a specific moment, and generally speaking, this takes place in phenomena, situations, new or less addressed contexts by the different areas of study (Hernández, Fernández y Baptista, 2014). In this case, the contexts only reflect the level of preference of the values that students at a institution of higher education uphold while the research took place based on the Portrait Values Questionnaire.

C. Sample

The sample was composed by students of different semesters of the institution of higher education that were enrolled in the school year August 2016 through May 2017. There were a total of 321 students out of which 67.6% (217) were of feminine gender while 32.4% (104) were masculine. The age of the sample was in between the 18 to 30 years old range, while 20 years old was the average age.

INSTRUMENTS

D. Portrait Values Questionnaire

The fourth edition of Shalom Schwartz's Portrait Values Questionnaire (PVQ) was used for this study, as its purpose is to measure value orientations from people.

This instrument is composed of written descriptions of a given person's goals, wishes, and desires. Respondents are asked to answer the question 'how similar am I to this person?' using a six-point scale, whose options range from 'very much like me' to 'not like me at all' based on the level of importance that the respondent assigns to each value. (Linderman & Verkasalo, 2005).

The instrument is composed of 38 items that measure ten basic values which guide people's behavior: self-direction, conformity, tradition, security, power, achievement, hedonism, universalism, and benevolence.

Schwartz's definitions of the ten basic values are as follows: (García, Medina y Dutschke, 2010, pp. 42 - 43):

Self-direction: Independent thought and action – choosing, creating, exploring (creativity, independent, freedom).

Stimulation: excitement, novelty, and challenge in life (a varied life).

Hedonism: pleasure and sensuous gratification for oneself.

Achievement: personal success through demonstrating competence according to social standards.

Power: social status and prestige, control or dominance over people and resources.

Security: safety, harmony and stability of society, of relationships, and of self.

Conformity: restraint of actions, inclinations, and impulses likely to upset or harm others and violate social expectations or norms.

Tradition: respect, commitment and acceptance of the customs and ideas that traditional culture or religion provide.

Benevolence: preservation and enhancement of the welfare of people with whom one is in frequent personal contact (the 'in-group').

Universalism: understanding, appreciation, tolerance and protection for the welfare of all people and for nature.

With regards to this instrument's reliability, Druet, Escalante, Cisneros, and Guerrero (2017) established that Cronbach's alpha was .864. On the other hand, factor analysis was used as the validation technique to extract the factors from the scale, in order to obtain a value higher than KMO 0.9 (KMO = .864). In addition, the significance level for Bartlett's Test of Sphericity ($x2 = 5346.127$ / gl = 780, Sig. = .000) was lower than .05. Lastly, the first component of the unrotated factor matrix had a variance value of 17.909, saturating all items with a positive value higher than 0.3, which is appropriate.

II. FINDINGS AND DISCUSSION

The findings after the administration of the Portrait Values Questionnaire (PVQ) to 321 students of a higher education institution in México are presented through the motivational domains considered in the

instrument Universalism, Self-Direction, Stimulation, Hedonism, Achievement, Power, Security, Conformity, Tradition, and Benevolence. This was achieved through the analysis of the descriptive statistics and the measures of central tendency.

Figure 1. Level of preference in the domains of the Portrait Values

Figures and Tables

Figura 1.

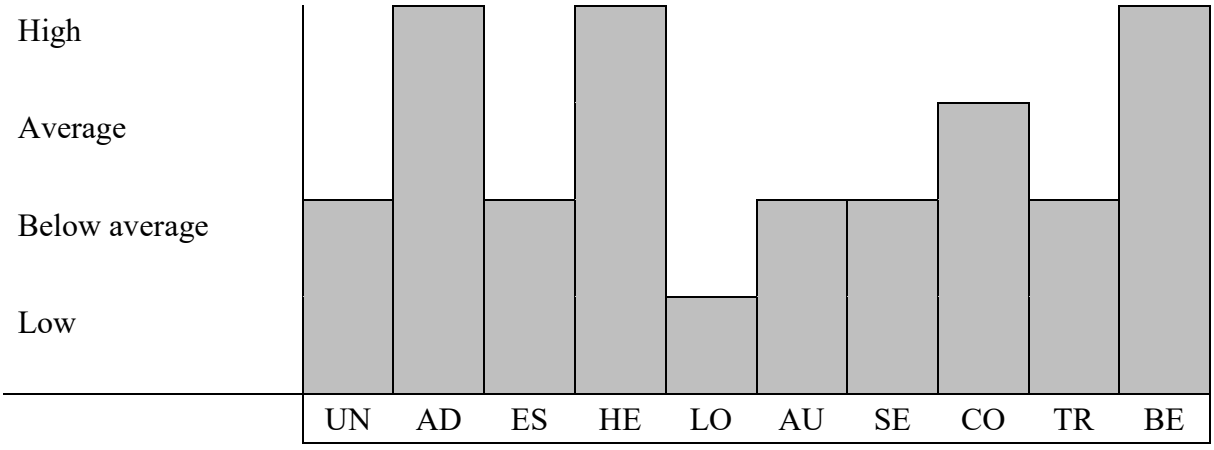

Figure 1. This graph represents the level of preference in each domain after analyzing the findings of all the students who participated in the diagnostic. Meaning of abbreviations: UN= Universalism, AD= Self-direction, ES= Stimulation, HE= Hedonism, LO= Achievement, AU= Power, SE= Security, CO= Comformity TR= Tradition y BE= Benevolence.

As it can be seen in Figure 1, Self-Direction, Hedonism, and Benevolence are the domains in the high level of preference. Conformity is in the average level of preference. Universalism, Stimulation, Power, Security, and Tradition are below the average level of preference and Achievement is found in the low level of preference.

Based on this, it is considered that the students fulfill the high level domains. However, the other seven domains present an area of opportunity that seeks to match the coincidences with the values that the institution establishes as an important element for students to have as part of their academic training in their exit profile.

García, Medina and Dutschke (2010) state that the students considered as the most important values those that have to do with the development of their creativity, independence and freedom. They are interested in the well-being of people who are closed to them as well as being interested in activities related to pleasure and personal satisfaction. Moreover, these findings overlap with the research conducted by García (2010) because two of them are similar. The objective of the former research was to identify the Value System of the Undergraduate Students of the Faculty of the PUCP, since it was found that the prevailing domains in these students were Self-Determination, Benevolence and Universalism.

In this same line, identifying the motivational domains in university students allows the higher education institutions to establish strategies and mechanisms so that the students can get a congruent training in the necessary values for their professional training and those that the students deem to be a priority for them.

III. CONCLUSIONS

The findings of this research allowed the identification of the value preference of the students of a higher institution in an exploratory manner using the Portrait Values Questionnaire (PVQ) because it measures ten general motivational domains.

The findings show that only Hedonism, Self-Direction and Benevolence are in the high level of preference whereas Universalism, Stimulation, Power, Security and Tradition were in the below average category and the Achievement one in the low category of preference.

The findings reveal that even when the higher level institutions outline the importance of fostering values in students in their institutional development plans it is still necessary to include this training in the syllabus. In addition, spaces need to be opened and projects need to be developed that consider vivid strategies to be included in real educational environments that allow students to endorse values.

Even though students identify themselves with some values like Benevolence, it is important to mention that this value is only focused in the people close to them. However,the nature of professions demands that students should be benevolent to all people as well as to nature.

In addition, other research on identifying the portrait values could not be found in higher education that use a quantitative methodology that allows a first approach to this topic.

These findings give an opportunity to the institutions of higher education to identify the values that need to be reinforced according to the institutional mission and vision. This will allow the learning processes to contribute to the development of a more human professional with values.

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A neglected event in endovascular repair of aortic dissection: acute blood pressure variability during aortic angiography

Jing Zaiping (Corresponding author)
Dept. of Vascular Surgery, Changhai Hospital,
Changhai Rd. 168, Shanghai, China.

Tian Wen, Zhijun Mei, Jian Zhou, Qingsheng Lu
Dept. of Vascular Surgery, Changhai Hospital,
Changhai Rd. 168, Shanghai, China.

Abstract

[Purpose]To investigate acute blood pressure change during aortic angiography in aortic dissection endovascular repair, and analyse the potential risk of this incident.

[Method]24 patients with aortic dissection underwent endovascular repair in department of vascular surgery of Changhai hospital between May 2016 and July 2016 were enrolled in this research. Patients were divided into two groups: patients underwent general anesthesia and patients underwent lumbar anesthesia. Blood pressure was monitored by intro-artery catheter. Blood pressure readings were recorded every 10 seconds during the procedure of angiography. Outcome of these patients were observed in hospital.

[Result] All patients received endovascular aortic repair, with 19 underwent lumbar anesthesia and 5 underwent general anesthesia. Patients underwent lumbar anesthesia presented temporary blood pressure decrease with average of -11.2±13.4mmHg, while patients underwent general anesthesia presented temporary blood pressure elevation with average of 4.2±6.3mmHg. The Maximum time interval were 26.7±12.7s vs25.8±15.8s, and difference in blood pressure between pre- and post-angiography were 1.53±4.4mmHg vs. 4.6±3.4mmHg, both without significance (P>0.05).

[Conclusion] Angiography is an effective factor influencing blood pressure during TEVAR, it's a potential "trigger" of intra-operative cardiovascular events. Blood pressure should be kept on proper level to avoid cardiovascular events induced by blood pressure variability with angiography. Angiography with General anesthesia has less influence on blood pressure than with lumbar anesthesia.

Keywords: aortic angiography; blood pressure variability; endovascular repair;

Blood pressure is one of the most important risk factor for patients with aortic dissection, especially in process of endovascular therapy. In procedural of endovascular repair, high blood pressure may induce tearing of dissection, or encephalorrhagia, while low blood pressure may induce perfusion-insufficiency of important organs, resulting in stroke, cardiac infarction or paraplegia. In some key steps of intervention, blood pressure should be regulated. Blood pressure should be temporarily decreased when stentgraft was

released, in order to reduced the possibility of migration Blood pressure should be elevated when long thoracic aorta was covered by stentgraft, to prevent paraplegia. In some papers, researchers also found intra operative blood pressure variability may resulting adverse events1.

It is important to maintain proper blood pressure during operation therapy. However, we found that in some cases blood pressure changes roughly. We found aortic angiography might induce acute blood pressure variability, And the different type of blood pressure change may related with different anesthesia.

An investigation was therefore performed, in which blood pressure was measured during angiography in endovascular repair of aortic dissection. Potential risk of blood pressure change was discussed.

1. Method

1.1 Patient selection

Patients underwent endovascular aortic repair from March 2011 to July 2011 in Changhai hospital were enrolled in this study. All patients received intra-artery blood pressure monitoring and aortic-angiography. Patients were categorized into 2 groups: Group A: patients with lumbar anesthesia; Group B patients with general anesthesia. Patients in both groups received endovascular repair, with at least one stent-graft implantment. The exclusion criteria were: patients without intra-artery blood pressure monitoring; patients with local anesthesia.

1.2 Blood pressure recording

Blood pressure values were captured via intro-artery catheter, and monitored by Philip 5200. The blood pressure was measured with 10 second intervals simultaneously. Injection of contrast was signal of recording beginning. Recording continued after injection, until blood pressure values became stable.

Aortic angiography parameter: omnipaque: 40 ml, pressure 800: kpa, velocity: 20ml/s. Every patient underwent aortic angiography twice: pre- stentgraft placement and post stentgraft placement. Three parameters were defined to evaluate the blood pressure variability: (1) Maximum Variation (MV): The Maximum value of blood pressure during the process minus blood pressure value at the beginning. (2) Peak-time Interval (PTI): time interval between the beginning and the moment of maximum(or minimum) value. (3) Pre- and Post- angiography Variation (PPV): The stable value of blood pressure post-angiography minus blood pressure value at the beginning.

1.3 Statistical Analysis

Data records were transferred into computer. PASW Statistics 18.0 were used to analyze the data. Shapiro-Wilk test was used to indentify mormal distribution. Measurement data in mormal distribution were expressed as mean±SD. Non-mormal distribution data was described as median. T-test was used in mormal distribution data, and nonparametric test was used in other data. $P \leq 0.05$ was regarded significant.

2. Result

2.1 Patient Population

From May. 2016 to July. 2016 , 42 patients received endovascular repair in Vascular surgery department of

Changhai hospital. Exclude patients without intra-artery blood pressure monitoring and with local anesthesia, 24 patients entered the study, 19 （79.2%）male and 5 （20.8%）female. The average age was 65.4±15.1. 5 patients were with diabetes and 20 were with hypertension. All patients received endovascular repair, 19 with lumbar anesthesia and 5 with general anesthesia. Technical success of endovascular therapy was 100%.

2.2 Blood pressure variability during angiography

Blood pressure changed during angiography in patients with lumbar anesthesia presented as Fig 1. Blood pressure elevated in 5 patients while decreased in 18 patients. There was 1 patients presented no significant change of blood pressure. Fig. 2 shows the number of patients with different type.

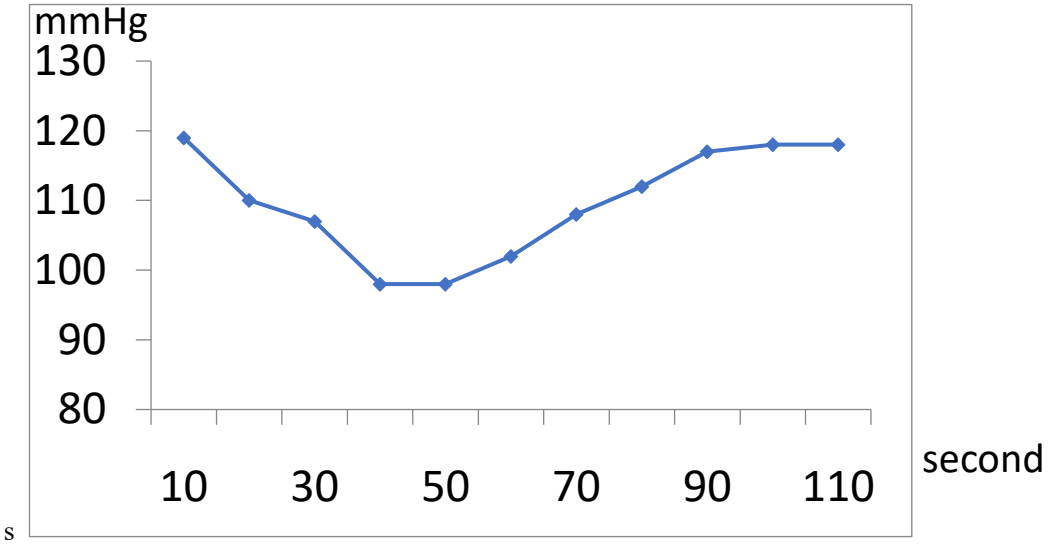

Fig. 1 Blood pressure decreased temporarily after angiography in patients with lumbar anesthesia

2.3 General anesthesia versus lumbar anesthesia

There were 5 patients in general anesthesia group, and 19 patients in lumbar anesthesia group. The pre-operation blood pressure difference between two groups was with no significant (P>0.05). The two group presented different type of blood pressure changes. Blood pressure of Group A mainly decreased while Group B mainly elevated. The MV of patients in Group A was -12 mmHg, which is significantly different from MV in Group B with 5 mmHg (p<0.05). PPI of group A was 1 mmHg, while group B was 6 mmHg, difference was no significant. PTI of group A was 26.7±12.71 seconds, while group B was 25.8±15.78 seconds, with no significant difference. Table 1 shows the contrast of the two groups. Fig. 3 shows the curve of mean blood pressure in different groups.

Table 1 Contrast of blood pressure variability between two groups

Group	MV (mmHg) [M(Q1，Q3)]	PPV (mmHg) [M(Q1,Q3)]	PTI (second) ($\bar{X}$ ±SD)
Group A	-12（-16,-5）	1（-1,3）	26.7±12.71

Group B	5（0,8）	6（2,7）	25.8±15.78
statistical magnitude	Z= 2.35	Z= 1.61	F=0.02
P value	0.0189*	0.1082	0.8961

PS: *P<0.05 was regarded with significant difference。

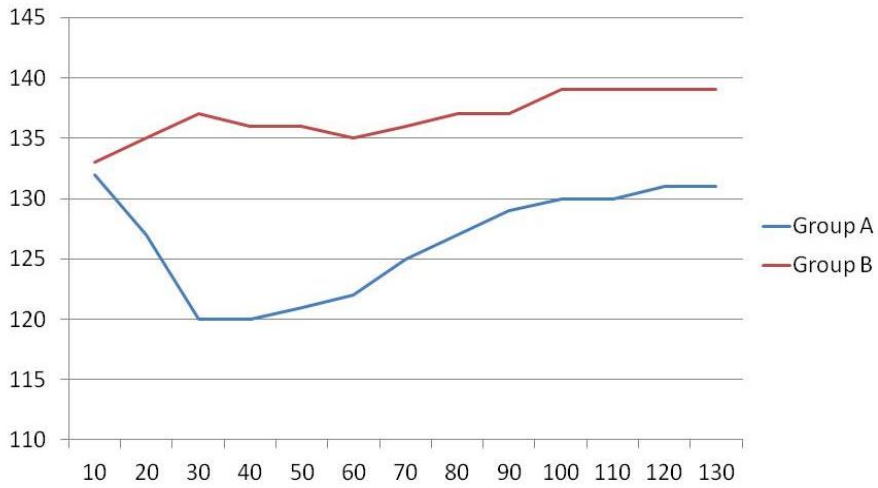

Fig. 3 Mean curve of blood pressure change during angiography in two groups

2.4 In hospital outcome

No critical adverse event was observed during hospital time in both two groups.

3. Discussion

Blood pressure change during aortic angiography were analyzed. The result reveals that angiography definitely influence blood pressure change. Blood pressure change showed opposite sign between lumbar anesthesia and general anesthesia. Blood pressure decreased with lumber anesthesia and elevated with general anesthesia. However, after about 120 seconds, the two kinds of blood pressure became the same, which indicated that it's just temporary change. It could not last long. Another same point was that the time interval to peak of blood pressure change. This indicate that effect of contrast on patients was the same, the only different thing is the anesthesia.

The reason blood pressure decreased during angiography for lumbar anesthesia may be: 1. The high-velocity fluid injected by the squirt stimulates the aortic baroreceptor, induces reflective blood pressure decrease. 2. Contrast itself may induce blood pressure decrease. The reason blood pressure elevated during angiography for general anesthesia may be: 1. Baroreceptor be blocked by general anesthesia, so the high-velocity fluid can not induce reflective blood pressure decrease. 2. The high-velocity fluid may inject into left subclavian artery or innominate artery, where the intra-artery catheter placed, and induce the measurement of blood pressure elevated.

Blood pressure variability impacts the outcome of vascular diseases. Rothwell et[2-5] found that the visit-to-

visit blood pressure variability was an independent risk fact for stoke. Pringle et[6] revealed BPV during the night time was a risk fact for cardiovascular events. In the research of Dawson et[7], diastolic BPV predicted poor outcome of patients with previous stroke.

Previous reports showed that blood pressure variability during operation also relate with outcome of therapy. Aronson et[8, 9] found that BPV during coronary bypass operation related with 30 day mortality post operation. Lukasz et[1] analyzed intra-operative BPV of 200 coronary bypass patients, found that female, smoker, patients less that 60 years old, patients without diabetes, patients without hypertension were likely to have higher BPV during operation.

As the importance of BPV, an interesting investigation was performed to indentify the factors that can be responsible for BPV in our life[5] over the short and medium term. The main factors include: anger/conflict, sexual intercourse, major physical exertion, pain, waking from sleep mid-morning surge, ect. However, factors responsible for intro-operative BPV has not been studied. We found during EVAR, blood pressure change temporarily while angiography, but differently in different patients. The outcome of this study reveals the effect of anesthesia on blood pressure variability during angiography. This study may be more precise than previous daily-life study, because: 1.we controlled the environment and diminished other factors that may be influence blood pressure. 2. Introartery blood pressure monitoring is more precise than blood pressure measurement in daily-life. Rothwell ect adopted a minimum of 5 mmHg variation while we adopted 3 mmHg, which is more precise.

4. Study Limitation

This study contained only 24 patients, which is a limited number. And this it was performed in a single center.

5. Conclusions

This research reveals that angiography is a factor influencing blood pressure during EVAR. It may be a "trigger" of intra-operative cardiovascular events. Make sure blood pressure was in normal level before angiography, especially in patients with refractory hypertension or shock, or angiography induced blood pressure variability may trigger serious cardiovascular event. Blood pressure varies less in general anesthesia than in lumbar anesthesia, reveals that general anesthesia may be safer than lumbar anesthesia.

6. Acknowledgement

The research has no financial support.

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