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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-3 of IJIER** which is scheduled to be published on **31st March 2018**.

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 screened 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,

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Assessing Sanitation Conditions and Its Impacts on The Health Status of Hostellers in Ambrose Alli University, Ekpoma

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Abstract

This study was conducted to investigate the sanitation conditions and its impact on the health status of Hostellers in Ambrose Alli University, Ekpoma. Using a random sampling technique, 100 students were selected for the study. Data were collected with the aid of self – administered questionnaire and analysed using descriptive statistical techniques. The majority of the students (58%) were impressed with services rendered by the cleaners with respect to keeping the bathrooms and its environs clean. 62% of the students' respondents stated that the environments and the hotel toilets is cleaned on daily basis. Although from the research there were indications that the cleaners have issues in acquiring their materials for executing their duties. About 75% of the respondents who at one time had complaints with the conditions of the hostel experienced delayed responses; 69 percents of the student respondents reported that at one point in time they had suffered some health issues which includes malaria, typhoid, dysentery, although no case of food poisoning was recorded. It was concluded that there are few sanitation problems in the institution. Availability of cleaning materials has been a problem as well as other health related issues.

1.0 Introduction

Sanitation and hygiene are among the powerful drives of human development as it affects quality of life at many levels including improved health and economic status [1]. There is growing awareness among public health practitioners that, until proper hygiene is consistently practiced, both at home, in the community as a whole and institutions, the desired impacts of improved sanitation and hygiene infrastructure in terms of community health benefits cannot be realized [2].

Every year millions of Children die from diarrhoea related diseases which could have being prevented through good and proper environmental sanitation and hygiene. Poor sanitation of all forms has led to the infestation of over two billion people globally [3], largely children, with a variety of worm infections which has caused corresponding cost-related problems in health. Human excreta are also responsible for transmission of schistosomiasis, cholera, typhoid and many other infections [1].

Sanitation can be described as conditions and processes relating to people's health, especially the systems which supply water and deal with human waste. The Cambridge Advance learner's Dictionary (1995) also defined sanitation as the system for taking dirty water and waste products away from buildings to protect people's health. In a nut shell, sanitation refers to a process whereby people demand, effect, and sustains a hygienic and healthy environment for them by erecting barriers to prevent the transmission of agents of diseases. Such an approach is needed not only to prevent disease and promote health but also to lay the foundation for sustainable development. Sanitation and good hygiene practices are fundamental to health, survival, growth and development.

Environmental Sanitation is a means to manage human waste at average cost, time and space. This will require the concern of many disciplines such as town planning, architecture, estate surveying, law, quality assurance and control, public health and human psychology. The involvement of many disciplines will amount to variants of agreements and disagreements which affects the beneficiaries without any exception [4].

1.1 Importance of Sanitation

According to Sanni (2015), the success and importance of personal and environmental sanitation are highlighted below:

- i. To reduce the occurrence of diseases and number of death tolls associated with poor hygiene.
- ii. To improve upon poor sanitation, inadequate toilets, lack of understanding about the importance of toilet and sanitation, current poverty level, and low level investment by all tier of governments and local communities.
- iii. To make government and the governed understand the concept of environmental sanitation and sustainability which is more of a journey rather than a stage to reach?
- iv. To bring a reversal to options of either you buy water or drink polluted one this can be done by having more toilets so that drinking water can be separated from waste water.
- v. To make sure that there is sufficient and regular supply of safe water to all houses, offices and student hostels without any stress to guarantee well- being of students and staff.

1.2 Ambrose Alli University, Ekpoma Hostels as a Case Study

The available sources of water are sachet and bottle, bore-holes and wells water. The usage of water cover areas like washing, laundry cleaning, watering flower, drinking, cooking, sewage disposal, flushing and sanitation, fire fighting, construction and renovation.

1.3 Research Objectives

The purpose of this study is to find out the implication of sanitation and hygienic practices on students health at the Ambrose Alli University Hostel. Specifically this study is to:

- a. Investigate the factors affecting the proper implementation of good hygiene and sanitation practices in the Ambrose Alli University Hostel.

- b. Evaluate the effects of poor sanitation practices on students' health at the Ambrose Alli University Hostel.
- c. Assess the impact of sanitation on development at the Ambrose Alli University Hostel.

2.0 Brief History of Ambrose Alli University Hostel

Ambrose Alli University, Ekpoma was established by the First Executive Governor of the defunct Bendel State – Professor Ambrose Alli University in 1982. The University was opened for full academic operations on January, 1982.

The idea of Ambrose Alli University hostel was to serve as an abode for the various students on long-term stay on the premises. The hostel which is allocated to students admitted into the institution has about Four hundred (400) rooms with utility facilities. It also has basic sleeping facilities such as a bed, storage facilities, wash hand basin, and toilet and bathrooms for everyone to use. In Ambrose Alli University, the hostel has an occupancy capacity of four (4) persons in each room and twenty (20) students for each of toilet and bath facilities.

The hostel is managed by the administration in conjunction with the hostel warden and supervisors. Each cleaner is also allocated to one block for proper cleaning exercise in order to maintain hygiene and sanitation.

Hostels are houses or halls of residence for groups who have specific needs, as students, young workers, tourists and organized parties. It was again said that, majority of the hostels came into existence in response to demand for safety.

2.1 Lists of Hostel Blocks in Ambrose Alli University Ekpoma

The following are the blocks of hotels (Boys and Girls included) as labeled present in Ambrose Alli University, Ekpoma;

- a. Emotan Female Hostel
- b. Kudirat Hostel (Male/Female)
- c. Onyealegbulem Male and Female Hostel
- d. Iyayi Male and Female Hostel
- e. Igbinedion Male and Female Hostel
- f. Big Joe Female Hostel
- g. Rev. Martins Male Hostel
- h. Marere Male Hostel

3.0 Methodology

3.1 Sampling Techniques

The target population which happens to be the students was relatively too large to successfully examine. The researcher therefore employed a survey technique in sampling the respondents and gathered information about the importance of sanitation at the Ambrose Alli University hostel and its impact on their health. This technique provides feedback from the respondent's point of view. This study adopted simple random methods of selecting samples. It was random in the sense that there was no certain structure followed in selecting students. It involved asking people questions about their attitudes and opinions about sanitation and hygiene in writing by having respondents complete a questionnaire. Total numbers of student sampled were hundred (100) randomly selected with fifty from the male hostels and Fifty from the female hostels of various hotel blocks in the institution.

3.2 Data Analysis

The questionnaire administered by respondents was recorded and coded. Microsoft Excel was used to analyze the data to obtain the descriptive statistics mainly in the form of frequencies and percentages.

4.0 Data of Demographic Characteristics of the Students

The study sought to describe the demographic characteristics of the sampled respondents used for the study.

The result of this analysis is shown in Table 1 below:

| Students Sex | Frequency | Percentage |
|----------------|------------|------------|
| Male | 50 | 50% |
| Female | 50 | 50% |
| Total | 100 | 100 |
| | | |
| Students Age | Frequency | Percentage |
| 15- 20 | 39 | 39 |
| 21 – 25 | 32 | 32 |
| 26 and above | 29 | 29 |
| Total | 100 | 100 |
| | | |
| Students Level | Frequency | Percentage |
| 100 Level | 40 | 40 |
| 200 Level | 22 | 22 |
| 300 Level | 20 | 20 |
| 400 Level | 18 | 18 |
| Total | 100 | 100 |

Table 1: Demographic data of the students

Majority of the student respondents (40%) were 100 level against all other levels which summed up to 60%, this because; at 100 level the students are still very much young and parents wouldn't want them to live alone on their own. Females were 50% as the Male respondents was also 50%, this is because equal numbers of students were selected from both male and female hostels. The age range of 25 and above constitutes about 39% of the total respondents whilst the other two ranges totaled 61%. This portrays that mostly the students still very young.

4.1 Findings

Majority of the students' respondents (58%) were impressed with services rendered by the cleaners with respect to keeping the bathrooms and its environs clean. 62% of the students' respondents stated that the environments and the hotel toilets is cleaned on daily basis. Although from the research there were indications that the cleaners have issues in acquiring their materials for executing their duties. About 75% of the respondents who at one time had complaints with the conditions of the hostel experienced delayed responses; only 10 % of them had their problems addressed promptly.

| Statements | Frequency | Percentage |
|---|------------|------------|
| Students opinion of jobs performed by Cleaners | | |
| Staff and the service they render | 58 | 58 |
| Cleaning of the rooms, bathrooms and environs | 42 | 42 |
| Total | 100 | 100 |
| Address of Students' Complaints | | |
| Promptly | 10 | 10 |
| As and When | 15 | 15 |
| Delayed | 75 | 75 |
| Total | 100 | 100 |
| Frequency of how the hostel environment is cleaned | | |
| Daily | 62 | 62 |
| Weekly | 38 | 38 |
| Monthly | 0 | 0 |
| Yearly | 0 | 0 |
| Total | 100 | 100 |
| Availability of cleaning materials for cleaning | | |
| Yes | 30 | 30 |
| No | 23 | 23 |
| Not Sure | 57 | 57 |
| Total | 100 | 100 |
| Common Health Issues | | |
| Malaria | 50 | 50 |
| Diarrhea | 11 | 11 |

| | | |
|--------------|------------|------------|
| Dysentery | 9 | 9 |
| Typhoid | 22 | 22 |
| Others | 8 | 8 |
| Total | 100 | 100 |

On assessing the health status of the student respondents, it was discovered that the prevalent health related issues included malaria and typhoid, while there were very low cases of diarrhea and dysentery recorded which is not unconnected to the environmental sanitation status of the hostels and its environs at certain times. About 69 percents of the student respondents reported that one point in time or the other they had suffered some health issues which includes malaria, typhoid, dysentery, although no case of food poisoning was recorded.

5.0 Conclusion/Recommendation

Based on the above findings from this research, there is an indication that there are few sanitation problems in the institution. Availability of cleaning materials has been a problem and other health related issues. It is advised that proper measures be taken to increase the availability of cleaning materials, also sensitization programs be encouraged on the importance of sanitizations but personally and environmentally.

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Synthesis and photocatalytic properties of ultra-smooth TiO₂ thin films with superhydrophilicity

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Abstract

Functional TiO₂ films were fabricated on glass substrates by using modified dip coating method. The properties of the films including crystal structures, thickness, surface morphology and optical properties were studied. The film coated once possessed an ultra-smooth surface with a root mean square (RMS) roughness of 2.6 ± 0.7 nm, which was attributed to the effect of N₂ flow during the formation of film. The TiO₂ films exhibited superhydrophilicity without UV illumination and the superhydrophilic performance was enhanced with the increase of film thickness. Tests on degradation of dyes under UV illumination indicated that the annealing temperature and thickness of the TiO₂ films accounted for their photocatalytic performance. An increase of annealing temperature led to a decrease of the amount of defects and the recombination rate of electron-hole pairs. Because of change of film thickness, light absorption and amount of defects of the TiO₂ films influenced photocatalytic performance simultaneously.

Keywords: TiO₂ films; modified dip coating; superhydrophilicity; ultra-smooth;

1. Introduction

Semiconductor photocatalysts have boosted intriguing scientific research areas for the last decades that follows the extensively increasing demands in detoxification of organic pollutants and solar-energy conversion^{1,2}. Since the water splitting phenomenon on TiO₂ electrode was first discovered by Fujishima in 1972³, TiO₂ has attracted intensive interests for its potential applications in photocatalysis^{4,5}, environmental protection⁶, sensors⁷ and solar cells^{8,9} owing to the advantages on photocatalytic performance, chemical stability and production cost. A variety of techniques have been used to prepare TiO₂ thin films including chemical vapor deposition (CVD)¹⁰, sol-gel approaches¹¹⁻¹², gold-assisted electrochemical etching¹³, pulse laser deposition¹⁴, sputtering^{15,16}, electrochemical anodization¹⁷. These procedures usually need rigid environments, complicated processes or expensive vessels.

In this research, a widely applicable and straightforward alternate method without formation of sols or gels

has been developed to fabricate ultra-smooth titanium dioxide thin films, which exhibit efficient photocatalytic properties under UV illumination and superhydrophilicity without UV irradiation. The thin films are prepared by dipping glass substrates into a solution containing titanium precursor, followed by purging and drying with nitrogen flow and annealing in air.

2. Experimental:

2.1 Preparation of TiO₂ thin films

Ordinary microscope glass slides were used as substrates for TiO₂ film coating. Functional TiO₂ films were prepared by using an improved dip coating method. A precursor solution was prepared by mixing tetrabutyl titanate (Ti(OC₄H₉)₄, TTBO) and isopropyl alcohol (IPA). The cleaned glass slide was then immersed into the precursor solution for 1 min and taken out quickly. After that, the slide was transferred to nitrogen flow with a rate of 500 sccm, in order to purge the remaining liquid on the glass surface. Such a procedure was repeated for several times. The samples were marked as TiO₂-x, in which x is the total coating times through the procedure above. Finally, the resultant samples were annealed at 200 – 500 °C in air for 5 h. In order to investigate the effect of N₂ flow in the preparation process, a sample marked as n-TiO₂ was fabricated by the same procedure excluding N₂ purging.

2.2 Characterization

The X-ray diffraction (XRD) patterns of the samples were recorded using an X-ray diffractometer XRD-6100x (Shimadzu, Japan) with Cu K_{α1} radiation ($\lambda = 0.154056$ nm) and a Ni filter in a continuous scanning mode. The surface morphology of the specimens was obtained by an atomic force microscope (AFM) Nano Wizard II (JPK, Germany). The RMS roughness of the films was based on statistical results of the height distributions for the corresponding AFM images. The surface morphological features of the films were also observed using a field-emission scanning electron microscope (FE-SEM) SU1510 (Hitachi, Japan) operating at 15 kV. The thickness of TiO₂ thin film was determined by scanning an ellipsometer Alpha-SE (J.A. Woollam, USA). The water contact angles (WCAs) of TiO₂ thin films were measured by

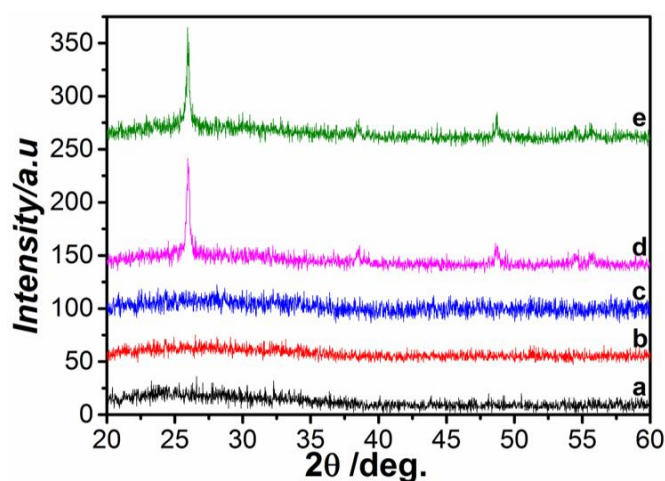


Figure 1. XRD patterns of the as-prepared TiO₂ (a) and TiO₂-1 thin films annealed at 200°C (b), 300 °C (c) ,400 °C (d) and 500 °C (e).

using CAM 200 (KSV instrument, Finland) without UV irradiation at ambient temperature. Water droplets were automatically generated with a volume of 5 μL . Samples were stored in a dark box for 48 h before measurements. Photocatalytic activities of samples were evaluated by degradation of methylene blue under light irradiation of a 500 W high-pressure mercury lamp. In each experiment, TiO_2 film on glass substrate as a photocatalyst was placed into 3.5 ml methylene blue solution ($1 \times 10^{-5} \text{ M}$) in a quartz vessel and the solution was stirred for 1 h in dark to reach absorption equilibrium between the catalyst and the solution. The solution was then exposed to light irradiation. After irradiation for a given time, the film was removed out of the solution, and the concentration of the solution was determined using UV–Vis spectra (Shimadzu UV-3600).

3. Results and discussion:

3.1 Structures and morphology

Figure 1 shows the X-ray diffraction patterns of the TiO_2 -1 thin films prepared on glass slides, which were annealed in air for 5 h at 200 $^\circ\text{C}$, 300 $^\circ\text{C}$, 400 $^\circ\text{C}$ and 500 $^\circ\text{C}$, respectively. The diffraction peaks indicated that annealing over 400 $^\circ\text{C}$ has greatly improved the crystallinity of the samples. The peaks shows the films are in accordance with anatase TiO_2 structures.

Figure 2 (a) and (c) shows FE-SEM images of the TiO_2 -1 thin film annealed at 400 $^\circ\text{C}$ in air for 5 h and

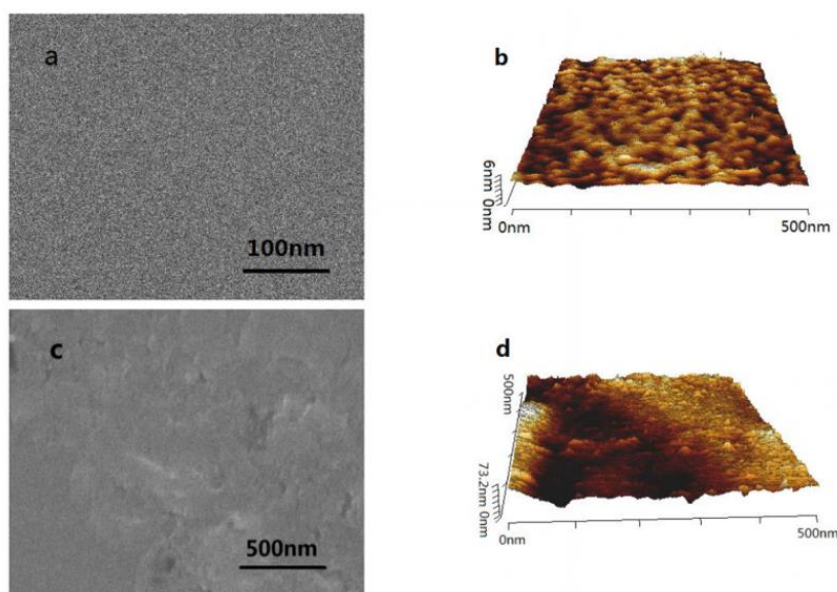


Figure 2. FE-SEM and AFM images of the TiO_2 thin film annealed at 400 $^\circ\text{C}$ in air for 5 h (a, b) and the n- TiO_2 sample prepared by the same procedure excluding N_2 purging (c, d).

the n- TiO_2 thin film prepared by the same procedure excluding N_2 blowing. Figure 2 (b) and (d) exhibits the AFM image of the corresponding samples. It is obvious that the annealed TiO_2 -1 film possessed an ultra-smooth surface. The calculated RMS roughness of the annealed films is $2.6 \pm 0.7 \text{ nm}$, which is consistent with the result of SEM image. The SEM image of the n- TiO_2 sample prepared shows a rough

surface and the analysis of AFM image yield an RMS roughness of 9.1 ± 6.5 nm, which is significantly larger than that of annealed TiO₂-1 film.

The formation of ultra-smooth surface of the annealed TiO₂-1 films may be attributed to the effect of N₂ blowing, which is demonstrated in Figure 3. Without N₂ flow, a much thicker layer of solution remained

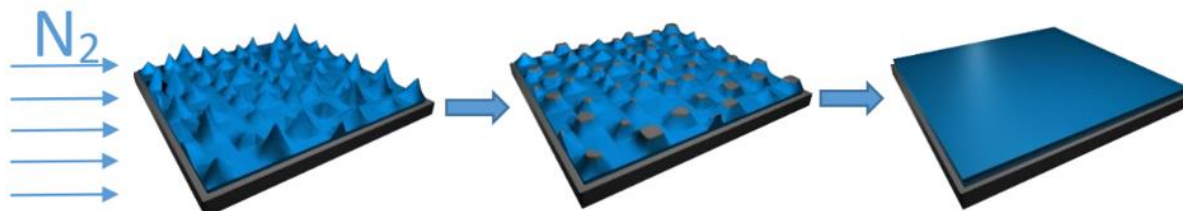


Figure 3. Schematic of formation of TiO₂ thin film facilitated by N₂ flow.

on the substrate and liquid droplets were generated before the evaporation of solvent since the glass surface was not superhydrophilic, which resulted in a rougher surface.

Ellipsometric analysis of TiO₂ films were performed at an incidence angle of 70° with optical range of 350–900 nm. The thicknesses of TiO₂ films after annealing at 400 °C obtained by spectroscopic ellipsometry were shown versus the corresponding coating times in Figure 4. The thicknesses of TiO₂-1, TiO₂-2, TiO₂-3 and TiO₂-5 films were measured to be 76 nm, 236 nm, 389 nm and 705 nm, respectively. The linear correlation between the thickness and coating times showed that the fabrication method can offer

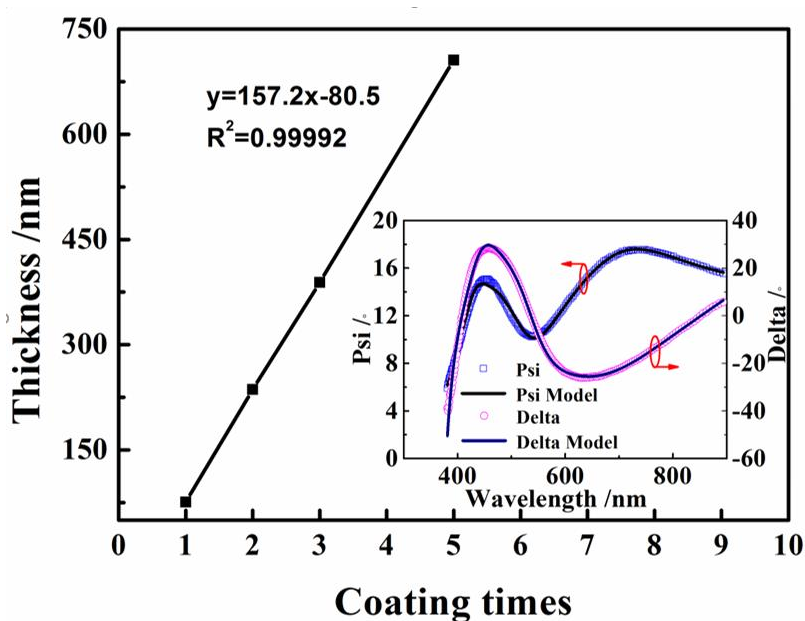


Figure 4. Relationship between the film thickness and coating times. A linear fit to the data is displayed. Inset is the measured ellipsometric parameters and fittings of the data to the EMT model for the TiO₂-1 film on glass substrate annealed at 400 °C in air.

control of the thickness of the TiO_2 films. The measured data of Δ (delta) and ψ (psi) were fitted using the Bruggeman effective-medium theory (EMT)¹⁸, as shown in the inset of Figure 4. The effective dielectric function was calculated by considering the sample type of a TiO_2 layer on a glass substrate. The EMT model extracts the refractive index of the TiO_2 layer as a function of wavelength, which yields an value of 1.92 ± 0.03 in the visible wavelength range, lower than that (~ 2.5) of bulk TiO_2 ¹⁸.

3.2 Superhydrophilicity

By measurement of WCAs, the surface wettability of TiO_2 films was investigated. Figure 5 shows water spreading behaviors of the TiO_2 films coated with different times. The equilibrium WCAs were eventually close to zero, which showed the superhydrophilicity of all films. With the increase of film thickness, the time for the droplets to expand fully on contact surface decreased. The performance follows the Tanner's power-law behavior²⁰ described as $\theta \propto (t + t_0)^{-n}$, where θ is the contact angle, t is time from droplet deposition, t_0 is a constant, n is a power parameter and its value increases with the thickness of the superhydrophilic film²¹. In our results, the time t and the power parameter n are negatively correlated, which is in good agreement with the correlation of Tanner's power law.

3.3 Photocatalytic property

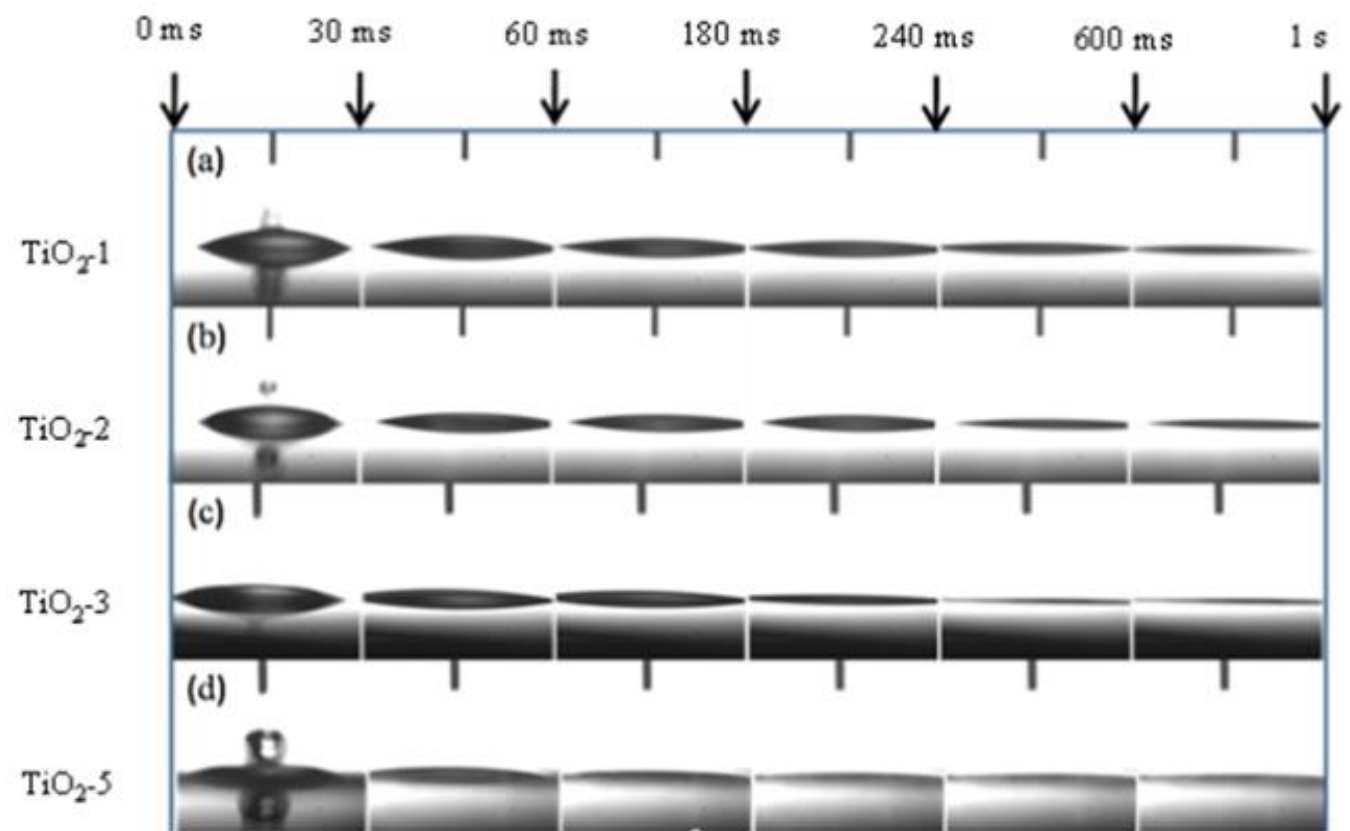


Figure 5. Optical images of water spreading behaviors on TiO_2 -1(a), TiO_2 -2(b), TiO_2 -3(c), TiO_2 -5(d) thin films annealed at 400 °C.

By investigating the photocatalytic degradation of methylene blue on TiO_2 thin films, the effects of the thickness and annealing temperature of the films on photocatalytic properties were taken into account, which is shown in Figure 6. Figure 6 (a) shows the degradation rate on TiO_2 -1, TiO_2 -2, TiO_2 -3 and TiO_2 -5 films annealed at 400°C . With the film coating times $x \leq 3$, the degradation efficiency of dyes increased with x . However, the efficiency dropped apparently for the films with $x > 3$. Neglecting difference of reflection effect on the surface, the number of photons absorbed by the films has a positive correlation with the film thickness in a moderate range. However, if the thickness of the film exceeds a critical value, photons will not be able to travel through the films and an increase of thickness will not enhance light absorption. In addition, charge carriers generated by lights may diffuse towards the substrate because of the concentration gradient, which impedes their contact with dye molecules.¹⁹ Figure 6 (b) shows the degradation rate on TiO_2 -1 annealed at 200°C , 300°C , 400°C and 500°C . The degradation efficiency increased with the annealing temperatures, which is consistent with the fact that the increase of annealing temperature led to the improvement of crystallinity and less defects, i.e., lower recombination rate of electron-hole pairs.

Figure 7 (a), (b) and (c) shows the degradation rate of methylene blue on as-prepared TiO_2 -1, TiO_2 -2, TiO_2 -3 and TiO_2 -5 films and the films annealed at 200°C or 300°C . With increasing coating times, the degradation rate decreased. The XRD results have demonstrated the formation of these amorphous TiO_2 films with the annealing temperatures less than 400°C . With comparison to crystalline TiO_2 films, amorphous TiO_2 films possessed a large amount of defects, which resulted in a high recombination rate of

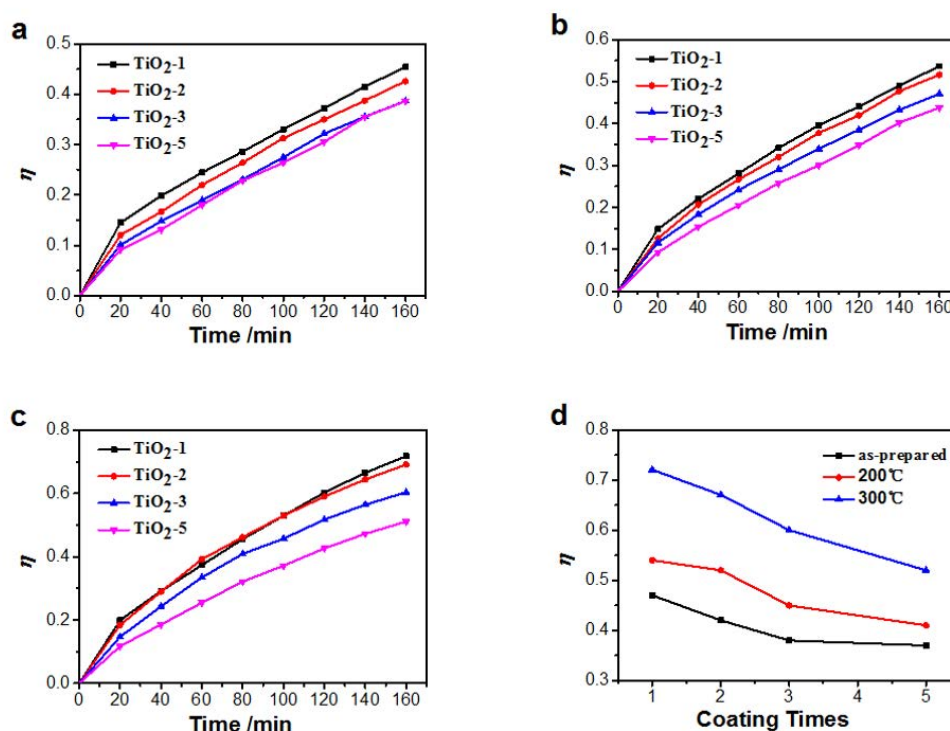


Figure 7. Degradation rate of methylene blue on the as-prepared TiO_2 -x films(a) and the films annealed at 200°C (b) and 300°C (c), respectively; Degradation rate of methylene blue on the TiO_2 -x films with UV illumination for 160 min (d).

electron-hole pairs and dominated the photocatalytic activity. Figure 7 (d) shows the effect of annealing temperature on the degradation rate. With increasing annealing temperatures, all TiO₂-x films showed increasing degradation rates due to decreasing defects.

4. Conclusion

In summary, an easy modified dip coating method has been used to fabricate ultra-smooth TiO₂ layers on glass slides. After annealing at the 400°C, the TiO₂ films exhibit an anatase structure and the RMS roughness of TiO₂-1 film measured by spectroscopic ellipsometry is 2.6 ± 0.7 nm. Tests on degradation of dyes under UV illumination indicated that the annealing temperature and thickness of the TiO₂ films account for their photocatalytic performance. A high annealing temperature resulted in a small amount of defects and a low recombination rate of electron-hole pairs. Thickness of TiO₂ films may affect light absorption and amount of defects simultaneously. All the TiO₂ films showed superhydrophilicity without UV illumination. The hydrophilicity of the films was enhanced with the increase of film thickness. All these properties showed promising applications in self-cleaning coating, anti-UV light and sterilization.

6. Acknowledgement

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7. References

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The Nexus Between Strategic Partnerships and Firm Performance of Listed Commercial Banks in Kenya

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ABSTRACT

The aim of the research was to investigate the effects of strategic partnerships on the performance of listed commercial Banks in Kenya. Descriptive design was adopted. This research included all the employees of banks listed in the NSE. The source of information were both primary and secondary. The respondents agreed that diffusion of technology affect performance of listed banks in Kenya as shown by a mean of 0.7907. The participants revealed that creating a strategic alliance can permit complete admission to knowledge and proficiency in an area that a firm does not have as revealed by a mean of 0.6279. The study indicated that cost synergies affect performance of listed commercial banks in Kenya. The research recommends that the management of commercial banks should continue looking in to forming strategic partnerships, this will help in achieving cooperative objectives and at the same time reduce inter competition and business risks. The study further recommends that before partnership agreements are finalized it is extremely important to identify managers who are foreseen as credible across the company.

Keywords: Strategic partnerships, Firm performance, Diffusion of technology, Customer service, Knowledge expertise, Cost synergies, Commercial banks in Kenya

1. Introduction

Strategic partnerships are progressively becoming prevalent in the business world. To achieve competitive advantage, companies have to associate their properties and competencies in a co-operative strategy that is referred as strategic partnership. Strategic partnership is deliberated as an important form of resource sharing, learning, and hence competitive advantage in the competitive business world. Management of partnerships and value creation to achieve competitive gain is very significant in strategic partnership (Ireland *et al*, 2012). Strategic partnerships involve firms with some degree of exchange and sharing of resources and capabilities to co-develop or distribute goods or services (Baum & Usher, 2010). The attainment of competitive advantage is hard by one firm operating on its own since it does not have all needed resources and competence to be entrepreneurial and sufficiently inventive in changing competitive markets. Partnering with other firms creates the chance to share the resources and competences of firms while working with associates to develop additional resources and capabilities as the function for new competitive advantage (Kuratko *et al*, 2010).

The importance of strategic partnerships in present business setting has been a collective opinion of conversation in the world of academic. At the same time, strategic partnerships are resulting to a more and more prominent in the global economy. Strategic partnerships are fast becoming a propensity in the corporate business. The prevalent change in corporate culture and the operation of business is the quickly rising number of company deals founded not on possession, but on partnerships. Certainly, searches on the internet for strategic partnerships reveal frequent press releases of companies creating partnerships and also produce several addresses for strategic partnerships consulting companies. As asserted by Booz and Hamilton (1997), the numeral of strategic partnerships had double in ten years and was to rise enormously. A strategic partnership is an official and mutually agreed partnership between two or more industries or firms. The associates gather resources together, exchange and assimilate particular assets for mutual advantage while they remain separate and entirely independent from each other. It is a cooperative arrangement which enables partners to achieve goals together that they could not achieve alone. Strategic partnerships are viewed as mechanisms for producing a more powerful and effective mode for competing in a globalized world. Strategic partnership relationships continue to be one of the leading business strategies as a result of increasing competition in the global market. However, strategic partnerships can take different forms and as such are not limited to commercial spheres alone. It can be a partnership of strong partners who are direct competitors, partnership between strong and weak partners, partnership between those who are weak and seek to gain power, between complimentary equals, or even a merger that results in formation of a new organization altogether. The main goal of partnership is to add value with different focuses on trade, competence, information/knowledge acquisition or overcoming barriers (Gamble, Strickland & Thompson, 2007).

Presently, strategic partnerships are a prominent phenomenon in the global economy among multinational companies (MNCs) and between companies in developing countries too. Peter Chin, Chan & Lam, 2012, asserts that “the ultimate transformation in company culture, and the way business is being steered, may be the accelerating performance of relationships based not on ownership, but on partnerships”. Strategic partnerships are therefore partnerships of two or more corporations or business units that work together to achieve strategically significant objectives that are mutually beneficial to the parties. These strategic partnerships present gigantic potential to a business. A strategic partnership is an “arrangement between firms to do trade together in conducts that is more than just firm to firm, but fall short of a unification or a full partnership” (Wheelan and Hungar, 2000). The partnerships array from casual agreements normally denoted to as “handshake” to formal arrangements with long contracts in which the parties may also exchange equity or raise capital to form a combined venture corporation. Typical strategic partnerships are formed between two firms; however, increasingly these are trending towards multi-company partnerships. A more common example is a six-company partnership strategically formed by Apple, Sony, Motorola, Philips, AT&T and Mitsushita to form General Magic Corporation to develop Telescript Communications software.

1.1 Strategic Partnerships in the Banking Sector

Strategic partnership attainment is very important to the organizations that form alliances with others. This formation of alliances are some of the ways used by the commercial banks in order to deal with the current market forces of competition. Kenya commercial bank partnered with Safaricom to come up with M-Karo which is a licensing agreement with Safaricom's M-pesa to enable clients to pay school fees directly into schools' bank accounts using the mobile money transfer platform, further Kenya commercial bank has also partnered with Safaricom through Kenya commercial bank M-benki to facilitate opening of accounts using mobile phone and Kenya commercial bank Mobi which facilitate checking balances, mini statements, funds transfer to Safaricom customers and Kenya commercial bank account holders (Daily Press bulletin, 2014).

According to the World Bank Report (2014), Kenya commercial bank group has also partnered with Safaricom through Biashar@Smart portal. The solution was set to discourse real life challenges that face growing businesses. From access to funds Lipana M-PESA for merchant payments to Biashar@Smart accounting for online ERP solution. The solution also helps SMEs improve their efficiency which ultimately boost their credibility in the eyes of their customers. Biashar@Smart club also offer capacity building opportunities through partnerships targeted at delivering practical knowledge and skills in business planning finance and marketing. Kenya commercial bank, a Safaricom's financial partner, provides Biashar@Smart members with preferential interest rates on loans. Also members of the club have access to a rich business portal Biashar@Smart Connect (World Bank Report, 2014).

Keen to gain the enormous unrealized potential in domestic mobile banking, CBA made a strategic partnership with Safaricom in 2012 to unveil M-Shwari, a mobile phone-based virtual banking platform which would be reachable to the 15 million people (80% of Kenya's adult population) who already used the M-Pesa mobile money transfer (MMT) system. M-Shwari is highly innovative and convenient as the account opening process is remotely initiated by the customer and then fulfilled electronically, using automated processes to verify KYC information in the space of a few seconds. Customers can then access interest-earning accounts at CBA and apply for 30-day loans from CBA without ever having to walk into a bank or fill out paperwork.

In an attempt to offer technology supported financial services, Equity bank affiliated with MasterCard to come up with MasterCard *Pay Pass*. Persuasively mindful of achieving a cashless society position, the bank in recent times partnered with Google Kenya and launched "*Beba Pay*", a payment card which will come up with a quick and suitable way to pay for bus fares without the use of cash. Remarkably, the success of this venture will mean vigorous commission gains to the bank; with the passenger's card account details being managed from their bank accounts. Additionally, the bank has strategic partnerships with key financial institutions in the Far East, for example China Development Bank and China Union Pay.

2 Materials and Methods:

2.1 Research Design

As asserted by Gerhard (2004), a research design is the method a research is framed and adopted to perform the study. It encompasses organizing, preparation, gathering and data analysis to make available

information and resolutions to the prevailing challenge of the research. This study adopted a descriptive research design. It assists in creating responses to the inquiries of when, who, where, what, and how related with a specific research challenge; it cannot categorically determine responses to why. Descriptive research is applied to get info regarding the present position of the occurrence and to explain what exists in relation to variables or conditions in a situation. The aim of the descriptive study is to give the investigator an outline or to define features of occurrence of concern from a firm oriented and other insight.

2.2 Research Duration

The research was done in the year 2015 between the months of January and August.

2.3 Sample Collection

Simple random sampling was employed in getting the sample. A simple random sample is a subsection of participants selected from a population. As asserted by Mugenda & Mugenda (2003) every respondent is selected randomly and completely by chance, this makes each to have the same probability of being chosen. All respondents of the target population were given equal chance of being selected because sampling was done indiscriminately.

2.4 Data Analysis

Both inferential and descriptive statistics were employed to analyze the information by using Statistical Package for Social Sciences (SPSS) (Version 20). Descriptive analysis was done on primary data. Mean and Standard Deviations (SD) were also used as measures of central tendencies and dispersion correspondingly. Correlation was used to analyze the degree of relationship between the variables in the study. The study conducted Spearman's rank correlation coefficient which is a non-parametric test. This technique was used to test the direction and strength of the relationship between two variables. Spearman's rank correlation shows whether any numbers in a set has an influence on alternative set of numbers. It uses the statistics R's that is between -1 and +1. Information was presented in frequency tables and graphs.

3 Results

3.1 Diffusion of Technology

The study sought to determine how diffusion of technology affects performance of listed banks in Kenya. The participants were consequently presented with statements to rate where 1=agree and 0=disagree. Founded on the results, the participants indicated that cost of technological infrastructure makes it hard for companies to thrive alone as shown by a mean of 0.6190 and a SD of 0.49151. It was further established that technological advancement necessitated mobile banking as supported by respondents by a mean of 0.6429 and a SD (Standard Deviation) of .48497. Additionally, analysis indicated that global technological advancement has opened up diversity in market (mean=.8333, standard deviation=.37720) and that skills and competency to manage advance levels of technology in Kenya is limited (Mean=.8049, SD =.40122). The respondents also indicated that to counter the competition the major target is to invest in new technology through a partnership as shown by a mean of 0.7442 and a standard deviation of .44148. It was

also established that strategic partnerships have enhanced connecting with consumers and all stakeholders through the Internet (mean=.6744, SD = .47414) and enhances economies of Scale through resource pooling across operational areas (mean=.6744, SD = .47414). Overall, the respondents agreed that diffusion of technology affect performance of listed banks in Kenya as shown by a mean of 0.7907 and a standard deviation of .41163. The summary of the findings is shown in Table 1. Strategic partnerships among commercial banks in Kenya were necessitated by changes in technology. Creation of these new forms of cooperation was activated by the essential alterations in the structure of the global economy and process of technological change. The development of new know-hows into banking has resulted to an everlasting effect, as once old-style banking income collections are now being developed by new contenders, particularly in the payments' place. This happens at a period when customer prospects for banking services (both online and offline) are being rearranged by the understandings being managed by traders and online benefactors, somewhere else.

Table 1: Diffusion of Technology

| Statements | Mean | SD |
|--|-------|--------|
| Cost of technological infrastructure makes it hard for companies to thrive alone | .6190 | .49151 |
| Technological advancement necessitated mobile banking | .6429 | .48497 |
| Global technological advancement has opened up diversity in market | .8333 | .37720 |
| Skills and competency to manage advance levels of technology in Kenya is limited. | .8049 | .40122 |
| To counter the competition the major target is to invest in new technology through a partnership | .7442 | .44148 |
| Strategic partnerships have enhanced connecting with consumers and all stakeholders through the Internet | .6744 | .47414 |
| Economies of Scale through resource pooling across operational areas | .6744 | .47414 |
| The bank has been able to acquire new technologies from partners in the alliance. | .6744 | .47414 |
| Diffusion of technology affect performance of listed banks in Kenya | .7907 | .41163 |

Strategic technology partnership signifies a substitute manner for rising innovation (Robertson and Gatignon, 1998) and reducing restrictions that would or else obstruct a firm's global competitiveness. They empower firms contending internationally to grow or extend high value products, contest in markets that seek those products, and create entirely new markets worldwide (Stevens, 2009). They also provide companies a way to limit the high costs connected with the progressively rapid pace of technology development. Strategic partnerships have also played a major part in the development of emergent technologies that offer firms an unmatched chance to compete universally.

3.2 Customer Service

The second objective of the study sought to establish the influence of customer service on performance of listed banks in Kenya. According to the analysis of the findings, it was established that strategic partnerships have enhanced service delivery in commercial banks as shown by 0.6279 mean and a SD of

0.48908. It was similarly established that change in consumer taste and lifestyle forces branchless delivery of banking service as supported by a mean of 0.6905 and a SD of .46790. The participants also agreed that partnership with telecommunication companies is the only way for the banks to reach the unbanked population (mean=0.5814, standard deviation=.49917), customers consider diversity and convenience of services offered before they open a bank account (mean=0.8333, standard deviation=0.37720) and customers consider diversity of services offered by telecommunication companies before subscribing to their services (mean=0.7442, SD = 0.44148). Overall, the respondents indicated that customer service influence performance of listed banks in Kenya as supported by a mean of 0.6744 and a SD of .47414. Table 2 shows the findings of the research.

The strategic partnerships between commercial banks and telecommunication firms in Kenya have led to improved customer service. The development of mobile has noteworthy consequences for banks. This is because mobile have a better functionality ability, this leads to revolutionization of the communication with the customers and sellers of the product or service. Well-resourced branches and websites will lose meaning, as consumers anticipate services to change. Location-based offers, well-timed and pertinent content, and collaborative presentations will be used as a foundation of the mobile customer's communication with their banks.

Table 2: Customer Service

| Statements | Mean | SD |
|--|-------|--------|
| Strategic partnerships have enhanced service delivery in commercial banks | .6279 | .48908 |
| Change in consumer taste and lifestyle forces branchless delivery of banking service | .6905 | .46790 |
| Partnership with telecommunication companies is the only way for the banks to reach the unbanked population | .5814 | .49917 |
| Customers consider diversity and convenience of services offered before they open a bank account | .8333 | .37720 |
| Customers consider diversity of services offered by telecommunication companies before subscribing to their services | .7442 | .44148 |
| Customer service influence performance of listed banks in Kenya | .6744 | .47414 |

3.3 Knowledge Expertise

The study sought to examine the association between knowledge expertise and performance of listed banks in Kenya. From the analysis of the findings, it was established that creating a strategic alliance can permit ready admission to knowledge and skill in an area that a company lacks as revealed by a mean of 0.6279 and a SD of 0.48908. Further findings revealed that the information, knowledge and expertise that a firm gains can be used, not just in the joint venture project, but for other projects and purposes as supported by a mean of 0.7209 and a SD of 0.45385. It was established that the expertise and knowledge can vary from learning to deal with government guidelines, production understanding, or learning how to acquire resources (mean=0.7442, standard deviation=0.44148). Based on the analysis of the findings, it was established that strategic partnerships lead to access to knowledge and technological innovation

(mean=0.9767, standard deviation=0.62552) and that one of the motivation of entering into partnerships is the potential to gain access to new information and skills (mean=0.6744, standard deviation=.47414). In general, the study established that knowledge expertise influence performance of listed banks as shown by a mean of .8605 and a standard deviation of 0.35060. Table 4.5 displays the summary of the findings.

Access to knowledge and expertise through strategic partnerships ensures the banks concentrate on their core competencies. Comprehending and rising core capabilities are important to attaining market leadership. Core proficiencies are those groups of skills, activities and technologies that a company does well. This permits the company to add direct value to the customer, creating a clear advantage and differentiation and letting the firm to spread itself into a new market. Essential capabilities take time to mature and in many times the time frame to grow associations and unions are not exclusively different.

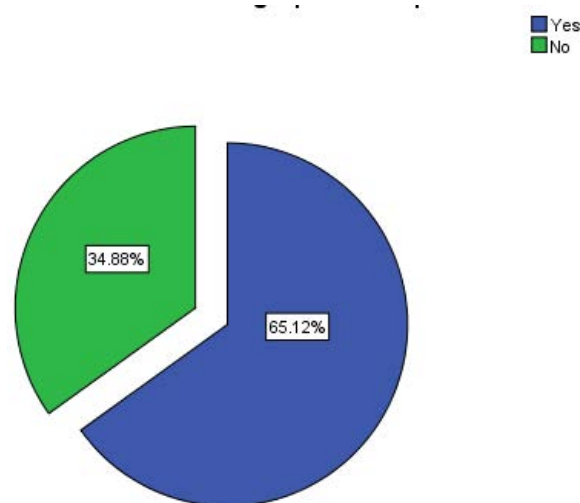
Table 3: Knowledge Expertise

| Statement | Mean | SD |
|--|-------|---------|
| Forming a strategic alliance can allow ready access to knowledge and expertise in an area that a company lacks. | .6279 | .48908 |
| The information, knowledge and expertise that a firm gains can be used, not just in the joint venture project, but for other projects and purposes. | .7209 | .45385 |
| The expertise and knowledge can range from learning to deal with government regulations, production knowledge, or learning how to acquire resources. | .7442 | .44148 |
| Strategic partnerships lead to access to knowledge and technological innovation | .9767 | 1.62552 |
| One of the motivations of entering into partnerships is the potential to gain access to new information and skills | .6744 | .47414 |
| Knowledge expertise influence performance of listed banks in Kenya | .8605 | .35060 |

Kimberley and Roy (2003) observed that many businesses are knowledgeable in selected areas and lack know-how in some parts; for example creating a strategic alliance can enable ready admission to knowledge and capability in an area that a firm lacks. The info, familiarity and know-how that a company gets can be used, not only in the shared undertaking project, nonetheless for supplementary ventures and commitments. A learning business is a growing business.

3.4 Cost Synergies

The respondents were asked to indicate whether cost synergies influence performance of banks in strategic partnerships. Founded on the results, majority (65.12%) of the participants agreed while 34.88% disagreed. Figure 1 displays the findings of the research.

Figure 1: Influence of cost synergies

The respondents were further presented with statements to rate on concerning the influence of cost synergies on performance of listed banks. The respondents indicated that acquisition of new technology influences cost leadership of the bank thereby reducing its marketing expenditure as shown by a mean of 0.7442 and a SD of 0.44148. It was likewise established that sharing activities provide cost savings and revenue enhancements as supported by a mean of 0.6977 and a SD of 0.46470. Additional findings indicated that joining forces implies cost reductions for the cooperating partners' (mean=0.6977, standard deviation=0.46470) and that the banks reduce the installation costs in adopting a technology through strategic partnerships (mean=0.6047, standard deviation=0.49471). It was also established that the bank staff are well trained and conversant with the system lowering the cost of training on the partners (mean=0.8605, standard deviation=0.35060), the availability of suitable space and openness fundamentally act as a cost reduction factor to the partners (mean=0.7442, standard deviation=.44148) and partnerships between banks and telecoms have led to reduced costs of cash handling (mean=0.6744, standard deviation=0.47414). In general, the study revealed that cost synergies affect performance of listed commercial banks in Kenya (mean=.8605, standard deviation=0.35060). Table 4.6 shows the findings of the study.

Table 4: Cost synergies

| Statements | Mean | SD |
|---|-------|--------|
| Acquisition of new technology influences cost leadership of the bank thereby reducing its marketing expenditure | .7442 | .44148 |
| Sharing activities provide cost savings and revenue enhancements | .6977 | .46470 |
| Joining forces implies cost reductions for the cooperating partners' | .6977 | .46470 |
| The banks reduce the installation costs in adopting a technology through strategic partnerships. | .6047 | .49471 |
| The bank staffs are well trained and conversant with the system lowering the cost of training on the partners. | .8605 | .35060 |

| | | |
|--|-------|--------|
| The availability of suitable space and openness fundamentally act as a cost reduction factor to the partners | .7442 | .44148 |
| Partnerships between banks and telecoms have led to reduced costs of cash handling | .6744 | .47414 |
| Cost synergies affect performance of listed commercial banks in Kenya | .8605 | .35060 |

Operation and especially information technology have positive economies of scale for any specific process or systems. That is, the larger the volumes, the lower the unit cost. Banks cannot produce the volume to cost base that external vendors can do to drive the cost reduction. The steady subject that underscores many of the difficulties experiencing the worldwide banking model in the upcoming years is cost reduction. Nevertheless, traditional downsizing strategies are not likely to be adequate to deliver the cost base reductions desirable. The researcher believes that banks should start thinking about implementing longer-term sustainable cost reduction measures, for example strategic partnerships. Strategic partnerships results into transactions of the costs under a shared cooperative arrangement thus allowing the associates to decrease the cost inquired hence circumventing opportunism between exchange associates (Beamish & Bank, 1987).

3.5 Firm Performance

To measure the performance of the banks, each respondent in this study was asked to evaluate it with respect to the following four dimensions: enterprise profits, employee numbers, market share/number of customers, and enterprise turnover/growth in sales. All these were benchmarked to 100% in 2009 as the base year. The findings are shown in Table 5.

Table 5: Firm Performance

| Constructs considered | Annual growth or decline as a percentage (%) | | | | | | Overall growth |
|----------------------------------|--|------|------|------|------|------|----------------|
| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | |
| Profitability (ROA, ROE) | 100% | 22 | 23 | 23 | 24 | 31 | 24.6 |
| Employee numbers | 100 | 2 | 2 | 3 | 3 | 3 | 3 |
| Market Share/Number of customers | 100% | 22 | 23 | 23 | 24 | 24 | 23.2 |
| Turnover/Sales | 100% | 15 | 15 | 20 | 21 | 24 | 23 |

From the findings on performance of banks with 2009 being the base year and benchmarked at 100%, the year 2010 registered an average score of (22%), the year 2011 registered an average score of (23%), the year 2012 registered an average score of (23%), an average score of (24%) for the year 2013 with the year 2014 registering the highest percentage average profit representing (31%). As far as employee numbers is concerned, there was an average of 2% employees in 2010, an average of 2% in 2011, an average of 3% in 2012, an average of 3% in 2013 with an average of 3% employees in 2014. Further the market share/number

of customers in 2010 was 22% 2011 and 2012 stood at a constant of (23%). In 2013 and 2014, the market share stood at (24%) showing a positive increase of (1%) as compared to the previous years. Furthermore, the turnover/sales showed a progressive increase throughout the period with the highest being in 2014 with an average of (24%). The overall growth was exhibited in the banks' profits with the best performing year registering (24.6%). The growth of profits may be attributed to the high turnover and low-cost structures that are typical of commercial banks. The employee numbers average at (3%) for the five years still indicating that the performance of commercial banks is still minimal. The sales turnover increased considerably to correspond with the growth in profits. It is worth noting that despite a favorable banks performance the market share is still very depressed at a partly (23.2%) annually due to stiff competition in the banking industry.

The findings corroborates Nielsen (2007) who reflects the association between subjective measures of performance of partnerships, a set of variables, which might act as constructs of achievement before the alliance is created and a set of variables which emerge during the operation of the alliance. The empirical study, based on a web survey, examines a sample of Danish partner firms engaged in 48 equity joint ventures and 70 non-equity joint ventures with international partners. The findings indicate a significant relationship between alliance performance and partner standing foregoing alliance creation as well as strong relationships between collaborative expertise, trust, protectiveness.

3.6 Regression Analysis

The investigator performed a multiple regression analysis in order to test the relationship among variables on the study. Dummy variables were used to run regression. Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (firm performance) that is explained by all the four independent variables (diffusion of technology, customer service, knowledge expertise and cost synergies). Regression analyses yielded various values including R, R^2 , F ratio, t-values and p-values. The R-value reflects the relationship strength between the constructs while R^2 values depict the extent to which variations in indicators are explained. The F-value shows the statistical significance of the overall model, while t-values represent the significance of individual variables. Further, beta values show the positive or negative effect of the independent variable on the dependent variable. Finally, p-values represented the significance of the model parameters. This study tested the relationships at 95 percent confidence level ($\alpha=0.05$) at which point a decision to confirm the relationship was made. Results that yielded p values < 0.05 led to significant relationships while, results with $p>0.05$ resulted in insignificant relationships.

3.7 Correlation Analysis

The correlation analysis showed strongest positive effect of customer service on firm performance (Coefficient of 0.504) and $P<0.05$ indicating a statistically significant relationship. Diffusion of technology, knowledge expertise and cost synergies are positively correlated to firm performance (Coefficient =.367, .387 and .349 respectively and $P<0.05$ suggesting statistically significant relations. The correlation matrix suggests that the independent variables are critical determinants of firm performance as revealed by their

strong and positive relationship with the dependent variable which was the firm performance.

It is also significant to note that diffusion of technology strongly was positively correlated with customer service (Pearson correlation coefficient =0.723 and $P<0.05$), fairly correlated with knowledge expertise (Pearson correlation coefficient =0.539 and $P<0.05$), strongly correlated with cost synergies (Coefficient =0.577 and $P<0.05$). Further findings indicated that customer service strongly correlated with diffusion of technology (Pearson correlation coefficient =0.723 and $P<0.05$), strongly correlated with knowledge expertise (Pearson correlation coefficient =0.625 and $P<0.05$) and also strongly correlated with cost synergies (Pearson correlation coefficient =0.621 and $P<0.05$). It was also noted that knowledge expertise was fairly correlated to diffusion of technology (Pearson correlation coefficient =0.539 and $P<0.05$), strongly correlated to customer service, (Pearson correlation coefficient =0.625 and $P<0.05$) and strongly correlated with cost synergies. The study also indicated that cost synergies was strongly correlated with diffusion of technology (Pearson correlation coefficient =0.577 and $P<0.05$), strongly correlated with customer service (Pearson correlation coefficient =0.621 and $P<0.05$) and also very strongly correlated with knowledge expertise (Pearson correlation coefficient =0.971 and $P<0.05$). Strategic partnerships are becoming an important form of business activity in many industries, particularly in view of the realization that companies are competing on a global field. Strategic alliances are not an answer for all firms and every condition. Nevertheless, through strategic alliances, firms can increase their competitive placing, gain entrance to new markets, share the risk and cost of major development projects and supplement critical skills (Koigi, 2012).

Multiple regression analysis was conducted as to determine the relationship between firm performance and the four variables. As per the SPSS generated table above, the equation ($Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \epsilon$) becomes:

$$Y = 1492.193 + 5.431X_1 + 49.041X_2 + 79.373X_3 + 69.224X_4$$

Y (Firm performance), X_1 (Diffusion of technology), X_2 (Customer service) X_3 (Knowledge expertise) X_4 (Cost synergies)

As found from the regression equation generated, taking into account all factors that included diffusion of technology, customer service, knowledge expertise and cost synergies, constant at zero firm performance was 1492.193. The constant value of 1492.193 can be explained by other factors influencing banks performance such as the legal environment, competition and economic factors. The findings scrutinized also REVEAL that taking all other independent variables at 0, a unit addition in diffusion of technology will lead to a 5.431 increase in firm performance; a unit increase in customer service will lead to a 49.041 increase in firm performance, a unit increase in knowledge expertise will lead to a 79.373 increase in firm performance and a unit increase in cost synergies will result to a 69.224 upsurge in firm performance. At 5% level of significance and 95% level of confidence, diffusion of technology showed a 0.049 level of significance, customer service indicated a 0.032 level of significance, knowledge expertise showed a 0.036 level of significance, and cost synergies showed a 0.025 level of significance. All the significance values were less than 0.05 ($p<0.05$) implying that they were statistically significant in explaining performance. A number of studies indicate that alliances may contribute to company growth (Stuart, 2010), product

innovativeness, reduced mortality (Mitchell and Singh, 2011), and facilitated organizational learning (Hamel, 2011).

3.8 Model Summary

Regression model was used to explain how the mean of the dependent variable varies with shifting circumstances. Regression Analysis was done out for emphasis on diffusion of technology, customer service, knowledge expertise and cost synergies and firm performance. To test for the relationship that the independent variables have on firm performance, the study did the multiple regression analysis.

Table 6: Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1 | .531 ^a | .282 | .206 | 147.5795 |

a. Predictors: (Constant), Cost synergies, Diffusion of Technology, Customer service, Knowledge expertise

b. Dependent Variable: Firm performance

The four independent variables that were studied explain 28.2% of the firm performance as represented by the R^2 . This therefore means that other factors not studied in this research contribute 72.8% of the firm performance. The first pointer of generalizability is the value of adjusted R Square, which is adjusted for the number of variables encompassed in the equation. This estimates the anticipated reduction in R Square that would not simplify to the population since the solution is over-fitted to the data set by containing numerous independent variables. Since the adjusted R Square value is less than the value of R Square, it is a sign that the regression equation might be over-fitted to the sample, and of limited generalizability. The values of R Square = 28.2% and adjusted R Square = 20.6% are very close.

Table 7: ANOVA

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|------------|----------------|----|-------------|-------|------|
| Regression | 324285.245 | 4 | 81071.311 | 3.722 | .012 |
| Residual | 827629.406 | 38 | 21779.721 | | |
| Total | 1151914.651 | 42 | | | |

a. Dependent Variable: Firm performance

b. Predictors: (Constant), Cost synergies, Diffusion of Technology, Customer service, Knowledge expertise

The significance was 0.012 which is less than 0.05 thus the model is statistically significant in forecasting how diffusion of technology, customer service, knowledge expertise and cost synergies effect the firm performance in Kenya. The F critical at 5% level of significance was 3.722. This indicates that the general model was significant. The research did the process of finding the coefficients, and the findings were as revealed in Table 7. The findings therefore concurs with Gleason et al. (2006) who found that strategic partnerships have an influence on financial performance of commercial banks

4. Conclusion

Strategic partnerships could be applied to get additional complementary resources therefore enabling market extension and decreasing competition. So as this to be operational, there should be effective communication and collaboration between associates. Additionally, a determination of partners requires to be taken into deliberation as well as strategic fit and resources that the partner possesses. The management of the partnership through clear separation of tasks between partners and use of separate project teams is also a possible option between partnerships with firms in different industries. Moreover, cross industry support has been seen to provide a way through which organizations can benefit from partnerships with firms that are not part of their industry leading to supplementary advances by corporations who follow them.

From the findings, the study concluded that the independent variables studied accounted for 20.6% of the variation of banks performance while 79.4% may be affected by other factors not studied. These factors may include; management efficiency; interest income; asset quality; capital adequacy and inflation. In the current competitive market, many organizations cannot operate alone without partnering with others. The main agenda is bringing together the resources available from both organizations that enhance synergy for better operation in the volatile business environment. Technological changes coupled with increase in demand for better services at a cheaper cost by customers has generated more competition. Innovation and consistent research is the only way forward for an organization to prosper in the competitive market.

The study concludes that layout of an organization offers differentiation and integration of work undertaken by the employees of the company through the design of the structure, management established expectations for what individuals and groups will do to achieve the organization's purposes, strategic partnership structure that helps the banks to identify its hierarchy of managers and sources of authority hence improve firm performance.

The study determines that indeed commercial banks should adopt strategic partnerships, but only after having clear objectives of what they want to achieve from these partnerships, after which those adopted should be closely monitored for corrective measures. Lastly the study asserts that the choice of partner affects performance of commercial banks.

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Perception of undergraduate from veterinary medicine course about sustainability in the training of the future veterinarian

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ABSTRACT

In the last decades, sustainability has become the subject of many discussions mainly driven by the global concern over climate change and scarcity of natural resources. So, some measures were agreed in the major international rounds on the environment as well as on educationally planning of countries that have established a commitment to integrate sustainability in different educational levels. Hence, the objective of this study was to determine the importance given by the veterinary medicine students about sustainability in their training. The study is descriptive with quantitative approach where the Likert scale questionnaire with 5 scales was used and applied to students of the last semesters of veterinary medicine in a university. Subsequently the data were tabulated and a general boxplot type graph was elaborated showing the distribution of data. Most students presented a high degree of agreement regarding the relationship between sustainability with professional training. It can be drawn the conclusion that it is important and necessary for the formation of the veterinarian of the future.

Keywords: Education; Sustainable Development; Veterinary Medicine.

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1. INTRODUCTION

From the eighteenth century, the depletion of natural resources has intensified due to human activities, where humanity changed from a rural *modus vivendi* to an urban one. Any human activity should be based on concepts related to sustainability. The three pillars that guide sustainability, the social, the economic and the environmental, are present in any profession or activity being carried out. However, the term seems to have lost some meaning over time because everything and everyone now call themselves sustainable. This rescue of the real meaning and the perception of the relevance that this theme has mainly, regarded to the professional activities, are fundamental for the technical and human formation in consonance with the environmental preservation and the citizenship.

At the United Nations-sponsored meeting called Rio +20 in 2012, signatory nations agreed that the sustainability theme should be an integral part of curriculum grid and teaching of the courses at all levels. Law 9.795 of 1999, which in its Article 2 says that “environmental education is an essential and permanent component of the national education and it must be present, in an articulated way, at all levels and modalities of the educational process, in a formal and not formal character” (Brasil, 1999). As well as the Ministry of Education, through the Opinion of CNE/CES n. 105/2002, guided on the Curricular Guidelines for the Course of Veterinary Medicine that value the socio-environmental interactions (Brasil, 2002). This insertion can take place by means of transversality in the different contents and disciplines of the courses contributing to the internalization of the concept in the future professional.

Sustainability has been the subject of numerous discussions in the last decades given the depletion of natural resources. The term sustainability was used for the first time in the United Nations General Assembly in 1979. According to Elkington (1998), sustainability must be anchored on three dimensions: environmental, economic and social. Currently, environmental themes are emerging in all social, business and academic scope, being the subject of discussions and studies. The educational process after the industrial revolution aimed at forming skilled labor for the market and this has been the current educational model. Within a policy of expansion of technical and higher education, where professionals are graduated for the labor market, and who, in many opportunities will be those who will form an opinion in the future, the notion of sustainability is imperative (Zamberlan et al., 2015).

Some courses, especially those related to the agrarian field, have in their formation a much more intimate contact with the environment than the other different areas of knowledge. In relation to agrarian practices, veterinary medicine works in harmony with the environment, using different interactions with the environment and animals. These interactions are interrelated with the intrinsic activities and processes of animals affecting the metabolism, bioclimate, pathologies, well-being, reproduction, and production.

In the case of the Veterinary Medicine, there are in some cases, specific disciplines within the curriculum that deal with the subject of sustainability or even with sustainable development, separately. At the end of the course, the subject seems to be empty, with no relations with the other disciplines of the curricular grid throughout the semesters. This situation contributes to providing that the professional does not acquire the necessary awareness about the importance of sustainability within his or her own profession.

One of the relevant factors in the veterinarian profession is its direct relationship with public health and welfare, regarding health surveillance, since it includes the control of vectors, hosts, venomous

animals, contaminations, food inspection, where the factors may be biological and not, and all that is related to the three dimensions of sustainability (Franco Netto and Carneiro, 2003). It is important to prepare the prospective veterinarian with this sustainable awareness, a professional integrated to the environment and able to deal with the current complexity of the world, whose profession is integrated with. The function of the universities plays a key role in this training. Therefore, the purpose of this study was to verify the importance given by veterinary medicine students to the sustainability in their training.

2. THEORETICAL REFERENCE

Since the man first appeared on Earth, the natural resources started being excessively exploited. Resources such as soil, water and animals have always been available over the centuries, without the slightest concern with maintaining the quantitative and qualitative conditions or even their resilience. To recognize the benefit that an alternative model to that of dominant neoclassical economic development could enable the world to discuss its possibilities, being essential to rethink how to establish more harmonious relations with the other subsystems of activities (Closs and Antonello, 2014).

That is, the human being would need to know the peculiarities of the planet to use it for a long time, ensuring the continuity of the species itself (Schweigert, 2007). Sustainable development will be achieved if three criteria are simultaneously obeyed: social equity, environmental preservation and economic efficiency (Sachs, 1993).

Barbieri (2007) states that the problems caused by humans arise from the use of the environment to obtain the resources needed to produce goods and services and the dumping of unused materials and energy into the environment. However, this has not always generated environmental degradation, because of the reduced scale of production and consumption and the way in which human beings understood and interacted with nature.

Sustainability can be regarded as a concept imported from ecology, but whose operationality still needs to be proven in human societies (Rosa, 2007). However, if on the one hand, the understanding of sustainability is necessary to promote changes, on the other, the Institutions of Higher Education face difficulties to absorb this understanding and practicing it (Shirberg, 2002).

Educational institutions, especially those of higher education, are the main responsible for the spread of knowledge in the society. They train most professionals who take positions of decision (Trigo et al., 2014). Calder and Clugston (2003) define a sustainable university as the one that helps students understand the degradation of the environment, which motivates them to seek environmentally sustainable practices and sensitizes them to current injustices.

To learn to think for oneself, releasing oneself from conditioned assumptions about the world, about the others and about oneself, is crucial for the labor market, for citizenship, and for moral decision-making in a rapidly changing society (Closs and Antonello, 2014).

A healthy environment contributes to public health and the veterinarian graduated in our universities must be integrated into this process. The Veterinary professional acts in zoonoses, contamination of products of animal origin, animal production and all that has consequences on health and food safety and

this has a narrow relationship with sustainability, as they avoid damages to natural capital in the long term instead of short-term benefits that include health aspects (Frazzoli and Mantovani, 2010).

For this purpose, professional training must contemplate sustainability in its educational processes so that the professional of the future is prepared to deal with the intrinsic complexity of the present time. In the last decades, we have witnessed the advent of the discourse of sustainability as the dominant expression in the debate involving environmental and social development issues (Lima, 2003). To teach sustainability, schools need to be more sustainable, as this is the perfect place to learn, to take the initial steps by changing some attitudes (Figueiredo, 2010). It is necessary to find some interaction mechanisms in human societies occurring in a harmonious relationship with nature. "In a sustainable society, progress is measured by the quality of life (health, longevity, psychological maturity, education, clean environment, sense of community and creative leisure) rather than just material consumption" (Ferreira, 2005).

To modify the school, it will be imperative to modify, above all, the training of its teachers (Camargo and Wolf, 2008). In this sense, Moraes (1998) points out that we must work from an early stage with terms such as sustainability, to form citizens aware of environmental values and to practice sustainability. There is a diversity of intentions and strategies that teachers use to expose the phenomenon of sustainability. Some teachers consider sustainability and teaching as themes of difficult relationship and because of that do not allow the theme to be part of their teaching (Sherphard and Furnari, 2013). The training of teachers in a liquid world, as Zigmunt Bauman tells us, which is in a constant change needs to prepare students for a global society that requires that different aspects, such as sustainability, are attended. Schools are filled with students with a diversity of cultures and values that need to be prepared for global society (Freire, 2007).

According to Camargo and Wolf (2008), the solution is not to make sustainability a compulsory discipline in the curricula, but in school environmental education we must emphasize the study of the environment where we live, where we are integrated and from that, to raise the main problems of the community, the contributions of science, the knowledge needed and the concrete possibilities for solving them. Sustainability is bound to a number of meanings, the most common one regards the quality of what is "protected", "preserved", "prevents the decay," and "encourages." Since, more important than support preservation, is the need of mobilizing new attitudes of parents, students, teachers, and community, among others, in order to avoid environmental exhaustion. This working from the perspective of curriculum content as well as from the management of physical resources and business in the school daily routine (Figueiredo, 2010).

3. METHODOLOGICAL PROCEDURES

This section describes the procedures needed to be performed for the execution of the research. It starts with the characterization and delineation of the study, the description of the population, the instruments used for data collection and the way in which the collection was done, finishing with the methods of data analysis

3.1 Study characterization and design

This study was carried out at the University of Cruz Alta, in the Middle Plateau region of Rio Grande do Sul, specifically in the Veterinary Medicine course. The campus of the Universidade de Cruz Alta is in the geographical coordinates 28° 36' S latitude and 53° 40' W longitude at 409 m above sea level. The climate of the region according to the classification of Köpen is the Subtropical Cfa with average air temperature of 18.7°C, average minimum of 9.2°C in July and maximum average of 30.8°C in January. The average annual precipitation is 1,721 mm, well distributed throughout the year.

This study used a quantitative approach, classified as descriptive which, according to Vergara (2011), aims at describing the phenomenon as it happens with no attempt to establish a cause and effect relation, a fact corroborated by Gil (2010) who states that the descriptive research aims to describe in a general way a phenomenon or characteristics of a certain population. As for the means, the research can be classified as a case study because according to Gil (2010), the case study refers to a study of a given reality. An analysis of the curricular curriculum of the course was carried out to verify the existence of subjects related to sustainability or even specific subjects and a confrontation with the PDI and PPC of the course was performed, characterizing a documentary research.

3.2 Population and sample

Veterinarian students of *Universidade de Cruz Alta* (Cruz Alta University) interviewed for this study were those who attended the last semesters of the course or who had completed at least 75% of the credits, making a total of 91 students, of which 34 were from the seventh (7th), 25 from the eighth (8th) and 32 of the ninth (9th) semester. Because the students in the tenth (10th) semester were at the final stage of the course, no questionnaires were applied to them, since they were studying at the most diverse locals, even outside the state of Rio Grande do Sul, making it difficult to carry out the research. The number of the students who answered the questionnaire were 69, 16 and 21 from the 7th, 8th 9th semester respectively.

3.3 Data collection

As a research tool, questionnaires structured with ten statements with Likert scale were used using 5 scales ranging from 1 totally disagree to 5 strongly agree. A scientific initiation student was responsible for collecting data and going to the classes to apply the questionnaires. To validate the tool, a pre-test was performed with 10% of the students to verify the time spent in the answers and their understanding of the tool.

Once the tool was validated, the questionnaires were applied in the classes of the 7th, 8th and 9th semester of the veterinary medicine course, where the teacher of the discipline was asked to allow the application of the research in his or her class, which was promptly attended in all situations thanks to the understanding of the teachers of the course.

3.4 Data analysis

As data were available, they were tabulated in the Excell software and later statistical analyzes of the frequency of the answers were done and plotted on the Boxplot graph where the distribution of the data

showing the upper, minimum and median values of the responses were evaluated. This distribution of the data in the boxplot provides evidence about dimension, asymmetry, and extreme or atypical values (outliers or discrepant values).

4. RESULTS AND DISCUSSION

In this section, it will be discussed the results found in the study in general, analyzing the final three semesters of the course where the students already had completed at least 75% of the course subjects. In the Figure 1 shows the quartile distributions of the general data corresponding to the 7th, 8th and 9th semesters of the Veterinary Medicine course.

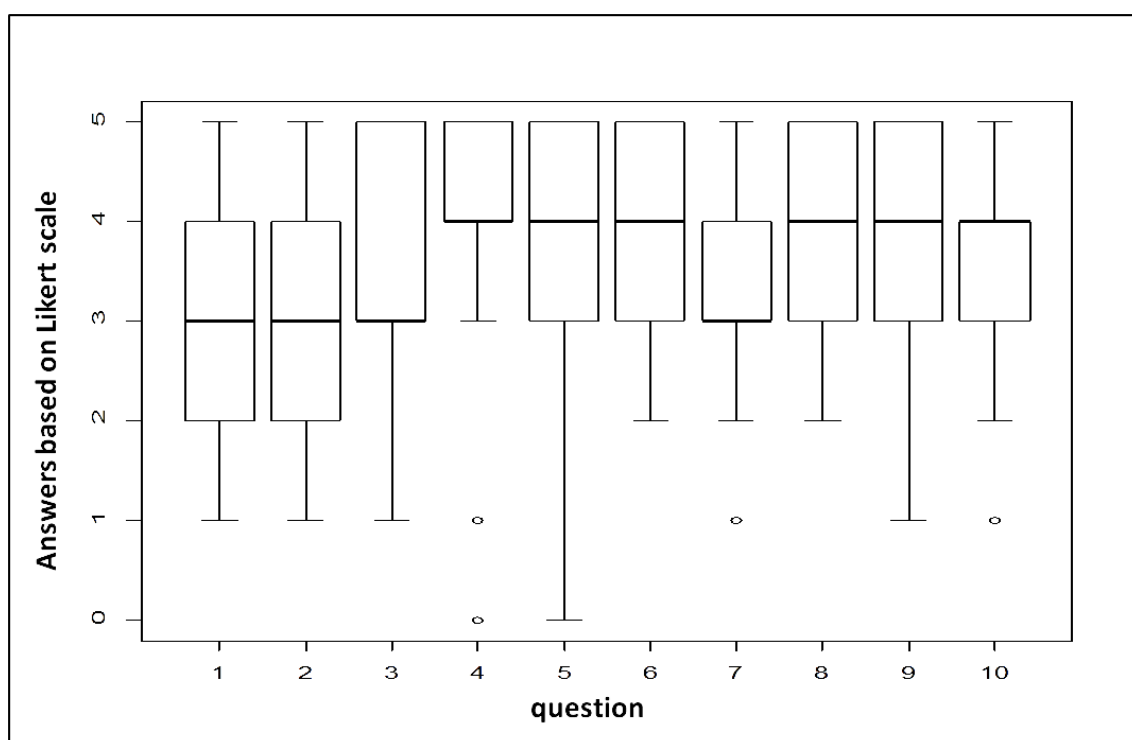


Figure 1. Distributions of the answers regarded to the importance of sustainability in the training of the veterinary medical doctor.

In the case regarding statements 1 and 2, which ensures the existence of specific discipline in the curriculum and that the subject would be approached transversally in the course, the graph shows a certain symmetry between the answers, divided by the value of the median where it is in the center of the answers. There were no outliers or discrepant data, with the occurrence of answers that comprised the maximum value as well as the minimum value. This shows that there is a certain lack of knowledge about the curricular constitution of the course itself and little inclusion of the subject in other disciplines of the course. Sustainability does not necessarily have to be present formally in the curriculum, what is more important is that it is approached, related and integrated to the other disciplines of the course (Zamberlan et al., 2015).

Statement 3 is about the need for the existence of a discipline when the theme is treated transversally in the other subjects and themes of the course. Most of the answers were concentrated in the third quartile,

showing that the answers are above the median value, with some answers that reached the minimum value. This shows that in the perception of the academics, there would be no need to have a specific discipline if the theme was treated transversally in the other curricular contents and that sustainability would be better understood when contextualized. An argument that reinforces the presence of sustainability in the training of the veterinarian is stated by Pfuetzenreiter et al. (2004) that the veterinarian's extensive training qualifies them to perform generalist functions since their training is multidisciplinary in nature, the directions, the human beings and the animals.

The objective of the following statements is to verify the degree of importance and applicability of sustainability in the veterinarian profession. The affirmative 4 sought to verify if sustainability is a fundamental factor in the anthropic actions and if so, it is a consequence in veterinary medicine. The graph shows a great asymmetry, where most answers totally agree that sustainability plays a preponderant role in human actions, located in the third quartile, in the upper part above the median with a high degree of agreement. However, in this case, there were discrepant data or outliers where they stated that sustainability is not fundamental. This often reflects the lack of knowledge of what sustainability really is and its lack of contextualization together with the chosen future profession because it is difficult to visualize where social, environmental and economic aspects are interrelated.

Statements 5, 6, 7 and 8 are related to the practice and the intimate relationship between the subject and the profession. It tries to identify in the students their ability to relate to professional practices and procedures. In statements 5 and 6, the data are located in the third quartile, that is, they agree that sustainability is related to animal production and also the practices commonly used by veterinary medicine in their day-to-day professional life. In this case, the median that separates the third quartile, with the highest concordance data, from the data of the first quartile, with the lowest concordance, is higher than the others, denoting that the degree of concordance with respect to these statements is much higher. A very low minimum datum was found in statement 5 and another in statement 6, resulting in a large number of answers corroborating with the greater value, that is, the superior value. This means that sustainability is viewed by academics as an important subject and that it has high relation with the profession and its practices, being fundamental for their formation.

The degree of agreement was also high. This fact of being related with the area is supported by the study of Souza et al., (2010). Those authors observed that disciplines such as environmental sanitation and surveillance are already part of at least 22% of the courses in veterinary medicine. Cifuentes (1992) states that in order to carry out activities related to the environmental field, the veterinarian should have general knowledge about environmental sciences, as well as knowledge about environment-illness relationship, agricultural activities and their relationships with the environment and basic technology for protection and sanitation.

Statements 7 and 8 verified the relationship with medicines and residues generated by the professional practice in its range of activities and locations. In statement 7, most of the data were asymmetrically located in the upper quartile above the central median, with an outlier or discrepant data that completely moved away from the mean of the answers. Most of the data in this case partly agree, and

perhaps the students see that responsibility for the drugs used is intrinsic to the manufacturers and that their co-responsibility lies in simply properly disposing waste and packaging,

This evidence corroborates with statement 8, which is in fact related to residue management. In this case, the median is at a higher position and the data are distributed in quartiles with higher values, that is, it agrees that management in a rational way contributes to sustainability and eventually it has a relevance in the profession. It can be found in this question a high degree of concordance of most answers. No discrepant data were found in this case and one answer achieved a minimum value.

In relation to statements 9 and 10, they are more objective and consider identifying the perception of the students regarding the concepts of sustainability and its integration to the professional training and whether these are easily applicable to the veterinarian profession. Regarding statement 9, most answers were found in the upper quartile with median also high in relation to the degree of agreement. Only one minimal value was found and 50% of the answers were in the higher value range, indicating that the concepts are indeed fundamental in the training of the veterinarian and the professional needs to be prepared to apply them in his or her day to day professional life.

Regarding question 10, it seeks to verify the applicability of concepts and fundamentals of sustainability in veterinary practice. In this case, the answers are asymmetrically distributed and located basically in the central position, and there are also those who attributed superior and inferior values in the answers, with the occurrence of an outlier or discrepant data. This gives an indication that the transmitted concepts are disconnected from the practice, decontextualized. This observation shows the importance of working towards sustainability in a transversal way in the other disciplines. Somewhat that may be attributed to training a teacher who does not feel confident in working with this subject, and the difficulty of identifying a link between sustainability and content, not just by having a specific discipline, which was observed in the statements 1, 2 and 3. This fact is supported by Zamberlan et al., (2015) who, when studying Business Technical course found that when the teacher does not have the knowledge and the perception about sustainability, this is not a guideline for the classes and contents.

However, the dispersion of the data of the analysis was concentrated in the upper quartiles, that is, in higher degrees of agreement, denoting that students do indeed recognize that sustainability is relevant in their formation, but that there is still a lack of information and it should be treated in an integrated and transversal way in the course subjects.

5. CONCLUSION

By rescuing the objective of the study, which was to verify the importance given by the students of the veterinary medicine course to sustainability in their formation, a series of interesting aspects such as the clarity with which the students exposed that the sustainability should be part and must be worked on in the course. That there is specific discipline in the first semesters (Ecology and Sustainable Development) and that the theme should be integrated with the other subjects of the course. The precepts and dimensions that are the foundation of sustainability are fundamental for their training and the professional practices of the future veterinarian.

They see in sustainability an intimate relationship with the profession, with animal production and that it is related and integrated with several intrinsic activities of veterinary medicine, and they are aware that the environmental management of waste, clinical and surgical materials supplies are necessary. However, they do not feel co-responsible, for example, when manufacturing a drug or a veterinary product, attributing it to the company from the beginning of the supply chain.

Nevertheless, they do recognize that sustainability is important for their professional training and that the market requires veterinarians prepared to act and work in a new reality, where sustainable development is the tool to maintain the integrity of the planet for future generations. However, while this relevance was perceived, the students find it difficult to visualize and operationalize sustainability in their veterinary practice. This may denote that training is disconnected from the current context and that the theme is not handled transversally in the other disciplines of the course.

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DIAGNOSIS OF BRAZILIAN SCHOOL TEACHERS ABOUT THE PREVENTION AND USE OF CRACK BY THE NEW COMMUNICATION TECHNOLOGIES

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Abstract

This article presents a study on awareness about the use of illicit drugs, more specifically crack, first seen as a health problem, allowing a reflection on the possibilities of improvement in the training process for professionals in the area of education, with emphasis on the public network. Based on the information obtained by the research carried out with a sample of teachers, the massive availability of databases and scientific journals is a salutary alternative to the dissemination of scientific and systematized knowledge. The populations studied are part of a region concentrated around centers of excellence in research and dissemination of information through Information and Communication Technologies as innovative tools at the service of educational institutions in this multidisciplinary initiative. The study leads to a worrying reality, considering the importance of the professionals studied in the prevention and care to the drug user in the figure of the student.

Keywords: Crack; Prevention; Teachers; Technologies.

1. Introduction

One of the most important social problems today concerned to the abusive use of psychoactive substances. In Brazil, crack cocaine, which has defined as a "devastating drug" due to its physical, psychic and social effects, stands out. The easy access and low cost made the drug a worrying dimension for Brazilian public health, especially in large urban centers, such as in the metropolitan region of São Paulo. However, crack

has been breaking social and geographical barriers, becoming a specific challenge for educators regarding the prevention of their use and the treatment of addicts. Among the difficulties to deal with this issue is the need to improve the qualification of primary and secondary school teachers, who play a great role in preventing the consumption of addictive chemical substances.

This training faces difficulties that go beyond the knowledge of scientific concepts. In this constantly changing scenario, fast, complete and reliable information must be available and accessible to education professionals, so that they act based on reality, respecting the peculiarities of the place where they intend to intervene. Information and access are paradigms that penetrate the reality of individuals in a predominant way, which builds paradoxes. The construction of more effective preventive actions, with the aim of minimizing the problem of drug abuse, will depend on the type of information that one has on the subject, favoring attitudes more tolerant or more restrictive, depending on the constructed archetype.

In the educational environment, Information and Communication Technologies (ICTs) have become present even more, either indirectly, when the student brings with them their smartphone, or when the institution provides technological means to mediate education. The latter seems still to be an objective to be achieved due to the preconceptions and limitations that professionals have in using technological resources to mediate teaching-learning practice. The fact is that, if well used, these technologies bring to the educational environment a pool of possibilities that seemed unthinkable in the context of traditional technologies such as chalk and blackboard. It is unquestionable that with the information processing capabilities of today's computers, any educational process becomes even more dynamic.

This kind of challenge imposed on education professionals is confronted with the reality lived in many institutions, mainly public, that are deprived of preparation and technological material to accompany the transition from a content reality to one in which the formation of new knowledge is predominant. For Ayres, Araújo and Kamimura [1], education today, more than ever, needs to be rich in resources, empowering its public to build new knowledge and develop their capacity to think, create, express themselves, participate and decide. Therefore, it is questioned how education professionals use ICTs in their training and updating of knowledge. Most developed countries are investing in the use of ICTs in schools and in the renewal of educational projects.

It is important to emphasize that ICTs equipment infrastructure, Internet access, increased professional training and content creation and digital learning methods, are part of this financial incentive. At the end of the 2000s, it was possible to begin to recognize in Latin America a series of advantages that ICTs can bring to education, whatever the pedagogical model adopted. Data from the United Nations Educational, Scientific and Cultural Organization - UNESCO (2010) state that investments in Technology and Communication, geared towards educational projects, are increasing in the countries of Latin America and the Caribbean.

In Brazil, government initiatives to encourage the use of information and communication technologies in Brazilian public schools date back approximately 1996. This means that the Brazilian governments took a long time to promote concrete actions in this area. In particular, in the last decade, all governmental spheres have instituted public policies aimed at the digital inclusion of the population in Brazil. It is worth mentioning the joint actions of the federal and state governments through initiatives such as the National

Program of Informatics in Education (Proinfo), which has implemented internet access in public schools. According to the Unesco Report (2015), the entity aims to cooperate with the Brazilian government through the dissemination of ICTs in schools, with the purpose of improving the quality of the teaching-learning process, considering that digital literacy is a natural consequence of the frequent use of these technologies. In this context, the Ministry of Education had the goal of universalizing computer labs in all public schools by 2010, including rural units. Unesco also supports and cooperates with the TV School Program, with the aim of exploring and encouraging the convergence of digital media, seeking to increase the interactivity of television content used in face-to-face and distance education for almost the entire national territory.

This reflection about the use of ICTs is justified by the physical, psychological and social consequences of the consumption of crack for its consumers, as well as the enormous burden generated for them, since they require that the professionals involved in their fight have access to up-to-date and fast information in order to achieve success in their actions. Regarding the use of psychoactive drugs, the literature shows that access to information is deficient and that the use of the technological resources currently available in the area of informatics, with a view to incorporating new knowledge and research, is very timid. It should be emphasized that these new technologies can be a support alternative to improve this situation, since its use has been previously conceived and improved by education professionals, which, it is believed, optimizes the use of information.

The drug theme is a multidisciplinary content, but it has an emphasis on the discipline of biology, directly in a very brief way. There is an informal dissemination of this theme on related subjects. As most content transmitted through formal education in schools at all levels is fragmented and sterile knowledge, unrelated to the real life of children and adults, the educational process, rather than being formative, becomes times in a bureaucratic ritual of memorizing and repeating useless information that penalizes the most creative and non-conformist people. The most fervent adepts of this critical view of education have gone so far as to decree the end of formal school, proposing its replacement by a variety of informal, spontaneous and non-hierarchical mechanisms for transmitting knowledge and developing creativity and competence on a personal level. However, just as the formal school cannot promote social progress alone and reduce social inequalities, its elimination could have the same effect, further increasing the serious socio-economic problems we face today, including, in this case, the use of crack by students, especially in public educational institutions.

Nowadays, in order to become a reality, the idea of the Welfare State that prevails in developed countries needs to rethink and review the needs of the generation of adults and a new generation of young individuals, children and adolescents, with a view to the implementation of a democratic education. Education, then, is not for society but the means by which it prepares the essential conditions of existence itself in the innermost parts of children [2]. Still, according to the sociologist, the main function of the teacher is to educate citizens capable of contributing to social harmony. In his conception, education aims to elicit and develop in the child physical and moral states indispensable to the political society as a whole.

Following this line of thought, if education is detached from the historical context, it tends to become merely the exercise of individual will and development, which for Durkheim was incomprehensible: "How can the individual intend to rebuild, through the only effort of his private reflection, which is not the work

of individual thought?'. He himself replied that the individual only acquires the capacity to act insofar as he learns to know about this scenario, to identify its origins and the conditions on which it depends to interact socially. This is not possible without him attending school and beginning to observe the raw material that lies there to be stoned. Through his contribution to the development of world-level education, the sociologist Durkheim can be considered one of the mentors of the republican ideals of a public education, monopolized by the state and secular, thus free from the influence of ecclesiastical doctrines. In this way, the objective of this study is to present the teachers' perception of the Brazilian basic cycle about crack, including the level of knowledge about the drug and the way the teachers approached this subject. This description contributes in a singular way to the understanding of the phenomenon in the educational universe and generates concrete hypotheses about the influence of one actor over the other in this universe crack and education.

2. Materials and Methods

For this study, the qualitative methodology were chosen, since some characteristics of this method help the development of this work, as well as the scientific knowledge as a product of a "constructive-interpretive" view [3, 4]. It consists of a new way of looking at the empirical world [3] and the data cease to "speak for itself". The interaction between the researcher and the object of study is indispensable for the production of knowledge [4], and finally, the significance of the singularity as a legitimate level of knowledge production: singularity constitute as a differentiated reality in the history of the subjective constitution of the individual [4].

For some analyzes, descriptive statistics were used to represent the relative frequencies of sample characterizations. The understanding can be describe through the discourse of teachers of the Basic Cycle (Middle and Elementary Education), the sources they use to inform themselves and the knowledge they have about the technologies of access to information. The study was composed of education professionals. The study sample followed the intentional precept. The qualitative approach does not favor the numerical criterion and does not seek a statistically representative sample [5]. Therefore, instead of randomness, was chosen the purposeful or intentional sampling [6], choosing as participants those who experienced the social phenomena under study, the so-called information-rich cases [7], seeking the largest possible variety of cases within the sample, in order to contemplate the different perspectives of the phenomenon.

The sample size was not determined a priori, that is, before the start of the study. The participants were selected in a continuous way until the theoretical saturation point was reached, at which time the information became repetitive, redundant or recurrent [7, 8, 9]. The ideas conveyed by one participant that had already been reported by others and the inclusion of new participants did not result in additional insights or information that could indicate new perspectives of the phenomenon, indicating that selection should be discontinued [7]. Although the sample is not statistically representative, it does not mean that the sampling process has not been systematic [7], being defined through the adoption of special sampling techniques [6]. One is sampling by criteria, the so-called inclusion criteria. Whereas the present study analyses the social phenomenon as the identification of the sources of consultation in the universe of ICTs, used by education professionals of the Basic Cycle to aid in the formation and updating of knowledge about crack. It includes

also the exchange of experiences and development of health education programs, the criteria were: education professionals involved with the drug / crack theme, with origins in the public and private network with working time in the area for more than two years and different ages.

It was been considered that the realities of public and private networks are different in terms of information, and the possibility of younger professionals having a greater identity with technologies have led to a differentiation of age groups. The two-year period in the teaching profession was a measure of safety in the sense that the newly enrolled in the profession was not included in the sample. The sample selection came from the participants in the metropolitan area of São Paulo, the largest city in Brazil. For the recruitment of education professionals, the strategy was to list two initial professionals - the gatekeepers - who started to indicate the others in the selection process. We define gatekeepers as those who collaborate to find the interviewees, who have some connection with the target population, facilitating the approach of the researcher with this population [10]. Therefore, education professionals were necessarily teachers of Science or Biology, depending on their participation in the educational process.

The gatekeepers indicated the first interview. After the identification and selection made by this group of professionals, the chain sampling technique was applied [6]. Within chain sampling, a special case is the technique of snowball sampling, or "snowball" [6, 11]. Biernack & Waldorf [11] described it as follows: the first respondents will present the second ones, these the third ones, and so on. Different chains of interviews were been studied as many as necessary to understand the theme, according to the saturation point. To ensure a sample with a different profile was been taken that the intra-chain components were similar and the inter-chains, quite diverse, unrelated [6].

The main resource in qualitative research is discourse. Speech is revealing of structural conditions, of value systems, norms, symbols [12], emotions, anxieties and anxieties [13]. In this sense, the interview consists of an interactive tool in which the establishment of the investigator-researched bond fulfills an essential function in the quality of the empirical indicators produced [14, 3, 4, 15]. The great advantage of the interview is that it allows access to feelings, thoughts and intentions, capturing the desired information in an immediate and current way, allowing corrections, clarifications and adaptations [15].

With the participants of the sample by chains, a semi-structured interview was been conducted that was characterized by the use of an interview with themes/questions that helped the researcher. As a formal interview, the semi-structured, has been an open character, but the interviewee focused exclusively on the proposed theme, constantly controlled by the researcher so that this condition was preserved. This type of interview allowed flexibility to the researcher who withdrew or introduced new questions according to the findings that he was making throughout the interview and the need for deepening [16].

The analysis of the results defined as content was been based on the procedures of organization and interpretation of the data as suggested by Bardin [17] and had as instrument facilitator, mainly for the organization of the data, the NVivo software. For this reason, the interviews were been recorded, with prior agreement of the participant, and each recording was duly identified. Then the transcription process began, which took about an hour, each. Since transcripts are raw data, they do not provide explanations, so they need preparation and interpretation procedures. Therefore, the transcripts were been submitted to a rigorous analysis process, following the floating readings (each interview was been read and reread, allowing the

investigator to get in touch with the material). The exploratory procedures employees in order to allow hypotheses about the phenomenon to begin to emerge; preparation of the material: stage in which the interviews were been divided and regrouped according to the script questions.

During this process, first, each interview was been coded, that is, it was broken up according to the script. The printed reports were been evaluated individually and transformed into thematic tables, in order to allow the treatment of the results. The thematic tables contain a summary of the experiences and points of view of the interviewees, allowing the abstraction and synthesis of the data. Finally, through the thematic tables, concepts were been defined, mapping the nature and extent of the phenomenon, creating typologies and associations, in order to obtain results and hypotheses regarding the subject of study of this research. It is important to emphasize that the process of mapping and interpretation was been influenced by the original objectives of the study, as well as by the themes that emerged from the analysis process.

As suggested by Patton [6], we chose three forms of triangulation: techniques used in data collection (snowball technique with individual interviews); data source data analysis (categorization and inference by two researchers). Such procedures guarantee the reliability and validity of the qualitative data that will obtained. In this research, triangulation occurred with the presentation of the results so that two other independent researchers - selected by the principal investigator - could do the methodological process of reading and preparation, which consists of the classification of the testimonies. The study was been submitted and approved by the Ethics Committee of the Federal University of São Paulo, under number 0632/11.

3. Results

From the large sample, 30 teachers from the Basic Cycle (Elementary and Middle School) from public (14 teachers) and private (16 teachers) schools were interviewed. The performance of teachers in the extracts of the Basic Cycle was 33% working only in High School, 23% working in Elementary School II and 43% in Elementary and Middle School. When asked about the frequency with which they approached the subject of "drugs" with their students, they all stated that they approached it when the specific content was been reached in the curricular matrix of the courses or when they lived the reality of having some of their students exposed to this circumstance. Unanimously, the teachers said they deal sporadically with the theme.

Asked if they knew the crack and what they could say about it, all respondents said they had heard about the drug. However, they gave superficial detail about what they knew about her. When they said: "they had already heard about the drug", they report that this contact was been made through the students - "students usually talk about crack" - or the media - "this is constant, in all means of communication nowadays talks about it "; "I've heard of it. The media also notice this almost daily"; "Yes, I have heard of news, study objects, too". When asked what they knew about the drug, participants described several elements, which were been summarized in frequencies in Table 1.

Table 1 - Frequency of knowledge about crack

| Knowledge | Frequency | % |
|-----------------------------|------------------|----------|
| Causes addiction | 16 | 33% |
| Causes organic damages | 11 | 22% |
| Cost of acquisition | 7 | 14% |
| Social effects | 5 | 10% |
| Origin of the drug | 4 | 8% |
| Psychic effect | 3 | 6% |
| Know nothing about the drug | 2 | 4% |
| Forms of use | 1 | 2% |

It is possible to observe the greater frequency of citations refers to the capacity of dependence of the users, followed by the ability of the drug to cause damage to the organism. Some words are constant, such as: "from the moment one starts using this type of drug, right, crack, I think it's very difficult for him to get out, right, not impossible, but difficult"; "It's a highly addictive drug". Some have the perception that little use is already capable of inducing addiction: "I also know that the user, from the first time he uses, he feels addicted, he already has a habit addicted to consuming more. Interviewees were been asked how they did the professional approach to crack in the classroom. Of the respondents, 32% do not approach the subject with their students, even though it is predict in the curricular matrix of the Basic Cycle.

Table 2 - Frequency of answers about the professional approach of teachers of the Basic Cycle.

| Answers | Frequency | % |
|-------------------------------------|------------------|----------|
| Guidelines on Drugs | 11 | 39% |
| Development of educational projects | 4 | 14% |
| Does not address the issue | 9 | 32% |
| Real situations | 2 | 7% |
| Use of teaching materials | 2 | 7% |

Participants, for guidance on drugs, describe that they professionally approach the subject of "crack" in order to guide their students about the drug. In no instance has there been a pharmacological or psychic citation, but rather the orientation regarding the family and social harm that the drug brings to the individual, highlighting concern and advice so that students do not engage with drugs in general. Another group of quotes on types of professional approach deals with the development and use of educational projects to expose the harms of crack and drugs in general. Probably, this generalization is due to the curricular matrix approach the drug theme in a generic way and there is no specific concern with one or another type of drug. No major reason for not engaging the professional in the work with this theme was been highlighted. However, it was been noticed discreetly, through the speech of these participants, that there is no preparation to develop the subject with the students.

It was noticed the insecurity of the professional when approaching the subject in function of the possibility of the speech to the students to be interpreted as apologia to the drug and, in this case, instead of to prevent the use, to stimulate it. It was also been observed that when there is a discreet performance of the

professional, this is accompanied by an empirical and very personal comment of the teacher. The teachers interviewed also use real situations, lived or not, close to them, to create a working tool with their students, as it was been observed. Associated to this exists the reality for some institutions and professionals where the student, even young, has already have been involvement with drugs or, in particular, with the crack. In these cases, there is a fear of the teacher in approaching the subject with greater tranquility so that the subject does not become personal to the student. The subject "drugs" is approach in the curricular matrix of the Basic Cycle, officially, in a summarized and discreet way, but it is present in didactic material. However, there was a very fraction of citations made by education professionals when approaching this resource as one of their technical tools for use in their professional life. The teachers of the Basic Cycle were been openly questioned about the sources of information they used to inform and train about crack. Table 3 shows that the majority of the sample (35%) reported using the Internet as an information tool, generating a predominance of the use of this tool as a source of access to information. We did not detect which sites are been used, however, by the interviewees' description, only internet search engines are used. It was also been observed that there is no tendency for younger professionals to have more affinity with the internet than older ones.

Table 3 - Information source for crack training

| Source of Information | Frequency | % |
|---|-----------|-----|
| Internet | 20 | 35% |
| General Media (Newspapers, Television, Magazines) | 14 | 25% |
| Books | 7 | 12% |
| Third-Party Experiences | 4 | 7% |
| Teaching Material | 3 | 5% |
| No Search Information | 3 | 5% |
| Health Professionals | 2 | 4% |
| Academic Works | 2 | 4% |
| Religious Group | 1 | 2% |
| Courses | 1 | 2% |

For the 5% frequency of citation on information source, Didactic Material represents the pertinent content to the curricular matrix of the students of the Basic Cycle. Already for the three participants who cited the textbook, it was clear that this is the only source of information used to get information about crack: "well, we get material from the State, right, didactic material". Within the group of didactic materials, the books were been remembered for 12% of the citations described and reflect a tendency of the teacher to use the didactic material. Therefore, in the variable "Books" the researcher understands that the interviewee refers in fact to the didactic material offered.

With the highest percentage of citations (35%), the internet was been declared mostly as a source of information about crack. Despite the generic internet citation, respondents refer to the Internet as tools, search engines, which make available and take to different sites, information websites. As perceived in the previous question, for some professionals the empirical experience is a great source of information and access to the theme. These reports were present for these professionals, especially for their contact with a needy public. After the internet, the general media (newspapers, magazines, television) was the source most

cited by the interviewees (25%). For them, these sources are the most used for training and access to information about crack and other types of drugs.

After they were been questioned about the sources of information that the teachers used to inform themselves and to train about crack, they were asked about the reasons for using these channels. According to Table 4, it was been observed that, for 39% of respondents, ease of access, in general, is the main reason. This ease of access is associated with Internet users as a source of information.

Table 4 - Reasons for searching the specific crack information

| Reasons | Frequency | % |
|-----------------------|-----------|-----|
| Ease of Access | 9 | 39% |
| Reliability | 6 | 26% |
| Greater clarification | 4 | 17% |
| Specific Content | 4 | 17% |

When they say that reason is enlightenment (17%), they refer to the breadth of information that channels offer. It is also been noted that the internet is again referenced as a source of quality. That is, it offers not only ease of access, but also breadth of information. In the variable "Greater Enlightenment", the media in general (newspaper, magazines and television) is also highlight. It was also mentioned the capacity of the television to generate specific content and that this facilitates the capture of information.

The second most cited reason, reliability (26%), was the ability of the information vector to generate reliable information. For those interviewed, this is a good reason for choosing sources of information.

There is also a specific criticism that the internet is not a reliable source of information and that other media (television, for example) are more discerning. However, another participant pointed out that "[...] on the internet the information is more up-to-date. The books, in this case, are more like this, in fact, are so magazines of information that we receive from the board of education to work for us". When questioned about facilities or difficulties in the mentioned channels of information, respondents remember the internet more often. The centralization of citations to the internet and its characteristic of easy access to the information are out of the other percentage of frequency. It was been noticed that the quality of the information is not an item reinforced in the citation of the teachers.

Table 5 - Facilities and Difficulties - Information Channels

| Reasons | Frequency | % |
|-----------------------------|-----------|-----|
| Ease of Access | 10 | 42% |
| No Difficulty Level | 4 | 17% |
| Erroneous Information | 4 | 17% |
| Need to Confirm Information | 4 | 17% |
| Quality of Information | 1 | 4% |
| Updated Information | 1 | 4% |

For 17% of citations, there are no difficulties or problems in the use of information channels. This information is reinforce in the speech of these participants: "In fact, I found no difficulty at all. On the contrary, I found it super simple, the search and the result". Just one quotation emphasized the timeliness

of the information available on the internet. In this quote are the enhancement of quality in the ease of access to the media and its opposition to other media. It was also been reminded by the participants that the internet contains many erroneous or unreliable information. In the participants' speech, it shows how difficult it is to use this channel.

For 42% of the citations in this question, which indicated the internet as a medium of access to information, the ease of access stood out as a relevant perception. There were described numerous possibilities for easy access to information and how to disseminate it among students are described. Another relevant point was the association, the interview, the ease of access, the technological resource and the age of the students: "I think that use the internet is an easy reach channel for students and their interest in technology". "Well, I think that, like everything else, on the internet, the facility is very large, if I click there, it will be easier to use the Internet search engine as a tool for optimizing the location of the information". "If I put the subject in a subject finder there, you're going to have a list of a million subjects involved in it". It can be seen that the interviewees (56%) tended to state that the mentioned channels offer complete information, which makes them feel satisfied, qualified or well informed (Table 6).

Table 6 - Effectiveness of communication channels in providing information

| Effectiveness | Frequency | % |
|--------------------------------|-----------|-----|
| Provides Information | 14 | 56% |
| Provides Partially | 6 | 24% |
| Leaves something to be desired | 5 | 20% |

The remainder is divide into those who feel partially informed and empowered and those who report that the media offer information of dubious quality, failing to provide the training and good information they deem necessary. Those who cited being well informed or empowered with the chosen medium of communication referred to the internet as media. Among the justifications described to corroborate this assertion is the dynamism of circulating information on the internet: "Well, from what I saw, in my opinion I do not think there are any. Even because they always so reporting new and discovered things. I think it's always recycling what's there."

It is also reveal the dynamics of updating the internet as a factor of importance in the training and in obtaining information for the participants of this research. Among those who stated that the aforementioned means of communication partially provide information, the main justification lies in not all the information provided by television or even the internet: "Sometimes what you, for that particular subject that you find, maybe yes, not totally, but be it, but there is still something more that you cannot find". There is a consideration that the channel should be improve and the information more willing: "I think it helps a lot, but could be improved, should have more information, because there is still little, especially on crack". For the 20% who say they find their media deficient in providing information and/or enabling them, they cite mainly the internet - similar to those that consider it efficient - as the main media that leaves something to be desire, not considering others, such as television, newspapers or other channels.

Table 7 presents the clouds of citation on what respondents consider necessary for good training. It is important to point out that for 31% there is no need for additional training, since the resources they already use, be it the television, the newspaper or the internet, already enables them.

Table 7 - Resources that the interviewee considers necessary for their training

| Resource | Required Frequency | % |
|---|--------------------|-----|
| Satisfied With Current Assets | 8 | 31% |
| Specific Courses | 7 | 27% |
| Educational Lectures | 4 | 15% |
| Professionals Specific to Educate | 4 | 15% |
| Living in a Truthful Situation | 2 | 8% |
| Greatest Pedagogical Approach in Thematic Crack | 1 | 4% |

In the 15% who mentioned the need for lectures, it was notice that they felt the need for a greater interaction between community, school and participants: "had to have lectures, had to have projects, right, on the subject of crack inside the school, calling the parents and the community". In general, these interviewees cited "talk" as a simple resource that could favor information and professional qualification. Following those who stated that they were satisfied with their communication and training channels, those who mentioned the need for specific courses (27%) came. They complain about the shortage of courses offered to teachers, mainly in the public network and the lack of time of these teachers to dedicate themselves to this modality. They still justify the little preparation to deal with the issue pointing to the lack of opportunity to attend a course that addresses the drugs theme.

The obstacles cited by the interviewee, difficult to solve, distract the teacher from a more adequate training. Another lack observed was the existence of a specific professional, already qualified, who could offer this training. There have also been citations that teachers, in particular, demand from other professionals such as, for example, those in the health area to have a specific training when they consider it necessary. It has realized that these professionals are insecure to address specific issues. Respondents asked about the use of information resources beyond what the institution offered. The comparative analysis between the interviewees and their corporate origins demonstrated a dichotomy of responses. Among teachers in public schools, a statement was predominant that the institution does not offer resources for training. Already, among the private institutions, the internet has predominated as an auxiliary tool for seeking information.

Table 8 - Tools used by teachers besides what is offered by the institution where they work

| Resource | Required Frequency | % |
|------------------------------|--------------------|-----|
| Internet | 10 | 37% |
| Institution does not provide | 10 | 37% |
| Diverse Media | 3 | 11% |
| Children's Books | 2 | 7% |
| Third Party Experience | 2 | 7% |

The internet emerges as a great resource for searching, even when considered complementary. The current school model does not consider the digital insertion in the classroom, so for teachers, the possibility of accessing online environments in the institution is an important resource. There is also the perception that the internet has democratized and consolidated access to information. For 37% of the declarations, the institution does not provide additional resources. As stated earlier, public school teachers converge on these discourses.

Three citations (11%) aimed to seek information in the media, such as television, newspapers, magazines and others: "television, newspaper, magazines, professionals who somehow have contact with people who use this kind of narcotics or information beyond what they is disclosed". When questioned about the existence of student questions, all the teachers interviewed said that they are a stimulus to improve their searches on the drugs theme. However, once again, when the origin of work was analyzed (public or private), there was a perception that the statements differ.

For the teachers, the questions that are eventually been asked by the students are difficult to answer at the time, due to the lack of knowledge of the subject by the faculty. An account presented the reality lived by a professor with the crack, in which he observed that the drug was part of the daily of the students. They often live in an environment where drugs are an integral part of people's lives. This fact does not arouse curiosity in the students, and there is no questioning about the subject. In that context the drug is not see by them as "invasive". On the contrary, it is a normal fact, accepted by the society in which they live.

4. Discussion

In spite of the emergence of several technologies, the educational methodology has undergone little modification. The implementation of educational methods that benefit well from the digital technology tools available at the beginning of the 21st century is not observe. This is corroborate by Faria, Souza and Fernandes [18]. According to these authors, the origin of computer science in Brazil occurred in the 1970s, and since then, teachers have been resistant to new teaching/learning models, fearing that they will be replace by machines and, often, not know how to work with them. When it comes to drugs, the need for constant updating of the professional involved in their prevention or treatment is essential. The changes occurring in drug-using cultures strongly influence the severity of the social, organic, and psychic complications suffered by users [19]. Crack, the subject of this study, is a very convincing example of this statement. A number of changes, promoted by users, trafficking and others, have been changing the way drug use and behaviors are relate in Brazil [19].

Considering these peculiarities of the internet as a source of information, it is observe in this study that, although the internet is common among all interviews, the drug information sites used, and especially on crack, differ between key informants and education professionals. ICTs have described a peculiar phenomenon of access to information. For this public, the information referred to as good quality focuses on specific sites, which are far from a not so specialized audience. The Internet, in the view of these informants, is a resource that optimizes the process by searching for information and makes the relationship with timeless knowledge. In this context, Moran [20] justifies that there was a change in the paradigm by

the key informants when searching the web, through specific information sites, the basis of their repositories of data and information, that is, the information passed from the printed for the digital.

Education professionals said they did not fully trust the information available on the internet. For about 28% of respondents, the distrust in the information deposited in the internet or in the media to which they have access is a question of the fragility of these channels. In considering the risks that information found on the internet offer, information specialists have been developing checklists with criteria and indicators, in an attempt to establish minimum standards of quality [21]. The drug theme, along with other themes involving health and education in human health, is been foreseen as a "Cross-Cutting Theme" in the National Curricular Parameters of the Ministry of Education (1998).

They are consider "transversal" themes, since they should be consider concurrently with the regular disciplines, such as Sciences (Basic Education) and Biology (High School), and in multidisciplinary projects of the school institution. In the approach, the drug theme includes the illicit ones, which allows the teacher to contemplate the subject in the classroom and to extend the citizenship education to the students of the Basic Cycle (Primary and Secondary Education). That way, the approach declared by teachers about the drug/crack theme in the specific contexts of contents that are being treat in the classroom becomes natural. It was also been observed that the drugs under debate varied according to the sphere of education (public and private) and to the region of the school location. According to the teachers' own testimony, private schools are face with more socially debated drugs, such as marijuana, and are distant from crack, which was perceive as a sanitary problem in public schools located in the outskirts of the metropolitan region of São Paulo.

The VI National Survey on the Use of Psychotropic Drugs among Elementary and Middle School Students, held in the 26 Brazilian Capitals and the Federal District [22], points out that the use of crack among students of public schools is higher, in terms of percentage of students, than in individuals, which corroborates the perception of this study. The population of teachers in the study focused on teachers of Science and Biology as a function of the didactic material of these disciplines to favor the approach of the transversal theme and be the first people to approach health topics with the students. In addition, the theme Drugs appears in the programmatic content of these two regular subjects. At no point in the approach, the method of exposure to the drug problem was been questioned, but its citation in the school context was questioned.

There was unanimity among education professionals in claiming to have "heard" talk about crack. The contact was has been make through different channels, but the media was the main vehicle of information, regardless of its specificity. It is important to emphasize that the didactic materials of consecrated authors of the Basic Cycle do not mention crack directly, but rather, drug classes in which this drug can be included. Specific questioning about drug knowledge reflects common sense, capacity for dependence, low cost, and social effects. These spheres were empirically observe about the media's use of drugs, whether written or spoken. Sodelli [23] points out that preventive education programs based only on information about the drug and its negative effects are ineffective, with the intention of harming and frightening adolescents and young people. This overarching discourse of the prohibitive model, based fundamentally on the harmful effects of the drug and the intolerance of its use, in the "drug war" has long been unrealistic.

Drugs, among them crack, are the product of a social phenomenon that needs understanding by multiple facets. Scivoletto and Morihisa [24] state that there is a consensus in the scientific world that the use and abuse of psychotropic substances are multifactorial (bio-psychosocial dimension) and that the main factors involved are curiosity, pleasure, group influence, social pressure, social isolation, low self-esteem and family dynamics. However, teachers do not seem to have any idea of this multifactorial dimension that influences drug use, focusing almost exclusively on drug-related factors such as degree of dependency and cost of acquisition, noting internal factors that interfere with their decision to consume.

This finding represents a poor view of the real consequences of the drug and its perfusion in the individual universe of its users. Access to information is dynamic and complex, exposing students and teachers to different concepts and data on drugs. It is up to the fully qualified teacher to offer a secure orientation of information and access to it, mitigating the erroneous paths that students may be exposed to in their immature training phase. Ferreira et al. [25], analyzing the perception of teachers of public and private education on drugs, detected a worrisome picture regarding the obtaining of information by these professionals, who obtained it through consultation and reading from lay sources and personal experiences, leading to erroneous and misleading visions of drugs. For Moreira, Vvivo & Micheli [26] it is fundamental that there is an acceleration of the growth and the quality of the public systems of education, health and social assistance. These authors argue that social protection should be considered as a fundamental lever for the eradication of poverty and misery, to national infrastructure.

In the universe of the professional of the education, several can be the strategies of approach of the subject, not being punitive or merely citatory. For Pedrosa et al. [27], preventive actions to use drugs to minimize risk behaviors are based on the autonomy of the educator and the students, a task that needs to be performed by various sectors of society. The school has an ideal universe for prophylactic work related to drug use. In it, the option of frank debate, exposure and discussion of cases and possibilities, driven by the presence of the teacher, can confer a significant and still unmeasured measure of drug disuse. It was not the objective of this study to evaluate the teacher's condition in relation to this theme. However, it is very important to observe that there is an initial lack of preparation of education professionals on topics such as drugs, and on crack in particular.

In the educational universe, the basic disciplines do not contemplate access to this theme. The textbooks are limited to presenting the unique characteristic of the drug and its direct effects, but do not discuss with the student the totality of the consequences that the use of these substances entails to the individual. In the case of the Internet, it is the source of crack information prevalent among educators. In their speeches, it is not explicitly defined which Internet tool they refer to, but, indirectly, this feature is a search engine like Google. Already, the media in general is another niche of absorption of information common to these two populations. This finding leads to an indication that the sources are not systematized and do not have a qualitative origin that can be measured.

The empirical knowledge also supported the aggregation of knowledge and information by the populations. For educators, the quotation from personal experience has been taken as a secure source of information. This condition consolidates the idea that the population studied has been based on non-systematized information and conduct their professional actions in these parameters. The mass media are the main source of

information and research for a large part of the population, interfering in the production of meanings about health and disease and reaffirming traditional models and practices that are often discriminatory, but can also act as important allies in promotion, prevention and protection of health. Thus, the way in which the media defines and presents subjects is a powerful instrument of political power and persuasion [21]. Unfortunately, the information coming from the school was been considered by the students as unreliable, according to Sanchez et al [28].

The ambiguity of the use of digital media is in preference for the use of these channels at the same time that lack confidence in these media. The main characteristics of the communication channels chosen by the study population were been related to ease of use: "viability of access" and "reliability". The media converge: the internet and news and television media. It is clear that, although the general search channels are similar, the specific sites differ. This nuance is not explicit in the indicators, but appears in the interviewees' statements. The phenomena associated with the search for information are been considered in this analysis. Educators report ease in the use of technology, a condition dissociated from factors such as age - which could indicate a pre-provision of generation in the use of technologies - but associated with the complementation of information found in basic didactic resources. These resources, however, are not very dynamic, and the internet compensates for the lack of dynamism.

Ferreira et al. [25] identified those teachers, because of the lack of information and the fear of not having answers to solve the doubts of the students, showed insecurity and inability to deal with the prevention of drug use, avoiding the subject in class. The fact that these professionals use information sources, which have been demonstrated throughout the text as poor and without compromise with the scientific base, can contribute to perpetuate stigmas published by these sources, making it very difficult for the social inclusion of crack users [29]. Thus, it is urgent that information on drugs and especially on crack have quality, be reliable, based on scientifically proven foundations and encompass all components that interfere with drug use, which goes far beyond it in isolation. The scope of the study allowed us to conclude that the sources of information about crack are diverse, but focus on digital technologies, especially on the Internet and its specific tools.

In general, respondents say that they often access this information from their homes and less frequently in their work environments, that is, in educational institutions. The drug theme, along with other themes involving health and education in human health are foresee as a "Cross-Cutting Theme" in the National Curriculum Parameters of the Ministry of Education [30]. They are been considered "transversal" subjects, since a set with the regular disciplines, such as sciences (Elementary School) and biology (High School), as well as in multidisciplinary projects of the school institution should be contemplated. In this approach, the drug theme includes illicit ones, which allows the teacher to contemplate the subject in the classroom and to extend the citizenship education to students of the Basic Cycle (Elementary and Secondary Education). Thus, the approach declared by teachers about the drug/crack theme in the specific contexts of contents that need be treat in the classroom becomes natural. It was also observe that the drugs under debate varied according to the sphere of education (public and private) and in the region of the school location too.

According to the teachers' own testimony, private schools are been faced with more socially debated drugs, such as marijuana, and are distant from crack, which was perceived as a sanitary problem in public schools located in the outskirts of the metropolitan region of São Paulo. The VI National Survey on the Use of Psychotropic Drugs among Elementary and Middle School Students in the 26 Brazilian Capitals and Federal District [21] points out that the use of crack among public school students is higher, in terms of the percentage of students than in private individuals, which corroborates the perception of this study.

It is worth mentioning that the population of teachers in the study focused on teachers of science and biology because of the didactic material of these disciplines present pertinence to the approach of the transversal theme because these professionals are the first to address the health related issues with the student body. In addition, the drug issue appears in the programmatic content of these two regular subjects. In this sense, it is important to emphasize that, at no point in the approach, the method of exposure to the drug problem was been questioned, but its citation in the school context was questioned.

5. Conclusion

The realization of this study allowed an in-depth reflection on the possibilities of improvement in the training process for educational professionals in the prevention and in the fight against the use of crack by the students. Based on the data observed by key informants, the massive availability of databases and scientific journals is a salutary alternative to the dissemination of scientific and systematized knowledge. Although this is not the main objective in the teaching process, the engagement of schools and educators is necessary, since the educational process cannot be treat as an isolated process of the serious social and economic problems. These conditions interfere in a negative way in the cognitive aspects involved in the transmission and assimilation of the programmatic contents by the currently proposed curricular guidelines. Thus, the scope of the study allowed us to conclude that the sources of information about the use of crack are diverse, although they are concentrated in the digital technologies, mainly in the internet and in its specific tools. It was also possible to make contact with the fact that those of education are not solidly trained in a solidly way on this topic of study. In view of the above, it is urgent that in Brazil a task force is advance through a National Policy on Drugs, which, in its bases, thanks to the way it was been built, seeks innovative actions to address this issue, adopting a concept of harm reduction and assigning value to socio-educational actions. As a result, it is necessary to put into practice a multidisciplinary program capable of collaborating with the different scientific areas, in order to fill the absence of humanistic approaches on this subject. In addition, an effort to focus the most important information produced by the academic world on the prevention and use of crack on a specific site, tailored to educators in the public network, would be of great value, since most of them use the internet for your frequent searches.

It is in this context that ICTs stand out as the most up-to-date and available tools for the task force to promote unity, with a view to greater social and educational engagement. On the other hand, after identifying the unscientific way in which crack/drug information is reached by these professionals, one can expand this difficulty to other areas of knowledge that are ahead. This is a worrying assumption in order to promote the distortion of knowledge that is been installed among the education professionals selected for this article. This flaw serves as a justification for Brazil's extremely low position in the world ranking.

When basic education is considered and, on the other hand, the significant position in terms of scientific production in this area of knowledge needs to be reviewed and properly focus from now on in relevant issues in the current conjuncture of great complexity for solving the problems of Brazilian society.

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Differences in TQM Performance of Small Enterprises

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Abstract

This research investigates how small enterprises differ from large enterprises in adopting and using TQM practices. This comparison of performance in TQM practices is based on the items in the Baldrige criteria. The scores of 86 applicants to a state quality award were statistically analyzed to look for any significant differences in the scores based on the size of the applicant. The feedback reports provided by the examiners were used to explain the significant differences in scores. The analysis indicates that the scores of small enterprises were significantly lower than medium and large enterprises. The lower scores reflect a lack of sustained, formal quality strategy and a lower priority given to continuous improvement. Information management in benchmarking and determination of employee and customer satisfaction also contribute to the lower scores.

This study alerts consultants and managers to the possible areas that small enterprises need to focus on to get the best out of their TQM implementation. The study also indicates that the formality of the criteria in assessment tools such as the Baldrige award criteria may not be very suitable for small enterprises. Past research about the use of TQM in small and medium enterprises for the most part use self-reported data and rarely provide comparison to large enterprises. The study compares the performance of small enterprises with large enterprises and provides objective data to confirm the differences in performance of small enterprises in TQM practices.

Key words: Small business, TQM practices, performance, Baldrige award criteria

1. Introduction

Since the 1970s there has been increased global competition in critical industries such as automotive and electronics. Businesses have reacted to this competition by improving performance through the adoption of just-in-time and total quality management (TQM) principles. The fact that consumer awareness and global competition has made quality an order qualifier has led to the focus on quality as an essential component of business improvement plans. This focus has cascaded down to small enterprises that are suppliers to the larger firms. Although a number of small enterprises have had success with quality management programs, there are quite a few that have not seen the improvement they expected (Terziovski and Samson, 2000). This difference in achievement is mostly due to the fact that the success of the programs depends on how well they are adapted to the organizational context (Yusof and Aspinwall, 2001; Broderick *et al.*, 2010; Escrig and de Menezes, 2016).

One of the advantages of TQM as a tool for performance improvement is its applicability to all sizes of firms. A number of research studies have been published identifying the use of TQM principles in small and medium-sized organizations (Kuratko *et al.*, 2001; Temtime, 2003; Fred *et al.*, 2008; Assarlind and Gremyr, 2016).

Some of these studies clearly point to the advantages that small enterprises have in implementing TQM (Ghobadian and Galleary, 1996; Ahire and Golhar, 1996), while others have identified the problems small enterprises face in applying TQM principles (Yusof and Aspinwall, 2000; Gustafsson *et al.*, 2001; Escrig and de Menezes, 2016).

Past research about the use of TQM in small and medium enterprises for the most part use self-reported data. In this study trained examiners and judges evaluation of TQM practices and performance of applicants to a state quality award is used to compare the performance of small, medium, and large enterprises and draws conclusions based on these differences. The state quality award uses the Baldrige criteria, which measure quality management along seven dimensions or categories – leadership; strategic planning; customer focus; measurement, analysis and knowledge management; human resources focus; process management; and business results (NIST, 2018). The factors measured under each of the categories are operationalized through a set of examination items.

2. TQM Constructs and the Relationship to Performance of Small Enterprises

In order to successfully implement quality management programs, organizations have to adapt the teachings of the quality gurus and the different quality tools to their specific context. Ignoring this and taking an off-the-shelf approach to quality management is probably the primary reason for the failure of TQM programs in some organizations (Cole, 1993).

The size of an organization has a great influence on the type of programs that are useful and the success of these programs. Although it is expected that small firms will benefit as much as large firms from quality improvement activities, the benefits are greatly dependent on how well the programs are implemented (Ebel, 1991). Studies also indicate that small organizations need to adapt their quality management programs as they move through the different stages of their growth, which makes maintaining quality programs difficult and expensive (Port, 1993).

This study addresses the effect of size on the performance of firms when they are evaluated using the Baldrige criteria. The following discussion of the literature related to TQM in small enterprises therefore is organized by the seven Baldrige categories.

2.1 Leadership

This Baldrige category is concerned with the role of senior leadership in guiding and sustaining the organization (NIST, 2018). The leaders play an important role in making sure that all employees understand the values of the organization. This goal is achieved through effective communications. Small organizations have some advantages in providing strong leadership for quality management and improvement. Due to the flat organization structure, there is little doubt in the employees' minds about the values of the organization. It is also easier to communicate these values in smaller organizations (Haksever, 1996; Tannock, 2002)). Kuratko *et al.* (2001) found that communication of values was prevalent in small organizations. Management is also effective in promoting quality efforts amongst its employees (Anderson and Sohal, 1999). However, studies show that the leaders in small organizations do not focus on the improvement of their leadership skills and tend to improvise their techniques (Kuratko *et al.*, 2001).

2.2 Strategic Planning

This category addresses the process used for the development of the long-term strategy and how well it is deployed to the operational areas. Taking a long-term view is an important requirement for the success of TQM programs. Small organizations, already competing with large corporations for market share, tend to take

a survivalistic view to their business and focus less on the long-term future. Further, most managers in small organizations spend more time fighting fires and now have to adapt themselves to spend more time planning for the future (Bonvillian, 1996). Most CEOs in small organizations started their careers as entrepreneurs with skills in specific technical areas. Now they have to learn new (and often times difficult) managerial skills in other functions of the business. One of these new skills is the ability to delegate authority and responsibility to employees at lower levels. Entrepreneurs used to making all the decisions in an organization may have problems delegating the decision-making process (Haksever, 1996).

Kuratko *et al.* (2001) identified that while small organizations use suitable strategic planning processes they suffer from the lack of systematic dissemination of the requirements at the operational levels. Further, deployment is done very informally and may lead to a lack of understanding (Anderson and Sohal, 1999; Tannock, 2002). It is important to involve partners, including employees, customers, and suppliers in the planning process. In small organizations there is a lack of involvement of employees, customers, and suppliers in the process (Anderson and Sohal, 1999; Tannock, 2002).

2.3 Customer Focus

This Baldrige category recognizes that the customer is the center of all strategies and tools. It addresses the organizations evaluation of customer needs, commitment to and relationship with customers. Small organizations do recognize that knowledge of customer needs is essential to the growth of their organization (Kuratko *et al.*, 2001; Temtime, 2003; Anderson and Sohal, 1999). Studies, however, have also identified a lack of focus on improving customer relationship (Kuratko *et al.*, 2001) and the lack of adequate measurement of customer satisfaction (Anderson and Sohal, 1999) among small organizations.

2.4 Measurement, Knowledge, and Information Management

Good and timely information is key to making the right decisions for continuous improvement. This category of the Baldrige criteria addresses how effective an organization is in selecting, gathering, monitoring, analyzing, sharing, and using the information for decision-making. In small organizations, investment in the methods and equipment needed to collect data may be limited due to lack of capital (Haksever, 1996). The resulting lack of data may lead to decisions based on incomplete information. Most studies indicate that small organizations are effective in collecting company level (business) data (Kuratko *et al.*, 2001; Anderson and Sohal, 1999). Small firms, however, are not effective in gathering performance and quality data and hence lack adequate knowledge of the scale of their quality problems and make poor decisions (Kuratko *et al.* 2001; Tannock, 2002). Small organizations also do not focus on market and benchmark data (Temtime, 2003; Tannock, 2002; Kuratko *et al.*, 2001; Anderson and Sohal, 1999).

2.5 Human Resource Focus

This Baldrige category addresses the organizations work systems and the development, training, motivation, satisfaction, and well-being of the employees. Hoogervorst *et al.* (2005) discuss the importance of organization culture, management practices, and organizational structure in ensuring employee behavior that enables TQM implementation. Many small organizations lack the human resources to implement TQM programs. While large firms usually are able to designate individuals to coordinate and direct their TQM programs, small firms depend on their line staff to perform these functions. As a result of this some work suffers, either in TQM implementation or regular line duties (Ebel, 1991). Small firms also have problems attracting qualified and experienced managers to direct the TQM programs (Haksever, 1996). Axland (1992) and Penzer (1991) argue that small organizations have some advantage in TQM implementation. Due to their size and structure, employees in small organization are cross-trained to effectively handle multiple jobs (Penzer, 1991). Small

organization also provide an atmosphere where personal growth is encouraged and workers understand better how their jobs fit with organizational goals (Axland, 1992). Other studies show that employees are not sufficiently empowered and hence are not involved in TQM practices in small organizations (Anderson and Sohal, 1999; Kuratko *et al.* 2001; Tannock, 2002; Temtime, 2003).

2.6 Process Management

The efficient management of product design, production, support, and supplier processes and their continuous improvement is essential to any quality organization. Small organizations involved in TQM effectively document their processes (Kuratko *et al.*, 2001) and encourage involvement of key personnel and innovation in its product and process design and management (Anderson and Sohal, 1999). Huang *et al.*'s (2002) study of the new product development process shows that small enterprises lack a clear strategy in this process. A number of small organizations do not emphasize the involvement of suppliers and customers in their internal processes (Kuratko *et al.*, 2001; Anderson and Sohal, 1999). Small organizations also show less commitment to continuous improvement and do not document their improvement process very effectively (Kuratko *et al.*, 2001; Temtime, 2003).

2.7 Business Results

The business results category addresses how effectively the organization collects business, financial, supplier, customer, and employee results and uses them to make decisions. It is important for small organizations to develop their personnel to collect data and use it effectively to make accurate decisions (Rucci *et al.* 1998). Studies indicate that small organizations are effective in gathering financial results and using them to make decisions. However, they are not very effective in collecting performance data and relating them to business results effectively enough to make good decisions. Small organizations also show a lack of focus on supplier and other partner data (Kuratko *et al.*, 2001).

The above discussion indicates that small enterprises might do as well as large enterprises in using some of the elements of TQM. However, they struggle in areas such as linking information to strategy, formalizing processes, and working with partners. As a result, one would expect that small firms would perform worse than large firms in TQM implementations and realize fewer benefits from the programs.

3. Data and Research Question

The data for this research is derived from the applications to a state quality award in the US. This award is modeled after the Baldrige Award criteria and process. The award is open to all organizations, private, public, or non-profit, provided they have 50% of their assets or employees in the state. The distribution of these organizations by their size and type of firms is provided in Table I. Each of these applicants was individually evaluated by 4 to 7 examiners in each of the twenty-eight items examination items under the seven categories. The evaluation was done on a scale of zero to 100 in intervals of ten points.

Table I: Distribution of sample firms

| | Type | | | | | Total |
|---------------|---------------|---------|-----------|-------------|------------|-------|
| | Manufacturing | Service | Education | Health Care | Government | |
| Size | | | | | | |
| Small | 12 | 17 | 0 | 0 | 0 | 29 |
| Medium | 8 | 21 | 3 | 2 | 0 | 34 |
| Large | 4 | 3 | 3 | 5 | 8 | 23 |
| Total | 24 | 41 | 6 | 7 | 8 | 86 |

The analyses of the data focused on one basic research question: “Are there significant differences in the performance of small enterprises versus large enterprises along the seven TQM constructs and each of the twenty-eight examination items?” Since large organizations have more resources to implement new tools, it is expected that large organizations will rank highest and small organizations lowest in performance in quality management.

3. Research Methodology

For this research enterprises were classified as:

- a) small (less than 100 employees),
- b) medium (100 to 500 employees), and
- c) large (more than 500 employees).

The research question was tested using twenty-eight hypotheses for each of the twenty-eight examination items. The hypotheses were tested using analysis of variance models. The dependent variable for each model was the average score for the examination item. Organization size was treated as a fixed effect. Although it is possible for scores to range from 0 to 100, scores for most organizations are concentrated within 30 points with outliers in at the upper and lower bounds. Further, since the scoring is done in 10-point increments they are not on a pure continuous scale. Due to these reasons the data from the evaluation did not fit a normal distribution. Hence non-parametric tests were used to compare the means. The Kruskal-Wallis test performs an analysis of the ranks of the data (the Wilcoxon scores). The chi-square approximation of the Kruskal-Wallis test was used to test the hypotheses.

4. Results and Discussion

The average score and standard deviation by applicant size and the p-value for the chi-square approximation of the Kruskal-Wallis test for size effect are shown in Table II. The p-values indicate that the size of the organizations significantly affected the performance on each of the twenty-eight items. Scheffe’s multiple comparison procedure was performed to identify how firm size affected the scores. The significant differences in scores (at $\alpha = .05$) are also indicated in Table II. The Scheffe’s tests indicate that, in most cases, the difference in scores between small and medium firms and small and large firms were significant (p-value of 0.05). However, the scores between medium and large firms were not significantly different.

Table II. Item Scores by Size

| Item | Mean Scores | | | | | | p-value of K-W test |
|--|-----------------|-------|------------------|-------|-----------------|-------|------------------------|
| | Small N = 29 | | Medium N = 34 | | Large N = 23 | | |
| | Mean | S.D | Mean | S.D | Mean | S.D | |
| Leadership | | | | | | | |
| Senior Executive Leadership | 31.88 | 14.15 | 48.98 | 13.03 | 48.46 | 15.68 | 0.0001* |
| Management for Quality | 30.42 | 15.71 | 46.74 | 13.56 | 41.44 | 15.41 | 0.0005* |
| Public Responsibility | 29.85 | 16.92 | 46.59 | 14.01 | 42.55 | 12.62 | 0.0006* |
| Information and Analysis | | | | | | | |
| Management of Data | 33.78 | 17.51 | 47.54 | 14.11 | 44.81 | 14.07 | 0.0094* |
| Benchmarking | 21.66 | 13.27 | 38.19 | 16.71 | 38.88 | 13.42 | 0.0001* |
| Company Level Data | 27.28 | 16.81 | 43.66 | 13.23 | 42.26 | 13.70 | 0.0003* |
| Strategic Quality Planning | | | | | | | |
| Performance Planning Process | 24.17 | 14.28 | 42.71 | 18.62 | 41.01 | 13.56 | 0.0001* |
| Performance Plans | 21.13 | 13.17 | 43.29 | 13.86 | 33.27 | 16.59 | 0.0001* |
| HR Management | | | | | | | |
| HR Plans | 24.92 | 14.88 | 39.02 | 16.48 | 34.91 | 13.59 | 0.0085** |
| Employee Involvement | 28.88 | 16.52 | 41.64 | 14.31 | 37.29 | 13.19 | 0.0183** |
| Employee Training | 27.25 | 13.04 | 44.66 | 14.27 | 35.93 | 13.59 | 0.0001** |
| Employee Performance | 24.55 | 14.57 | 38.75 | 15.35 | 34.28 | 15.65 | 0.0001** |
| Employee Well Being | 23.22 | 15.52 | 41.01 | 14.78 | 39.55 | 16.92 | 0.0001* |
| Process Quality | | | | | | | |
| Design Quality | 27.75 | 17.28 | 46.01 | 13.33 | 45.63 | 13.75 | 0.0001* |
| Process Management | 31.15 | 17.38 | 42.92 | 13.20 | 45.02 | 15.49 | 0.002* |
| Support Services Management | 20.01 | 12.76 | 40.88 | 10.92 | 34.65 | 14.73 | 0.0001* |
| Supplier Quality | 26.74 | 15.56 | 41.22 | 16.72 | 37.80 | 16.18 | 0.0034** |
| Quality Assessment | 25.36 | 16.53 | 43.02 | 17.71 | 40.71 | 13.25 | 0.0003* |
| Results | | | | | | | |
| Quality Results | 19.59 | 16.55 | 36.17 | 18.47 | 30.54 | 11.98 | 0.0027** |
| Operational Results | 18.04 | 13.12 | 41.45 | 17.92 | 28.51 | 15.43 | 0.0001* |
| Business Results | 12.72 | 12.18 | 27.49 | 17.68 | 22.87 | 14.99 | 0.0011* |
| Supplier Quality Results | 9.42 | 9.25 | 22.43 | 14.51 | 18.50 | 12.91 | 0.0004* |
| Customer Focus and Satisfaction | | | | | | | |
| Customer Expectation | 28.26 | 16.81 | 44.75 | 16.12 | 40.42 | 14.62 | 0.0012* |
| Customer Relationship Management | 28.86 | 17.70 | 46.98 | 14.81 | 44.78 | 18.21 | 0.0009* |
| Commitment to Customers | 26.69 | 16.31 | 43.18 | 16.69 | 36.57 | 11.47 | 0.0013* |
| Satisfaction Determination | 24.10 | 15.53 | 42.01 | 16.49 | 36.54 | 14.48 | 0.0002* |
| Satisfaction Results | 21.25 | 13.45 | 33.84 | 17.32 | 31.27 | 18.20 | 0.0152* |
| Satisfaction Comparison | 13.10 | 12.63 | 28.42 | 18.82 | 22.90 | 18.03 | 0.003* |

* - Scheffe's test indicates that large higher than small and medium higher than small at a of 0.05.

** - Scheffe's test indicates medium higher than small at a of 0.05.

A review of the feedback reports from the examiners helped in identifying areas for improvement for the small enterprises. In most cases the small enterprises lacked sustained or formal quality programs. The firms had instituted informal programs and provided anecdotal evidence of the outcomes; however, it was not clear that the benefits would continue in the long-term. Deployment also was a recurring issue. Many of the applicants used processes for analysis, but these processes were limited to the primary areas or products.

In the area of leadership, the company's values and mission were communicated, but not very formally; also, reinforcement of these values was lacking. Further, continuous improvement of leadership qualities was rarely identified as important. Planning for quality was present in most small enterprises; the planning process, in many cases, was more an event rather than a process. In many firms, partners, and sometimes even employees, were not involved in the strategic planning process. Further, the connection between information gathering and the planning process was not very clear. The primary area for improvement cited in information management was benchmarking. The small enterprises did not invest in benchmarking; even when done, the investment was limited to the comparison to industry averages. This conclusion is supported by past research (Sharma, 2006).

The small enterprises performed the best in the human resources area. In fact, the large firms did not do significantly better than small organizations. The medium sized organizations ranked the best. This can be attributed to the fact that medium size organizations have the advantage of much flatter organization structures leading to better trained and motivated employees (Penzer, 1991; Axland, 1992) and have access to resources not available to smaller organizations. One common area cited for improvement for small enterprises was in the measurement of employee satisfaction. In the area of customer focus, the most common issue mentioned in the feedback reports had to do with the data gathering – consistency in the measurement of customer satisfaction and identifying long-term customer needs.

5. Conclusions

The above results support the literature on the problems that small firms face in implementing TQM programs. While past research has helped identify the TQM practices of small businesses, this research using the Baldrige criteria and process, which places great emphasis on formalized processes to ensure quality management has identified that the performance of small businesses vary greatly from that of large and medium firms in TQM practices. The fact that small firms' performance was poor in all of the twenty-eight items of the criteria is telling. Small firms, especially entrepreneurial firms, tend not to formalize their processes. The results from this study support prior research that point to these differences (Sharma, 2006; Nelson, 2012) and support the need to tailor TQM practices for the flexible and entrepreneurial spirit of most small businesses (Assarind and Gremyr, 2016). The results alert executives and consultants in charge of implementing TQM programs to pay particular attention to the organization characteristics, especially size of the organization. However, one needs to be cognizant of the fact that the firms in the study were self-selected. As a result of this self-selection, the differences in the scores might be more exaggerated. Also, the Baldrige criteria emphasize formalized procedures that may not be applicable to small organizations in a growth phase. Further research should be performed using a more random sample of firms to confirm the results from this study.

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Model of Open Scientific Information Management in Events

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Abstract

In the process of scientific research, communication is essential. The insertion of Information and Communication Technologies have modified the profile of the researchers and the daily life of their researches. In response to these changes, this article proposes the adoption at scientific events of the video poster, replacing the poster on paper or canvas. The objective is to propose a model of Management of Open Scientific Information of Video in Events, as a means of scientific communication. This research was developed based on the literature review of models of this type of management, the information collected in interviews with the managers of the events that used the video poster as a strategy of scientific communication, and the data collected through a survey, sent to event participants. The results, after treatment of the data and confrontation of the ideas of the managers with the opinions of the participants, point out that the video poster has the potential to prolong and even perpetuate the products of scientific communication in events and to promote the scientific divulgations, besides the possibility of reuse, as an educational resource. As result of the research, the proposal of an open scientific information management model for the use of event managers is presented.

Keywords: open access; scientific content; video poster; product information.

1. Introduction

Videos are present in people's daily lives, whether on computers or on smartphones over the internet, for entertainment or learning purposes. According to the Cisco report [5], in 2019, online video will account for 80% of the world's internet traffic, which makes the video become a relevant study object, covering

several topics, among them teaching and scientific research.

In the scientific field, Pinto and Zagalo [8] warn that for science the gains go through the valorization and visibility. There is an urgent need to create the efforts of institutions and researchers to captivate the public, that is, to explore practices and communication models that adapt to the needs of society that facilitate the understanding and appreciation of scientific and technological research.

The scientific community constantly searching for updated information makes use of different channels of scientific communication [9]. In addition, the scientific events are a source of research, knowledge and exchange of new knowledge, promoting the exchange and transmission of information in a group of researchers and students of a area or specialty with common interests.

Valério and Pinheiro [17] affirm that these channels are considered informal because, "they are ephemeral forms of communication, because they are available to a limited audience for a short time." The authors emphasize that "among the oral mass media are conversations, scientific meetings, colloquia and conferences, as well as scientific and technical commissions."

Scientific communication has not incorporated the advances of Information and Communication Technologies (ICT), mainly in terms of events, which have the same presentation formats for decades. The scientific contributions to the congresses, almost entirely, are informal, that is, oral presentations are not recorded, and paper or canvas posters are discarded shortly after their use.

In view of this scenario, we highlight the proposal of Freitas, Schmid and Tavares [7] that indicates the substitution of the poster printed on canvas, paper or fabric by the use of audiovisual resources (videos) in the dissemination of research in scientific events and its later reuse in educational practices.

The management of scientific events has been consolidated and professionalized. The challenge of this research is to offer event managers a model of scientific information management in a differentiated information product that are scientific videos, which have their own characteristics. As an audiovisual product, it involves questions of how to receive, where to store, how to organize and classify, how to use and publish, how to be reused. And undoubtedly involves the concern with the authors participating in the events, as to the acceptance of producing the video.

The purpose of this article is to propose a model of Management of Open Scientific Information of Videos for organizers of scientific events.

1.1 Management of Scientific Information

Le Coadic [10] asserts, "Without information, science cannot develop and live"; and that "information only matters if it circulates and, above all, circulates freely". It is in the development of a research that information is generated and deepened, and the dissemination of its ideas happens through channels of communication, formal, informal or hybrid.

Information management is a structured set of activities that mirrors the way in which an organization captures, distributes and uses information and knowledge [6]. Alvarenga Neto [1] complements that Information Management (IM) is the identification, the correct use and the potentializing to generate new information of the informational resources of an organization, as well as guarantee to the learning organization able to promote the adaptation to the environmental changes.

The proposed theoretical IM models are results of the perception of the need to explain information management in a way that directly influences the development of company strategies. Analyzing the literature, we verified the existence of several models of IM processes. In this research, the models were analyzed: Thomas Davenport [6]; James McGee and Laurence Prusak [13]; Glória Ponjuán Dante [15], Adriana Beal [3] and Fernando César Lima Leite [11].

The selected models are based on the integrative perspective of information, which is the integration of information resources - processes, tools and people. When comparing (Table 1), among the proposed models, there are steps common to all, which permeate the four processes of the information cycle: acquisition, treatment, distribution and use - despite the specificities and individual contributions of each model.

Table 1. Stages that make up the Information Management models

| | Stages | Davenport [6] | McGee Prusak [13] | Ponjuán [15] | Beal [3] | Leite [11] |
|--------------------|--|------------------|----------------------|-----------------|-------------|---------------|
| ACQUISITION | Identification of information needs | | X | X | X | |
| | Determination of information requirements (requirements) | X | X | | X | |
| | Acquisition (procurement) and collection of information | X | X | | X | X |
| TREATMENT | Classification of information | | X | X | | X |
| | Analysis of information | | X | | X | |
| USE | Dissemination and distribution of information | X | X | X | X | X |
| | Use of information | X | X | X | X | X |
| | Development of information products and services | | X | | | |
| REUSE | Information Storage | | X | X | X | X |
| | Information retrieval | | | | | X |
| | Control - Monitoring | | | | X | |

The Davenport model [6] emphasizes that Information Management - IM is a process, because once the information process is described and ordered, it is possible to gradually improve or change it radically. Davenport [6] establishes the following steps in his model: determination of the requirements, obtaining, distribution and use.

McGee and Prusak [13] consider identifying needs and information requirements as a key step in the IM process. Note that in these models the entire process is directed, specifically, by transforming data into information products for customers, whether internal or external.

Ponjuán Dante [15] emphasizes that IM aims to collect, treat and disseminate information that is useful to

the organization and users, using physical, technological and human structures in the organization.

For Beal [3], the stage of identification of information needs and requirements is essential for the elaboration of informational products that meet the demand of the users. The stage of obtaining the information is composed by the activities of creation, reception or capture of information, coming from internal or external source. The information processing phase aims to facilitate its future recovery. For that, the processes of organization, formatting, structuring, classification, analysis, synthesis and presentation are performed.

Leite [11] conceptualizes the management of scientific information as a set of strategies and processes designed to effectively promote the flow of information that feeds and results from research activities, ensuring their use and reuse. It also highlights that the scientific expression refers to that type of information produced by a scientist, researcher or research group, presented in texts and scientific publications, which is discussed, disseminated and disclosed in different media and channels.

The author adds that scientific information is at the same time an entrance and exit from the production system of Science. The flow of information that feeds and results from research activities is promoted by the scientific communication system.

Based on these concepts, the Scientific Information Management comprises the specific processes of generation, collection, organization, preservation, retrieval, dissemination and use of the necessary information and created from the research activities of the research institutes [11].

Leite and Costa [12] adds that the effective promotion of the flow of scientific information requires the consideration of internal and external forces that act on its processes generation, collection, organization, preservation, recovery, dissemination and use of scientific information.

However, what is perceived is that in all models, communication is essential for the process of scientific investigation, because it is the way the scientist conveys the advances and conclusions of his research. Through communication, research gains legitimacy after being analyzed and accepted by peers [14]. Because it is a knowledge that must be widely discussed and tested before a specific community, science presents a communication cycle that involves the researcher in constant dialogue with his peers [2].

2. Methodology

The methodology covered different strategies. Initially, the theoretical reference based on the analysis and extraction of concepts from the literature to constitute the research model - this one that offered us the foundations from which the research problem was observed and discussed. Then, guided by the theoretical reference, the methodological procedures were determined, detailed below.

Because it is still an unexplored topic - the use of video poster as a resource for scientific communication - there is little knowledge about it. In this way, the research effort was directed to the theoretical construction of a base that would substantiate a model of open scientific information management to the use in videos in events, with contribution of the literature in each one of the stages.

In the development of information products and services, it is necessary to consider the opinions of final users, coming from other areas of knowledge, that may present new perspectives on the process [13]. Therefore, the model was delineated from the theoretical construction of interviews with event managers

who adopted the video poster strategy and the application of a survey with the participants of the events. The research had as an environment, four scientific events that adopted the video poster as communication strategy, presented in Table 2.

Table 2. Research Environment

| Event | Acronym/Year | Place and Date | Number of Videos |
|---|--------------------------|---|------------------|
| V Latin American Meeting of Buildings and Sustainable Communities | ELECS 2013 | Curitiba – PR (Brazil) October 21-24, 2013 | 99 |
| I European and Latin American Meeting of Buildings and Sustainable Communities | EURO ELECS 2015 | Guimarães - Portugal July 21-23, 2015 | 39 |
| International Sustainable Built Environment Conference Series | SBE 16 Brazil & Portugal | Vitória – ES (Brazil) September 7-9, 2016 | 30 |
| III International ICT Congress for the evaluation of external practices in multidisciplinary contexts | CoRubric 16 | Malaga – Spain October 13-15, 2016. | 5 |

Interviews were conducted with managers of each of the events: ELECS 2013; EURO ELECS 2015 and SBE16 BRAZIL & PORTUGAL, totaling nine interviewees. The objective of the interview was to identify critical factors in the management of scientific information in video in all stages of the process: generation, collection, organization, preservation, recovery, dissemination, use and reuse of scientific information. Participants of the events, previously mentioned, answered a questionnaire that aimed to identify the acceptance of the proposal of the video poster, the difficulties in the elaboration and monitoring and use of the video poster. The rate of return obtained by this research, considering that 506 possible respondents received the questionnaire, was of 21.94% that is classified as efficient, because according to Freitas [7]; Janisek-Muniz and Moscarola (2004), the standard rate of return of an internet mailing is 7 to 13%, and for Comley (2000) the response rates vary between 15% and 29%.

The data collected with the instrument applied with the participants of the events were tabulated and analyzed in Microsoft Excel® software, to generate graphs and scores for each variable searched. In the resulting collection of the research with the participants of the events and / or authors of video poster, the data collected passed first by a quantitative question by question, to classify each item searched from the most selected to the least selected.

Subsequently, some data were crossed to identify the profile of the author and the respondents who had:

- the highest degree of acceptance of insertion of a new scientific communication product;
- the greatest difficulty in the preparation of the video poster;
- degree of interest in following the post-event video; and

- the use of videos as an educational resource or for other purposes.

Table 3 shows the data resulting from the interviews with the managers of scientific events.

Table 3. Treatment of the data raised in the interviews with the managers

| Action | Goal | Result |
|---|--|---|
| Transcript of interviews with event managers. | Structure the collected data. | Archive with the texts of the interviewees, divided by questions and by interviewees. |
| Floating reading of transcripts. | Understand the context of each event. | Formulation of the first analyzes on the data collected. |
| Word cloud development at WoldCloud.com | Identify words with greater occurrence in texts. | Word list most frequently in the answers. |

After the transcription of all the interviews were generated clouds of words in the site WoldCloud.com, to visualize the most cited words. Each cloud generated the list of words was placed in a Microsoft Excel® spreadsheet, allowing the treatment of equal words written always in lowercase letters, sometimes with the first letter capitalized. The grouping of words, in turn, has the same meaning within the context. To generate the first cloud all words were used. Subsequently, words that had frequency less than five were taken out, as well as adverbs, pronouns, prepositions, verbs, and conjunctions. The result is shown in Figure 1.



Fig.1. First cloud generated with the words of the transcriptions.

The data of the interviews with the managers were analyzed qualitatively, question by question, within the context of each event, seeking to identify the positive points, the evolution of the processes and management. WordCloud software assisted in structuring the data and schematizing the analyzes.

Finally, in Table 4, the analysis of the data collected with the managers, authors and participants of the events, the positive aspects of the video poster and the suggestion of improvement for the upcoming events were rescued.

Table 4: Stages of the model for the management of open scientific information in events

| | Stages | Adequacy to the proposed Model |
|-------------|---|--|
| ACQUISITION | Identification of information needs | Planning/Scientific Project |
| | Determination of information requirements | General and Scientific Planning/Project |
| | Acquisition (getting) and collection of information | Receipt of videos (Cycle of Video Poster) |
| TREATMENT | Classification of information | Classification (Video Poster Cycle) |
| | Analysis of Information | Evaluation (Video Poster Cycle) |
| USE | Dissemination and distribution of information | Insert on the platform - Annals - and allow access (Video Poster Cycle) |
| | Use of Information | Exhibit the videos in the technical sessions (Poster Video Cycle) |
| | Development of information products and services | Video poster and communication channels are considered information products. |
| REUSE | Information Storage | Create channel on open access video platform. |
| | Control - Monitoring | Promote the reuse of videos as OER or for scientific marketing. |

The proposal was submitted to the managers for evaluation of the model. The changes and consolidation of the model were then carried out, as shown below.

3. Model for the management of open scientific information in events

As it is something new, the literature does not present a model that meets all the processes that involve the scientific video in events, it was sought theoretical foundation in the specific literature of the area of Information Management and Scientific Communication.

McGee and Prusak [13] consider the identification of needs and information requirements as a fundamental

step in the Information Management process and Beal [3] classifies the stage of identification of information needs and requirements as essential for the elaboration of information products that attend user demand. Another aspect considered in the proposal is the question of the physical, technological and human structures present in the model of Ponjuàn Dante [15].

Therefore, the proposed model has two stages: the acquisition of well-structured information, with scientific planning, and the administrative, financial and technical areas, in a detailed way, in order to meet the requirements of users of scientific information.

The processes of Management of Scientific Information in Video correspond to a cycle (a set of interconnected and interdependent phases that are repeated successively in an established order). And just as in the model of Beal [3], the proposal presents the stage of reuse of information.

The proposal of this research adopts the procedural perspective adapted from the models of Information Management registered in the literature (Davenport [6], McGee and Prusak, [13], Ponjuàn Dante [15] Beal, [3] and Leite [11]).

The elaboration of the Model for the Management of Open Scientific Video Information in Events - MOSVIE - for organizers of scientific events was based on the literature, based on the perception of event managers that used posters videos as a communication strategy, as well as the vision of the authors of videos and of the other participants of the events (Figure 2).

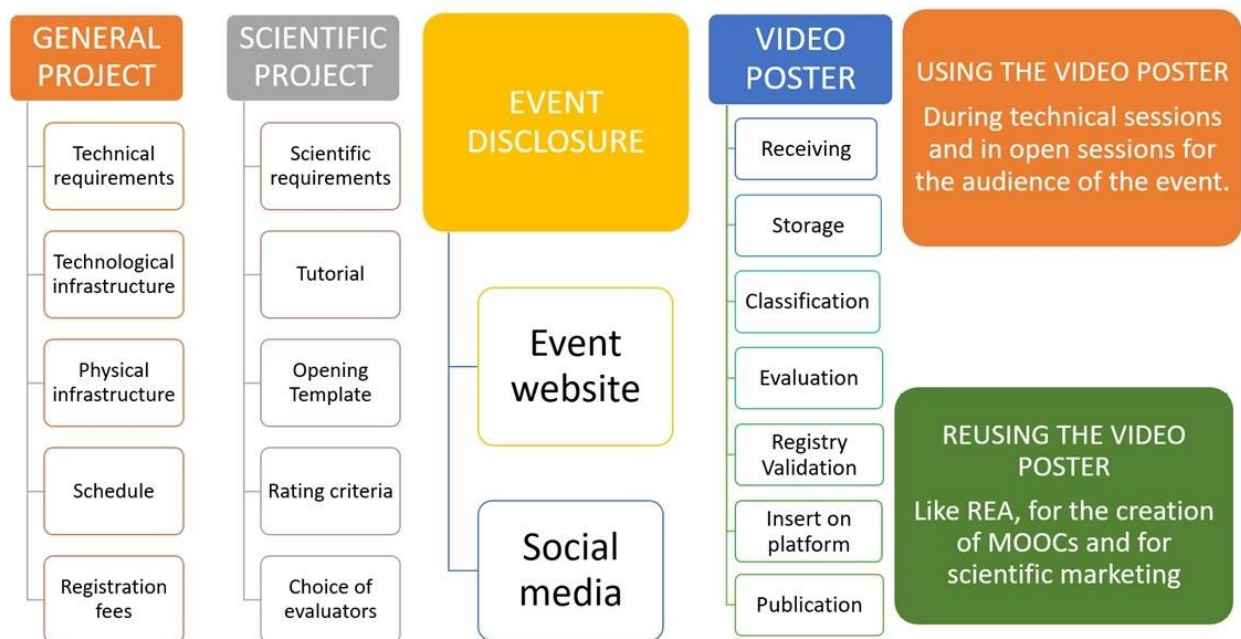


Fig.2. Management model of open scientific information in events – movies.

This proposal is divided into macro stages, that is, in the design and planning of the event both within the scope of administrative, financial and technical management as well as in scientific management. However, everyone on the team must exchange information with each micro process.

3.1 General design

After defining the adoption of the video poster in the event, the manager should initiate the project and

planning with the administrative, technical and financial team. Here are the items to be planned:

- **technical requirements:** set maximum size and file format; minimum and maximum screen resolution; minimum and maximum duration; use license - that meets OER's "5Rs" (review, reuse, remix, redistribute and retain); or other limitations according to adopted technology.

Attribution - technical team.

- **technological infrastructure:** predict the system of uploading the videos by the authors - event site and server for storage - as well as define indexing criteria and recovery system.

Attribution - technical team.

- **physical infrastructure:** adequate location for acoustics and lighting, for the transmission of videos during the event, as well as the necessary equipment.

Attribution - administrative and technical team.

- **timeline:** schedule planning is strategic, it is necessary to define the dates for submission of the abstract/script and the poster video, to establish criteria regarding the obligation of sending and the need for the author to adjust in the video after technical and scientific evaluation.

Attribution – administrative and financial team.

- **enrollment values:** you must define the enrollment values, considering the costs necessary for the technological and physical infrastructure.

Attribution - financial team.

3.2 Scientific project

In the scientific scope the items to be planned are:

- **scientific requirements:** define a road map with the scientific requirements required for posters - observe open access policy;
- **tutorial:** preparation of the guidelines guides to prepare the video poster will require time and should be detailed enough to meet the author who has the greatest difficulty. The tutorial can be reused in other events;
- **opening template:** for the standardization of the videos, a standard template with logo and theme of the event is necessary;
- **evaluation criteria:** prepare a checklist with the requirements that should be observed by the evaluators;
- **Evaluators:** evaluators should be chosen to analyze the scientific content of the videos as well as the presentation in its entirety.

The definition of the obligation to send video poster, scientific requirements (language, script, etc.) and technical requirements (time, format, etc.) should be discussed in the planning, according to the goals of the adoption of the video poster, as well as the expected results with this scientific communication strategy.

3.3 Event Disclosure

After completing the planning, the event starts - fundamental phase due to the proposal of a new scientific communication product, the video poster.

In contrast, there is resistance to the "new", because it is about creating a product with the use of techniques and technologies that part of the authors/researchers do not use habitually. In some situations, authors may not scale the time required to produce your video and not take the time to produce it, leading to even greater difficulty.

3.4 Video poster lifecycle flow

Attention should be given to the generation of "Video Poster Lifecycle Flow", which includes the specific processes for identifying the information of authorship with video sending, acquisition (input and reception), storage, classification, evaluation, publication (dissemination and use of information) and recovery (reuse). The steps detail the specific suitability of the video process and the involvement of all managers (administrative, financial, technical and scientific).

It is recommended that the lifecycle flow of the poster video be adapted according to the characteristics of each event and the teams involved:

- **Prepare the environment for receiving the videos:** involves the entire project and planning;
- **Receipt:** control the receipt of the videos sent by the authors, verify authorship of the materials received.

Attribution: technical team.

- **Storage:** on own server, or on a video sharing platform; in both options, use the descriptors defined in the planning.

Attribution: technical team.

- **Treatment:** the videos are analyzed according to the technical criteria and then classified into pre-defined categories and sent for evaluation.

Attribution: scientific team.

- **Assessment:** evaluate and, if necessary, ask for adjustments, both technical and academic, or disapprove the video.

Attribution: scientific team.

- **Validation of the registration:** verify that the author has made its registration and release for publication.

Assignment: Financial team.

- **Insert on the platform - Annals:** insert the videos in the platform defined for dissemination of the Annals of the event.

Attribution: technical team.

- **Publication:** allow access to the platform.

Attribution: technical team.

3.5 Use of the video poster at the event

The use of the video poster at the event, in the technical sessions, will be, as defined in the planning, that is, in sessions open to the public of the event. For this phase, the main aspects to be observed are: necessary equipment (monitors or televisions, speakers or headphones) as well as the acoustics and the lighting of the

place. It is recommended to perform some tests before the event.

Attribution: scientific team and technical team.

3.6 Reuse of the poster video

The reuse of the video poster implies taking actions to encourage the reuse of the videos by the participants of the events and the use for the promotion of groups and researchers - scientific marketing.

Attribution: scientific team.

Therefore, it is necessary to elaborate criteria in the definition of metadata for indexing in repositories or video platforms, since this factor is determinant for the retrieval of open scientific information.

The reuse of information is based on the models proposed by Beal [3] and Leite [11], as well as the concept of "Open Access", which aims to provide free access to scientific information. The reuse as an Open Educational Resource (OER) was also considered by the managers interviewed as a motivating factor for the adoption of the video poster as a resource for scientific communication in events. To do so, the video must have the permissions established by the OER Brazil Program (2012): the "5Rs" (grant users accessing these resources the possibility to use, improve, recombine and distribute).

It is therefore recommended that authors use the CC BY Creative Commons Attribution license. This license allows others to distribute, remix, adapt and create from your work, even for commercial purposes, if it's give it due credit for the original creation. Or the CC BY-AS - Creative Commons Attribution-Share Alike license, which allows others to modify, adapt and create from their work, even for commercial purposes, if they also assign the due and credit the new creations under identical terms.

Targino [16] emphasizes that scientific communication favors the product (scientific production) and producers (researchers) the necessary visibility and possible credibility in the social environment in which product and producers are inserted.

In this context, Bomfá [4] warn that research institutions and researchers rely on scientific publications to promote and obtain scientific visibility. And the video poster is a resource that helps in the process, due to the profile of new researchers who make use of these audiovisual resources as a source of information in their daily lives.

4. Final considerations

The present research had as main objective the proposal of a model of management of the scientific information of video in events based on the assumptions of scientific communication and open access to scientific information.

The difficulties in managing the insertion of the new scientific communication product into events, from the design and planning of the event to the monitoring of the dissemination actions and the finalization with reports and closings in the post-event. The managers were motivated to adopt, again, the strategy in upcoming events, being aware of the needs of improvement in the management process.

By analyzing the results of the research with the authors of video poster, it is perceived that there is a culture of "disposable" in the scientific environment. The knowledge produced for presentation is usually not reused by the authors. The results show that 67.74% of video poster authors never visit the YouTube channel

of the event, and 77.42% of the authors stated that they never used their videos as an educational resource or for other purposes.

The video poster appears as a proposal to prolong and even perpetuate the products of scientific communication of events and promote scientific disclosures. To do so, it is necessary to change scientific culture, where authors value their works published in events, and use them either for didactic purposes or scientific visualization.

In general, it has been observed that video poster has a significant potential for consolidation as a product of scientific communication. To do so, it is necessary to raise the awareness of managers of scientific events and researchers about the potential of the video poster. The issue of sustainability and the use of the time of the events to exchange knowledge between peers is highlighted.

Another potential of the video poster is to promote the visibility of research, researchers and institutions, as it is a product that meets the new profile of researchers who use audiovisual resources as a source of research. The reuse of the video poster as OER can also be a marketing strategy as they will be viewed by a larger number of people and possibly be instigated to read the source articles.

The video poster is a resource that can easily fit the context of the classroom because it is a product of scientific information, provided that it has the license that meets the five freedoms proposed by Open Education: use, reuse, recombine, distribute and retain

The potential of the video poster as OER should be considered by both event managers and authors themselves. With the authors' awareness about the possibility of reusing their videos and their peers in the classroom, videos are expected to be produced with the same care that the authors demand of their articles, adding more benefits to the scientific community.

The consolidation of the video poster as a means of scientific communication, depends on how the proposal is presented to the researcher, managers must be sure of the strategy for the event and the benefits of this resource, such as: i) the possibility of evaluating presentations before event; ii) to prevent issues of infrastructure failures; iii) increase the time for interaction between peers during the event; iv) promote an event that meets the sustainability criteria; among others; and v) provoke a change of scientific culture with consolidation and use of the materials generated in the promotion of groups or researchers and/or reuse of video as an educational video.

The main contribution of this work is the presentation of a model for the Management of Scientific Information of Video in Events, which allows managers a better understanding of the process, from the proper planning in the insertion of a new product of scientific information.

It is important to highlight the specific perspective of the proposed model. Its design considered general and necessary elements to any model of Management of Scientific Information and predicted in its constitution some flexible elements, that accommodate possible contextual differences that vary from event to event.

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The Prevalence of Missing Data in Survey Research

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Abstract

The credibility of surveys relies significantly on the completeness of the data collected from representative samples. Missing data is a serious problem in survey research. The existence of variables with missing information negatively affects the research results and findings. This study examines the prevalence of missing data in surveys, and additionally compares its incidence between genders. A total of 119 relevant surveys from different countries represented the sample of this study. Results indicated that, on average, 38% of data was lost in the surveys analyzed. Males and females were very similar with respect to the extent of missing data, with an average of 37% and 38% respectively. Overall, results show that only 62% of the initial sample size was available at the end of the data collection stage.

Keywords: missing data, survey, survey research, survey data, gender

Although missing data in research is a common problem, it is often ignored (McKnight, McKnight, Sidani, & Figueredo, 2007). Research results or findings are negatively affected by lost data in several ways (Acock, 2005; Bonder, 2006; Horton & Kleinman, 2007; Little & Rubin, 2002; McKnight, et. al, 2007; Wayman, 2003). First, missing data poses a threat to the validity of scientific inquiry. In fact, both the internal validity of causal inference, as well as, the external validity (generalizability) is negatively affected by missing data. Second, missing data decrease the statistical power of tests because of the reduction of the final sample size available for statistical analysis. Third, missing values make some data sets (or at least some variables) inappropriate for particular statistical analyses. For example, the minimum sample size required for conducting some statistical procedures or tests may be unavailable. Fourth, the final sample may no longer represent the actual population from which the sample was originally selected.

Generally, data can be missing in survey research for different reasons. Some reasons could be due to the design of the study (e.g., the study required too much of the participants' time), while others may be due to chance (Horton & Kleinman, 2007). For instance, a number of variables may be collected from only some subjects; while some items may be ambiguous or interpreted differentially by respondents; certain items may seem offending; some items may be inapplicable; and some subjects may not be willing to answer particular questions, or may quit before completing the survey; or errors may occur in any research step (Cool, 2000). Therefore, it is not uncommon to obtain either missing or unusable data in survey research (Cool, 2000; Raaijmakers, 1999; Raymond, 1987, Witta, 1994).

When conducting a survey research, it is usually recommended to increase the required sample size anticipating for possible missing information (Light, Singer, & Willett, 1990). However, the final sample still ends up, in many cases, with a large proportion of lost data. The central goal of making valid inferences

regarding the population of interest is threatened by missing data. This is more likely to occur when missing data make the sample different from the population that it was drawn (Wayman, 2003).

The main goals of this study were to estimate the incidence of missing data in surveys and the its prevalence with respect to the respondent's gender, and analyze how surveys' sample size is affected by this problem.

Literature Review

As missing data is a serious issue in surveys, it is useful to determine the prevalence of this problem in real surveys. It is also valuable to determine the proportion of missing data in surveys with respect to the gender of respondents for several reasons. First, it is rare to survey people using the responses of only males or only females. Having a reasonably equal ratio of males and females is one of the conditions that researchers usually like to have in order to improve the degree of the study representation and generalizability. Second, gender is the most common demographic variable that appears in almost all surveys. So it is necessary to estimate the prevalence of missing data with respect to this variable. This does not mean that the other variables have no effect; however, gender is evidently more common than others. Third, gender differences exist in most societies. Even in countries that promote equity between males and females in most life aspects, there are still some biological, psychological, and social factors that affect males and females differently. Consequently, these factors are likely to influence a person's response to a given variable or question.

In the literature of missing data a distinction is made between "unit missing data" which refers to data missing from a unit of analysis (e.g., a person or participant), and "missing values" which refer to scores or values on a particular variable (e.g., survey item or question) that are missing (McKnight, et. al, 2007). This study focuses on the missing values in survey research.

A typical survey consists of several questions or items about one (or more) topic of interest. Survey questions can be classified (based on the nature of the collected data) into two types: demographic questions that ask about personal facts and questions that ask about the survey topic. Questions on personal facts usually refer to physical and social details. For example, age, gender, level of education, race, income, occupation, marital status, number of children, place of birth, and number of working hours per day. In the second type, questions explore the participants' opinions, feelings, positions, or thoughts toward a specific subject of interest.

An important issue in studying missing data is to know the probabilistic process by which data become missing (missing data mechanism). In the literature, there are three types of missing data mechanisms (Acock, 2005; Little & Rubin, 2002). The first is when data are missing completely at random (MCAR). In this case, the probability that an observation is missing is unrelated to the value of any variable in the data set. For example, data on the variable "age" would not be considered MCAR if females were less likely to report their ages than males (prevalence of missing data is correlated with gender). The second type is when data are missing at random (MAR). Here, cases with missing data differ from cases with complete data, or missingness on a variable depends on the values of other variables. For example, if a test is administrated before a survey administration session, then participants with lower scores on the test may

be less likely to complete the survey. In this case, missing data are due to some external variable rather than the variable where data are missing. When data are MCAR or MAR the analysis is not biased, however, the problem of missing data still exists (Howell, 2007). The third type is when data are missing not at random (MNAR), also called non-ignorable. Dealing with missing data in this case is much more difficult than the other two types.

Missing data mechanisms are not the only factors to consider when we need to analyze or handle missing data problems. Other factors are whether missing values are with the dependent or independent variables, and whether missingness is due to the design of the study or due to chance. For example, for various reasons, some questions may not be asked to all the subjects of the entire sample. One more influential aspect to bear in mind is the size of missing data. Whether it is numerous or a few values and whether the information is missing from a few subjects or many of them, it is still a significant issue to consider and manage.

Methodology

Objectives

A valid and accurate assessment is the main goal in social research which heavily uses surveys for collecting data. Marie (1997) stated that improving the psychometric properties of the survey instrument is necessary since many survey instruments are poorly designed and interpreted. Often in data analysis of survey results, missing data cannot be excluded nor ignored. This study aimed at determining the prevalence of missing data in surveys in general and with respect to the gender of respondents in particular. Additionally, the study examined the effect of missing data on decreasing the final sample size and changing the ratio between the number of males and females with and without missing data.

The Survey Data Sets Used in the Study

Through an intensive process of search on the Internet, more than 250 authentic survey data sets were accessed and downloaded. These surveys were originally conducted in many countries to collect data information related to a wide range of issues including politics, family, environment, minorities, religion, health, job and customer satisfaction, youth, business, media, war, social security, and others. Data of these studies were raw and have not been treated by any method of missing values. Through initial analysis of each survey, many data sets were excluded in this stage for various reasons. For example, some data sets did not have variable labels and/ or variable values. Also, since the study compares missing values between male and female respondents, if the data file did not include the gender of the respondent it was not used. Some studies were excluded because they were designed for only one gender such as women and mothers. Additionally, some surveys collected only facts or personal information from respondents. At the end of this analysis, only 119 survey data sets were found appropriate for further analysis. These data sets which represented the study sample were originally from the following countries: USA (104), UK (8), Mexico (5), Taiwan (1), and Japan (1). Examples of these data sets are: USA Social Capital Community Survey (2006), The U.S. Citizenship, Involvement, Democracy Survey (2005), National Survey of America's Families (2000), National Survey of Latinos Education (2004), British Election Study (2001), Japan

National Survey on Family and Economic Conditions (2000), Political Tolerance in Taiwan (2004), and Pew Hispanic Center Survey of Mexicans Living (2006).

Results

To estimate the prevalence of missing data in surveys, the variable with the maximum number of missing data for each survey data set was identified. Then the percentage of missing data on this variable was calculated. Table 1 summarized the results of this analysis for five surveys selected as examples.

Table 1

Missing Data for Five Examples of Survey Data Sets

| Survey | Sample size | Variable with max missing data | No. of missing data | Percentage of missing data |
|---|-------------|---|---------------------|----------------------------|
| National Survey of Adolescents in the US-1995 | 4023 | Do you think school programs are helpful? | 1339 | 33% |
| Youth Vote Survey-USA-1999 | 807 | Which political party is more conservative? | 366 | 45% |
| British Crime Survey-2000 | 2561 | Should Britain stay member of EU? | 302 | 12% |
| Winthrop University Student 1996 Religion Survey- | 306 | Human beings evolved from earlier species of animals? | 214 | 70% |
| Smoking Survey University of Oregon-2002 | 776 | Current thoughts about quitting smoking? | 677 | 87% |

The same analysis was conducted to the 119 surveys. The distribution of the percentage of missing data was represented in the following histogram (Graph 1). The average of the percentages of missing data over the 119 data sets was found to be 38%. This means that, on average, surveys have more than one third of their data missing.

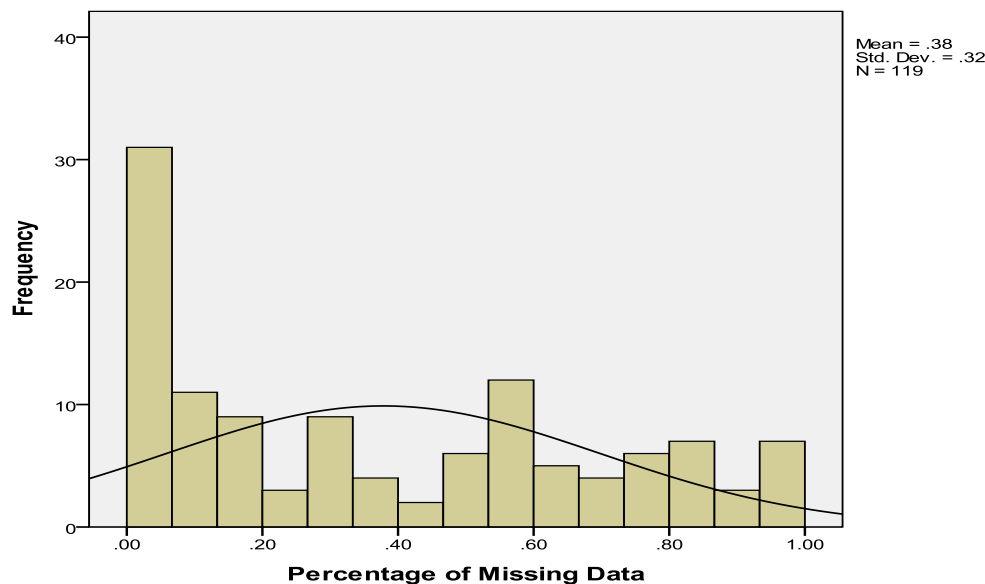
Additionally, and based on the value of this percentage, survey data sets were categorized into three categories that represent less than 25%, 25-50% and more than 50% missing information. These three categories represent the states of having small, moderate, and large amount of missing data, respectively (Dodeen, 2003). Results are summarized in Table 2. A quick look at this table reveals that, in general, missing data is prevalent in surveys. Out of 119 survey data sets used in this study, 54 (45.4%) surveys have less than 25% missing data; while 49 surveys (41.2%) have more than half of their data missing.

Table 2

Percentage of Missing Data in Surveys

| Percentage of missing data | Number of surveys | Percentage of surveys |
|----------------------------|-------------------|-----------------------|
| Less than 25% | 54 (45.4%) | 45.4% |
| 25% - 50% | 16 (13.4%) | 13.4% |
| More than 50% | 49 (41.2%) | 41.2% |
| Total | 119 (100%) | 100% |

Graph 1:

Distribution of the Percentages of Missing Data in Surveys

To evaluate the results between males and females, the percentage of missing data by males for each data set was calculated and compared with that of females. To illustrate this analysis, Table 3 summarized the results of the five selected survey examples.

Table 3

Comparing Missing Data between Males and Females for Five Surveys Examples

| Survey | Sample size | Initial No. of Males | Initial No. of Females | Percentage of Missing Males | Percentage of Missing Females | Ratio M to F Without Missing | Ratio M to F with Missing |
|---|-------------|----------------------|------------------------|-----------------------------|-------------------------------|------------------------------|---------------------------|
| National Survey of Adolescents in the US-1995 | 4023 | 1142 | 2881 | 43% | 30% | .40 | .32 |

| | | | | | | | | |
|---|-------|------|------|------|-----|-----|-----|------|
| Youth Survey-USA- 1999 | Vote | 807 | 401 | 405 | 45% | 46% | .99 | 1.01 |
| British Survey-2000 Winthrop | Crime | 2561 | 1143 | 1418 | 5% | 17% | .81 | .92 |
| University Student Religion Survey- 1996 | | 306 | 84 | 221 | 42% | 24% | .38 | .29 |
| Smoking Survey, University of Oregon-2002 | | 776 | 345 | 431 | 83% | 90% | .80 | 1.41 |

Although in Table 3 percentages of missing data between males and females are not very close to each other in some examples, results indicated that, overall, males and females are very similar with respect to size of missing data. The average percentage of missing data for males was 37%; while it was 38% for females (standard deviations were also very close with .32 for males and .33 for females). Also, the effect of missing data was analyzed by comparing males' to females' ratio with and without missing data. From all the surveys analyzed in this study, the average of the initial ratio between both genders (males to females) was 0.91. This means the number of male participants was less than that of females. Because of missing data, this average ratio was changed to 1.08. To further understand the change in genders' ratio, the number and percentage of data sets, in which the ratio has been reserved, was calculated. Results indicated that the ratio between males and females have been reversed in 23 (19.3%) data sets.

To analyze the effect of missing data in surveys, the loss in sample size for each data set was estimated by comparing the initial sample sizes (without missing data) with the final available sample size (with missing data). The ratio was 62% over the 119 surveys, which means that on average; only 62% of the initial sample size was available at the end of the data collection stage.

Discussion

Missing data is a common reality of research in general and survey research in particular. The problem still represents a significant challenge for social scientists due to the lack of understanding of its importance and prevalence (McKnight, McKnight, Sidani, & Figueredo, 2007). The purpose of this study was to investigate the prevalence of missing data in surveys, and the magnitude of missing data for males and females separately, and the effect of missing data on sample size.

Investigating the prevalence of missing data in surveys is an important issue because surveys are a common and practical tool to collect information about or from people. Therefore, surveys should be constructed and conducted appropriately to give clear, accurate, and valid results. Having missing data threatens the validity of the results. Additionally, as the size of missing data increases, the validity of the

results decreases. Hence, the credibility of the organization producing the report or study may be jeopardized (Witt, & Kaiser, 1991).

The results of this study showed that surveys, in general, have more than one third of lost data. Moreover, in more than 40% of surveys analyzed in this study, 50% of data or more was missing. This clearly indicates that missing data is a prevalent problem in surveys. Bodner (2006) attained similar results on analyzing a random sample of empirical research journal articles from the Psych INFO database. McKnight and his colleagues (McKnight, et.al. 2007) analyzed missing data in over 300 articles in a prominent psychological journal across a 3-year period, and also found that missing data is prevalent with an average amount that exceeds 30%. The frequency of missing data should raise the awareness of social scientists on the significance of this problem.

Overall, surveys analyzed in this study showed that males and females were similar with respect to percentages of missing data. This, of course, does not mean that in each survey, the percentage of missing data by males is equal to that of females, but it is the average over the analyzed surveys for each gender. An important point that could be concluded from this result is that there is no general tendency on one gender to miss data more than the other.

The effect of missing data on the survey sample size was clear and substantial. First, missing data causes a significant drop on the sample size. The final sample size was only 62% of the initial sample size for all the surveys. This big loss in sample size could be converted to loss in effort, time, and money that have been invested in collecting data. Furthermore, decreasing sample size has its strong negative effects on sample representation of the study population and its statistical power. Second, the missing data changed the actual ratio between males and females. Overall, females were more than males in the initial samples, but this ratio was finally reversed because of missing data.

The magnitude of missing data in surveys is serious and should be considered in all survey research and applications. In this regard, the American Psychological Association Task Force on Statistical Inferences strongly emphasized that researchers report complications like missing data and non-responses in their studies. Also, researchers should document how the actual analysis differs from the planned analysis (Wilkinson and APA Task Force on Statistical Inference, 1999).

Finally, as it is often true, prevention is better than cure, and treating missing data should start at the prevention level before remediation. All procedures to reduce the likelihood of obtaining missing data in each study or project should be evaluated, and the appropriate ones applied. This strategy should be part of every phase of research, starting from the development of the research question and design of the study, and continue throughout planning, piloting, implementation, monitoring, and data management and analysis (Hardy, Allore, & Studenski, 2009). The statistical procedures used to treat missing data in surveys are not supposed to compensate for or replace the essential efforts to reduce missing data. Strategies range from preparing clear and credible instruments to the use of effective data collection methods.

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Inter Simple Sequence Repeat markers for analysis of molecular diversity and genetic structure of eighteen *Dendrobium* cultivars in Sri Lanka

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ABSTRACT

The genus *Dendrobium* is one of the largest genera in the family Orchidaceae having more than thousand species over the world with diverse morphological characters. *Dendrobium* is a popular ornamental plant with complex genetic background which emphasize on the species identification at molecular level. The present study was aimed to identify Inter-Simple Sequence Repeat (ISSR) markers capable of detecting genetic polymorphism to characterize 18 hybrid, commercially available *Dendrobium* cultivars. Genomic DNA of each cultivar was extracted using CTAB method. A total of 17 different ISSR primers were evaluated. Only the reproducible bands were scored and number of different alleles (N_a), number of effective alleles (N_e), Shannon's Information Index (I), Expected heterozygosity (H_e), Unbiased expected heterozygosity (U_{He}), polymorphic percentage and polymorphic information content (PIC) of each primer were calculated. The highest Shannon's Information Index (0.537 ± 0.08) was recorded by the primer UBC 826 while the highest polymorphic information content (PIC) was generated by primer UBC 807. The PIC values of the primers were ranged from 0.0068 to 0.451, indicating that primers are moderately informative. In total, 631 bands representing 120 loci were amplified showing 85.71% - 100% polymorphism. The genetic similarities between individuals were compiled in the Nei's genetic identity matrix in order to construct the UPGMA dendrogram. Principle component analysis (PCA) and clustering analysis were done to divide different cultivars into groups. The analysis revealed the presence of four major clusters and two minor clusters among the cultivars. The study suggested that the ISSR markers originated from eight primers 12, 155, UBC 807, UBC 812, UBC 826, UBC 835, UBC 841 and UBC 842 can be used in the detection of molecular variation among cultivars in the genus *Dendrobium*.

Keywords: *Dendrobium*, Genetic diversity, ISSR markers, Polymorphism

1. Introduction

The genus *Dendrobium*, belongs to family Orchidaceae which is the third largest group having more than thousand species over the world (Leitch *et al*, 2009). The orchid family is probably one of the most important plant families from a horticultural point of view. *Dendrobiums* are popular as a cut flower and a pot plant in commercial floriculture industry. The cultivar identifications currently based on morphological

characterization, is time consuming, observer dependent and difficult (Adams *et al.*, 2006). Morphological parameters also rely on variability in species and plant growth conditions. Thus it makes more complicated to figure out the genetic diversity and individual genotypes of *Dendrobium* cultivars accurately.

Due to the increasing demand for cut flowers in the world market, a large number of novel *Dendrobium* cultivars are continually being imported for commercial cultivation, leading to a narrow genetic base for cultivar improvements under Sri Lankan conditions. Identification of all these different cultivars has become a major issue due to their similar plant morphologies. So far, cultivars have mainly been identified based on flower morphology, which is seldom available at the juvenile stage of plant development. The increasing number of *Dendrobium* hybrids and cultivars emphasize the need of molecular basis for the identification of genus *Dendrobium* (Burke *et al.*, 2008). It is important for the sustainable conservation and increased use of plant genetic resources on novel hybrid production hence avoid the genetic erosion of the local varieties.

As a consequence, the development of new reliable and efficient tools based on molecular analysis has become popular (Primrose *et al.*, 2010). These molecular biology techniques are powerful and good in species identification due to their consistency, independent from environmental parameters and developmental stage of the plant.

Among them PCR based techniques are the most popular due to their simplicity and requirement of little amount of DNA. The widely-using PCR based approaches are RAPDs, SSRs or microsatellites, ISSR and AFLPs. However, each and every markers have their own positive and negative remarks.

RAPD markers are very quick and easy to develop but have low reproducibility. AFLP markers have medium reproducibility but high operational cost, high developmental cost and high labour requirement. RAPD, ISSR and AFLP utilize arbitrary priming and do not require prior knowledge about genome sequence. The SSRs or Microsatellites are specific and highly polymorphic (Jones *et al.*, 1997), but they are limited in use as they require prior knowledge of genomic sequence in primer designing. ISSR uses Simple Sequence Repeats (SSR) presence throughout the genome which are ubiquitous, abundant and highly polymorphic tandem repeat motifs composed of 1 to 7 nucleotides.

In 1994, Inter Simple Sequence Repeat (ISSR) was introduced (Zietkiewicz *et al.*, 1994) which is carrying one primer complementary to a target microsatellite. They are best known as they are reproducible, highly polymorphic, highly informative, quick and easy to handle, but they have the reproducibility of SSR markers because of the longer length of their primers (Bornet *et al.*, 2001).

The genetic variability within specific study mainly concerns non-coding regions of the genome that are characterized by the abundance of highly repetitive sequences within which the mutations are quite frequent. This variability has been studied by the technique of ISSR. ISSR marker is reliable having high sensitivity with low cost relative to other molecular markers. The choice of technique for any given application depends upon the material used and the nature of the question being addressed.

For the present study, a promising and effective genotyping marker like ISSR is absolutely crucial. These molecular studies bring useful information on the determination of genetic variation and the organization

of genetic diversity within the genus *Dendrobium*. Hence this study was aimed at screening and selecting compatible polymorphic ISSR markers with eighteen *Dendrobium* cultivars to obtain molecular identification. Ultimately, it was expected to develop a reliable genotyping method to assess molecular diversity and to determine the genetic structure of *Dendrobium* cultivars.

2. Materials and methods

2.1 Plant materials

A collection of eighteen *Dendrobium* hybrid cultivars were selected for the assay as mentioned in Table 2.1. The uppermost tender leaf of the plant was harvested from each and every individual of cultivars. The samples were washed under running tap water and wiped with 70% ethanol. Approximately, 0.25g of each sample was weighed with two replicates, cut into small pieces and kept at -20°C for freezing.

2.2 DNA extraction

The frozen leaf samples were subjected to genomic DNA extraction using cetyltrimethyl ammonium bromide (CTAB) method. The DNA pellet was washed with 70% ice cold ethanol and dissolved in Tris EDTA buffer. Then the samples were verified for the presence of genomic DNA along with quantity and quality in 1% agarose gel buffered with TAE.

Table 2.1 List of *Dendrobium* cultivars used in the study

| Code in the study | Common Name | Code in the study | Common Name |
|-------------------|---------------|-------------------|----------------|
| 1 | Burana Jade | 10 | Y Red Lip |
| 2 | Blue Pink | 11 | Banana Ancheng |
| 3 | Blue Amathis | 12 | Red |
| 4 | Orange | 13 | Hollywood |
| 5 | Ni – P Pink | 14 | TG Blue |
| 6 | Brown | 15 | Blue Planet |
| 7 | Aridang Green | 16 | Pink Candy |
| 8 | Brown Yellow | 17 | Burana Emerald |
| 9 | Saleya Candy | 18 | Liberty White |

2.3 ISSR markers and PCR amplification

In this study, seventeen ISSR primers (Table 2.2) were evaluated among eighteen *Dendrobium* cultivars. PCR amplification was performed using 25 µl of PCR reaction mixture solution containing 10µl of Go Taq® Colorless Master Mix 2X [Go Taq® DNA polymerase is supplied in 2X Colorless Go Taq® Reaction buffer (pH 8.5), 400 µM dATP, 400 µM dGTP, 400 µM dCTP, 400 µM dTTP and 3 mM MgCl₂] 8 µl of ISSR primer, 5 µl of template DNA and nuclease free water up to total volume of 25 µl according to manufacturer's instructions.

Touch-down PCR was performed in MyCycler thermal cycler (BioRad and city) with initial denaturation at 94°C for 5 minutes followed by 10 cycles of 94°C for 60 seconds, 53°C for 45 seconds (decreasing 0.5°C

per cycle), and 72⁰C for 90 seconds and 35 cycles of 94⁰C for 60sec, 48⁰C for 45 seconds, 72⁰C for 90seconds and a final extension at 72⁰C for 10 minutes. The PCR run was end up with the final holding at dwell time temperature of 4⁰C.

For ISSR marker profiling, PCR products were subjected to electrophoresis on 2% agarose gels, followed by staining with Ethidium Bromide along with a 100 base pair DNA molecular weight marker Gel Pilot by Promega. The electrophoretic patterns of the PCR products were recorded digitally using a Gel-Doc Major Science Smartview Pro 1100 Imager System.

Table 2.2 Characteristics of ISSR primers used for the analysis of *Dendrobium* cultivars.

| No | Primer Name | Primer | Primer sequence | GC% | Annealing temperature (°C) | Total bands | Polymorphic percentage |
|----|-------------|----------------------|------------------|-------|----------------------------|-------------|------------------------|
| 1 | 12 | (AC) ₈ AT | ACACACACACACACAT | 44.44 | 51.6 | 8 | 100 |
| 2 | 14 | (AC) ₈ AG | ACACACACACACACAG | 50 | 53.9 | 5 | 100 |
| 3 | 15 | (AC) ₈ TG | ACACACACACACACTG | 50 | 53.9 | 10 | 100 |
| 4 | 125 | (AC) ₈ CA | ACACACACACACACCA | 50 | 53.9 | 9 | 100 |
| 5 | 134 | (AG) ₈ AA | AGAGAGAGAGAGAGAA | 44.44 | 51.6 | 6 | 100 |
| 6 | 144 | (AC) ₈ GA | ACACACACACACACGA | 50 | 53.9 | 15 | 100 |
| 7 | 155 | (TG) ₈ GG | TGTGTGTGTGTGTGGG | 55.56 | 56.1 | 8 | 100 |
| 8 | 165 | (AG) ₈ CC | AGAGAGAGAGAGAGCC | 55.56 | 56.1 | 2 | 100 |
| 9 | 174 | (ACTG) ₄ | ACTGACTGACTGACTG | 50 | 48.2 | 6 | 100 |
| 10 | *UBC 807 | (AG) ₈ T | AGAGAGAGAGAGAGT | 47.06 | 50.0 | 7 | 85.71 |
| 11 | *UBC 812 | (GA) ₈ A | GAGAGAGAGAGAGAA | 47.06 | 50.0 | 7 | 85.71 |
| 12 | *UBC 826 | (AC) ₈ C | ACACACACACACACC | 52.94 | 52.4 | 7 | 100 |
| 13 | *UBC 834 | (AG) ₈ CT | AGAGAGAGAGAGAGCT | 50 | 53.9 | 7 | 100 |
| 14 | *UBC 835 | (AG) ₈ TC | AGAGAGAGAGAGAGTC | 50 | 53.9 | 3 | 100 |
| 15 | *UBC 841 | (GA) ₈ TC | GAGAGAGAGAGAGATC | 50 | 53.9 | 8 | 100 |
| 16 | *UBC 842 | (GA) ₈ CG | GAGAGAGAGAGAGACG | 55.56 | 56.1 | 7 | 100 |
| 17 | *UBC 866 | (CTC) ₆ | CTCCTCCTCCTCCTC | 66.67 | 60.7 | 5 | 100 |

2.4 Data analysis

An electrophoresis gel of PCR products by each and every cultivar were used to score the markers. The genetic distance analysis was performed considering a binary matrix that was compiled using software PyElph (Version 1.4) where '1' to indicate band present and '0' to indicate band absent (Liu *et al.*, 2006). All the ISSR assays were repeated twice to confirm the validity of results. Only the reproducible bands were considered during gel scoring (Lentner and Bishop, 1986). Both monomorphic and polymorphic bands were scored for genetic distance calculations. The software GeneAEx (Version 6.501) was used in generating Nei's coefficient (Nei, 1972), Shannon's information index (Shannon & Weaver, 1949). For the analysis of genetic relationship, a similarity matrix of ISSR genotyping patterns was created using Nei's genetic identity for all pair-wise comparisons among the eighteen cultivars.

The resultant identity matrix was used to construct a dendrogram via unweighted pair-group method by arithmetic averages (UPGMA) program in the software package Mega (version 6.06). Simultaneously, the Principle Component Analysis (PCA) was performed to prove evidences by cluster analysis using software GeneAEx (Version 6.501).

The total number of amplified loci, total number of polymorphic loci, rate of polymorphism, polymorphic information content (PIC) values were calculated separately for each and every marker (Bostein *et al.*, 1980).

$$PIC_i = 1 - \sum_{j=1}^n p_{ij}^2$$

Where p_{ij} is the frequency of the allele j in primer i and n is the number of alleles.

3. Results and Discussion

3.1 ISSR polymorphism

Amplification profiles from different primers revealed a significant difference in their ability to determine genetic variation among the cultivars. Some of the primers amplified several different alleles through the eighteen *Dendrobium* cultivars but others produced less allelic variation. Genotyping with these markers produced 631 of distinct bands having 85.71% to 100% polymorphism with all the tested samples. It might be due to sufficient amount of GC content (47.06%) of the primers used in the study. Fukuota *et al.* (1992) observed an increased number of bands with increasing percentage of GC content in the primers. The explanation for the correlation between GC content and the number of bands may be the stability of base complementation of A with T.

A total of 120 ISSR loci were revealed across eighteen *Dendrobium* cultivars allocating an average nearly 7 loci over single primer. The genotyping profiles of each and every ISSR primer had unique pattern of banding. Primer 144 for di-nucleotide AC repeats detected 15 ISSR loci, was the most informative among all tested primers. The identity of eighteen different *Dendrobium* cultivars was easily detected using the primer UBC 807 and UBC 812 (Figure a and b). When compared to other multi-loci and PCR- based methods, ISSR amplifications gave more markers and showed a higher level of polymorphism between

Dendrobium cultivars. These observations are in agreement with many studies showing the higher reproducibility and efficiency of ISSR markers (Galvan *et al.*, 2003).

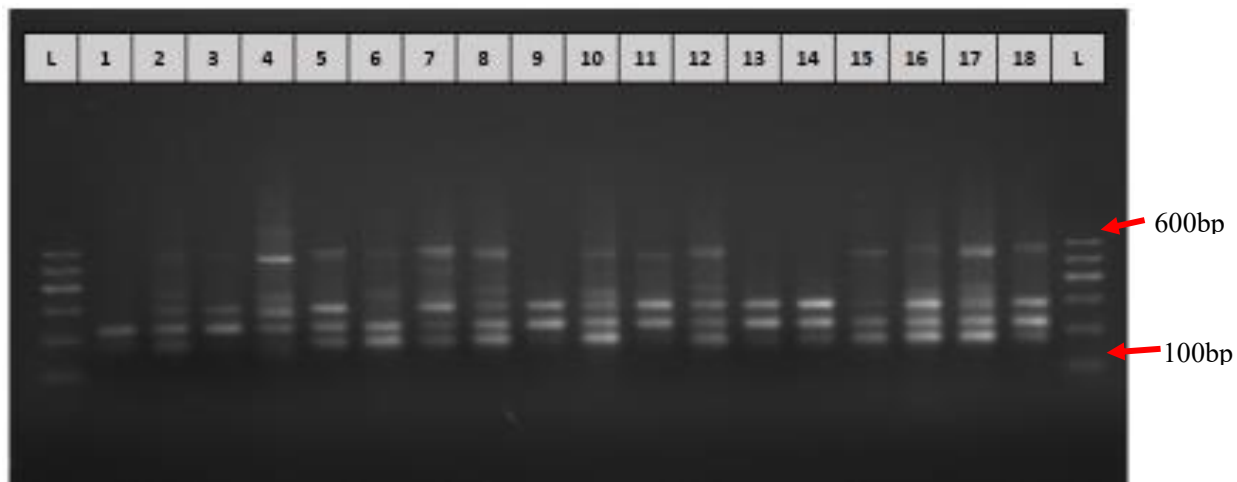


Figure a DNAfingerprinting analysis of eighteen *Dendrobium* cultivars by genotyping with ISSR marker UBC 807. The lane L represent the 100 bp molecular ladder. The codes of the different cultivars used in the figure are same as in the Table 2.1. (1) Burana Jade, (2) Blue Pink, (3) Blue Amathis, (4) Orange, (5) Ni-P Pink, (6) Brown, (7) Aridang Green, (8) Brown Yellow, (9) Saleya Candy, (10) Y Red Lip, (11) Banana Ancheng, (12) Red, (13) Hollywood, (14) TG Blue, (15) Blue Planet, (16) Pink Candy, (17) Burana Emerald, (18) Liberty White.

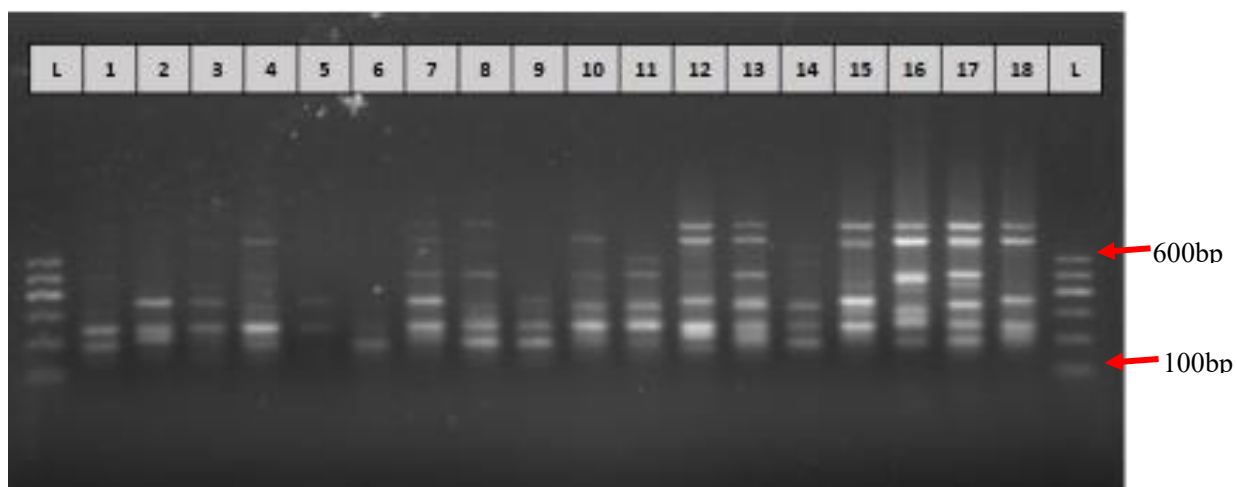


Figure b DNAfingerprinting analysis of eighteen *Dendrobium* cultivars by genotyping with ISSR marker UBC 812. The lane L represent the 100 bp molecular ladder. The codes of the different cultivars used in the figure are same as in the Table 2.1. (1) Burana Jade, (2) Blue Pink, (3) Blue Amathis, (4) Orange, (5) Ni-P Pink, (6) Brown, (7) Aridang Green, (8) Brown Yellow, (9) Saleya Candy, (10) Y Red Lip, (11) Banana Ancheng, (12) Red, (13) Hollywood, (14) TG Blue, (15) Blue Planet, (16) Pink Candy, (17) Burana Emerald, (18) Liberty White.

The seventeen markers were evaluated for their polymorphic level by calculating the polymorphic information content (PIC) which is an indicator of allele diversity and frequency among various *Dendrobium* cultivars. The values for PIC calculations varied widely from 0.0068 (primer 14) to 0.4511 (primer UBC 807) indicating that primers are moderately informative according to the studies by Bosten

et al. (1980). There are much evidences on use of moderately informative markers by Kesari *et al.* (2010) on *Pongamia pinnata* Pierre, Alikhani *et al.* (2014) on *Quercus brantii* Lindl and Aryanegad *et al.* (2013) on *Trifolium* spp. The most promising ISSR markers for proper identification of the genus *Dendrobium* are 12, 155, UBC 807, UBC 812, UBC 826, UBC 835, UBC 841 and UBC 842 Which were selected based on higher polymorphic information content (Blair *et al.*, 2003).

3.2 Genetic diversity analysis

The highest Shannon's information index was in primer UBC 826 and lowest in primer 14 (Table 4.2). Shannon Information Indices have been widely employed in ecology but largely overlooked in genetics. The presence of different values on Nei's genetic diversity and Shannon's information index (Table 4.2) revealed the variation in abundance of the complementary sequence to the primer on genomic DNA. Both parameters indicate higher values when the primers are synthesized with homo-dimer as the expected abundance of the homo-dimer is greater than homo-trimer and homo-tetramer. A survey report published by Toth *et al.* (2000) support the evidence on low availability of homo-tetramer sequences in embryophyta.

Table 3.1 Genetic diversity of eighteen *Dendrobium* cultivars identified by seventeen primers

| N | | | | | | | |
|----|-------------|-------------|-------------|-------------|-------------|-------------|--------|
| o | Primer code | Na | Ne | I | He | UHe | PIC |
| 01 | 12 | 2.000 | 1.408±0.110 | 0.416±0.066 | 0.262±0.053 | 0.269±0.054 | 0.1489 |
| 02 | 14 | 2.000 | 1.083±0.015 | 0.165±0.022 | 0.076±0.013 | 0.078±0.013 | 0.0068 |
| 03 | 15 | 2.000 | 1.171±0.046 | 0.250±0.043 | 0.135±0.030 | 0.139±0.031 | 0.0201 |
| 04 | 125 | 2.000 | 1.185±0.036 | 0.277±0.039 | 0.151±0.026 | 0.155±0.027 | 0.0278 |
| 05 | 134 | 2.000 | 1.214±0.109 | 0.257±0.085 | 0.148±0.062 | 0.152±0.064 | 0.0566 |
| 06 | 144 | 2.000 | 1.288±0.047 | 0.351±0.039 | 0.209±0.029 | 0.215±0.030 | 0.0333 |
| 07 | 155 | 2.000 | 1.535±0.130 | 0.471±0.079 | 0.312±0.063 | 0.321±0.065 | 0.2365 |
| 08 | 165 | 2.000 | 1.345±0.082 | 0.420±0.057 | 0.254±0.046 | 0.261±0.047 | 0.0802 |
| 09 | 174 | 2.000 | 1.159±0.038 | 0.250±0.044 | 0.132±0.029 | 0.136±0.030 | 0.0242 |
| 10 | *UBC807 | 1.857±0.143 | 1.489±0.170 | 0.400±0.114 | 0.270±0.085 | 0.278±0.088 | 0.4511 |
| 11 | *UBC812 | 1.857±0.143 | 1.579±0.150 | 0.470±0.107 | 0.323±0.078 | 0.332±0.080 | 0.4480 |
| 12 | *UBC826 | 2.000 | 1.681±0.146 | 0.537±0.086 | 0.369±0.069 | 0.380±0.071 | 0.2932 |
| 13 | *UBC834 | 2.000 | 1.226±0.041 | 0.317±0.041 | 0.178±0.029 | 0.183±0.029 | 0.0423 |
| 14 | *UBC835 | 2.000 | 1.535±0.256 | 0.457±0.167 | 0.306±0.129 | 0.315±0.133 | 0.2984 |
| 15 | *UBC841 | 2.000 | 1.365±0.121 | 0.368±0.079 | 0.230±0.061 | 0.236±0.063 | 0.1385 |
| 16 | *UBC842 | 1.857±0.143 | 1.258±0.103 | 0.290±0.086 | 0.175±0.061 | 0.180±0.063 | 0.2138 |
| 17 | *UBC866 | 2.000 | 1.242±0.074 | 0.324±0.057 | 0.185±0.043 | 0.190±0.045 | 0.0506 |

Na = Number of different alleles, Ne = Number of effective alleles, I = Shannon's Information Index, He = Expected heterozygosity, UHe = Unbiased expected heterozygosity and PIC = Polymorphic information content

3.3 Genetic distance

The different cultivars were resolved by their genetic distance during pairwise comparison, calculating Nei's genetic distance. The distance values ranged from 0.007 to 0.499 (Table 3.2). The highest distance value (0.499) was observed between cultivar Ni P Pink and Burana Emerald. This calculation of pairwise genetic distances for binary data follows the method of Huff *et al.*, in which any comparison with the same state yields a value of 0 (both 0 vs 0 comparisons and 1 vs 1 comparisons), while any comparison of different states (0 vs 1 or 1 vs 0) yields a value of 1.

3.4 Genetic similarity and cluster analysis

For the determination of genetic relatedness among different *Dendrobium* cultivars the Nei's genetic identity matrix was compiled during pair-wise comparison between individuals based on ISSR genotyping data. Figure 3.1 represents the Dendrogram for the *Dendrobium* cultivars generated by UPGMA analysis. The Nei and Li genetic distance (GD_{NL}) coefficient values of the Dendrogram ranged from 0.01 to 0.13, with a mean value of 0.07.

The low GD_{NL} values indicated that *Dendrobium* cultivars were closely related to each other and resulted in their close clustering in the dendrogram. The genotypes which were derived from the genetically similar ancestors were clustered together at the similarity coefficient value of 0.07 which is close to the genetic similarity level of 0.06 used by Rajesh *et al.* (2002) to categorize both annual and perennial wild *Cicer* species using ISSR markers.

Table 3.2 Matrix of Genetic distances among pairs of *Dendrobium* cultivars based on ISSR fingerprinting analysis

| <u>Burana Jade</u> | Blue Pink | Blue <u>Amathis</u> | Orange | Ni-P Pink | Brown | <u>Aridang Green</u> | Brown Yellow | <u>Saleya Candy</u> | Y Red Lip | <u>Banana Ancheng</u> | Red | Hollywood | TG Blue | Blue Planet | Pink Candy | <u>Burana Emerald</u> | Liberty white | |
|--------------------|-----------|---------------------|--------|-----------|-------|----------------------|--------------|---------------------|-----------|-----------------------|-------|-----------|---------|-------------|------------|-----------------------|---------------|-----------------------|
| 0.000 | | | | | | | | | | | | | | | | | | <u>Burana Jade</u> |
| 0.095 | 0.000 | | | | | | | | | | | | | | | | | Blue Pink |
| 0.182 | 0.085 | 0.000 | | | | | | | | | | | | | | | | Blue <u>Amathis</u> |
| 0.183 | 0.098 | 0.011 | 0.000 | | | | | | | | | | | | | | | Orange |
| 0.223 | 0.171 | 0.259 | 0.220 | 0.000 | | | | | | | | | | | | | | Ni-P Pink |
| 0.183 | 0.103 | 0.015 | 0.007 | 0.226 | 0.000 | | | | | | | | | | | | | Brown |
| 0.332 | 0.273 | 0.377 | 0.332 | 0.085 | 0.338 | 0.000 | | | | | | | | | | | | <u>Aridang Green</u> |
| 0.185 | 0.103 | 0.190 | 0.186 | 0.231 | 0.180 | 0.136 | 0.000 | | | | | | | | | | | Brown Yellow |
| 0.193 | 0.095 | 0.174 | 0.191 | 0.265 | 0.199 | 0.180 | 0.026 | 0.000 | | | | | | | | | | <u>Saleya Candy</u> |
| 0.288 | 0.196 | 0.285 | 0.283 | 0.129 | 0.288 | 0.047 | 0.100 | 0.094 | 0.000 | | | | | | | | | Y Red Lip |
| 0.286 | 0.186 | 0.280 | 0.288 | 0.128 | 0.287 | 0.049 | 0.096 | 0.099 | 0.010 | 0.000 | | | | | | | | Banana |
| | | | | | | | | | | | | | | | | | | <u>Ancheng</u> |
| 0.310 | 0.188 | 0.289 | 0.316 | 0.398 | 0.305 | 0.299 | 0.110 | 0.114 | 0.219 | 0.190 | 0.000 | | | | | | | Red |
| 0.100 | 0.010 | 0.088 | 0.096 | 0.177 | 0.099 | 0.281 | 0.099 | 0.092 | 0.194 | 0.191 | 0.191 | 0.000 | | | | | | Hollywood |
| 0.182 | 0.085 | 0.163 | 0.185 | 0.252 | 0.187 | 0.175 | 0.020 | 0.009 | 0.099 | 0.091 | 0.101 | 0.093 | 0.000 | | | | | TG Blue |
| 0.410 | 0.287 | 0.399 | 0.407 | 0.226 | 0.410 | 0.137 | 0.196 | 0.192 | 0.097 | 0.087 | 0.101 | 0.296 | 0.186 | 0.000 | | | | Blue Planet |
| 0.420 | 0.285 | 0.393 | 0.421 | 0.283 | 0.406 | 0.193 | 0.196 | 0.198 | 0.115 | 0.097 | 0.085 | 0.287 | 0.184 | 0.015 | 0.000 | | | Pink Candy |
| 0.408 | 0.277 | 0.177 | 0.189 | 0.499 | 0.187 | 0.391 | 0.192 | 0.182 | 0.293 | 0.291 | 0.098 | 0.280 | 0.177 | 0.191 | 0.182 | 0.000 | | <u>Burana Emerald</u> |
| 0.296 | 0.196 | 0.293 | 0.300 | 0.335 | 0.298 | 0.238 | 0.101 | 0.097 | 0.189 | 0.185 | 0.022 | 0.197 | 0.098 | 0.093 | 0.105 | 0.099 | 0.000 | Liberty White |

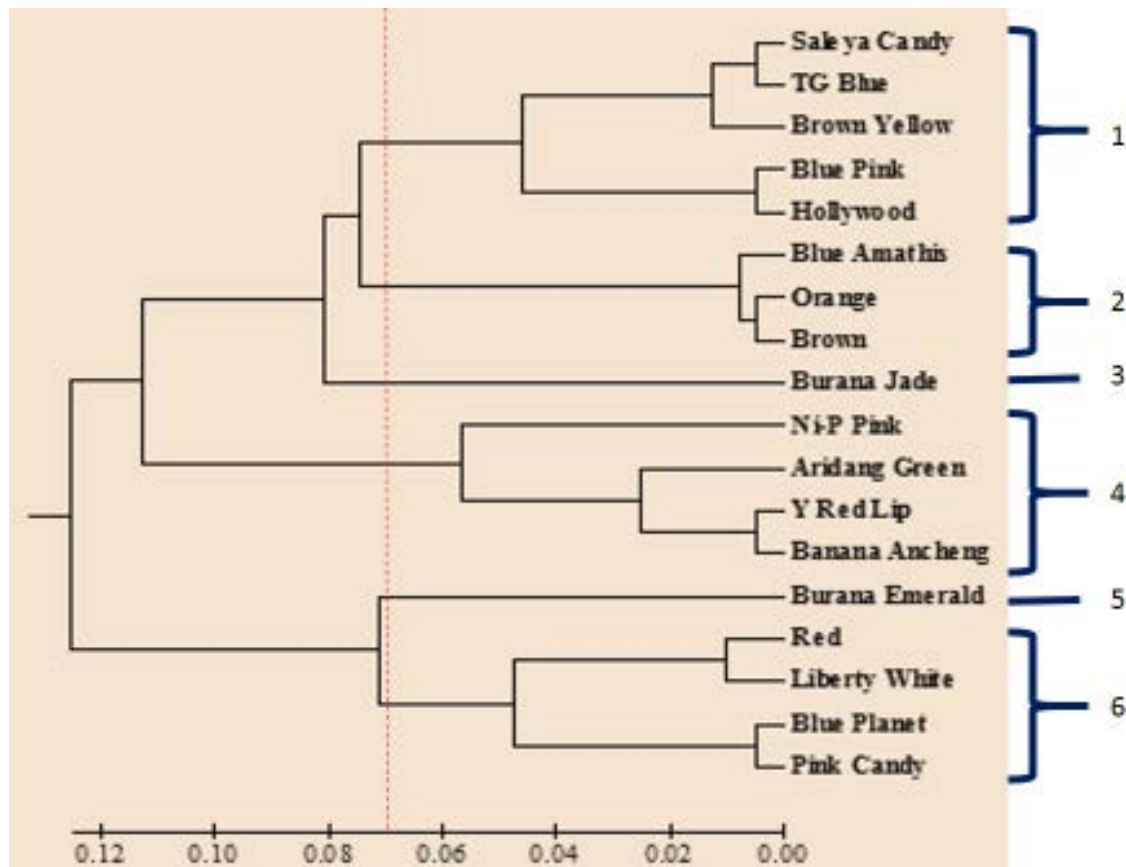


Figure3.1 Dendrogram of eighteen *Dendrobium* cultivars derived from UPGMA cluster analysis of

Nei's genetic identity based on seventeen ISSR markers

Cluster 1 grouped five cultivars, 'Saleya Candy', 'TG Blue', 'Brown Yellow', 'Blue Pink' and 'Hollywood'. Two cultivars including 'Blue Amathis' and 'Orange Brown' formed cluster 2 whereas four cultivars including 'Ni P Pink', 'Aridang green', 'Y Red Lip' and 'Banana Ancheng' formed the forth cluster. Finally, cluster six was formed by the 'Red', 'Liberty White', 'Blue Planet' and 'Pink Candy' cultivars. Both cluster 3 and 5 carried only single cultivars, 'Burana Jade' and 'Burana Emerald' respectively. Both cultivars had similar performance producing independent branches. In addition it was found that the highest genetic similarity value is between the *Dendrobium* cultivars Brown Yellow and Saleya Candy which are morphologically related in real. It was able to detect the different similarity level between different *Dendrobium* cultivars. But in the genetic identity matrix some cultivars have shared same values for similarity coefficient which emphasis the need of further study with more molecular markers to discriminate and characterize various *Dendrobium* cultivars.



Figure 3.2 Principle Component Analysis of eighteen *Dendrobium* cultivars UPGMA cluster analysis of Nei's genetic identity based on seventeen ISSR markers.

The principal component analysis based on genetic similarity matrices were used to visualize the genetic relationships among genotype which confirmed the results of cluster analysis. The contribution of the first and second principle component (PC1 and PC2) to the multivariate variation was 45.28% and 37.84% orderly, and the cumulative contribution was 83.12%. The results of the study showed that there is a relatively low level of genetic diversity between the studied cultivars. The procedure for PCA in GeneAIEx is based on an algorithm published by Orloci.

The genetic variability accessible in a gene pool is normally considered as being the major resource available to breeders (Ramanatha Rao and Hodgkin, 2002). The significantly low level of genetic variability detected among these *Dendrobium* cultivars highlighted the limited potential for cultivar improvement. Rapid replacement and elimination of numerous locally developed cultivars with commercially successful hybrids have resulted in a gradual genetic erosion of the local *Dendrobium* gene pool. Efficient handling of this low variability has thus become crucial for the success of the local *Dendrobium* industry.

5.0 Implication for the genetic improvement and conservation

Molecular based breeding techniques are one way to encourage the local breeders to improve the *Dendrobium* cultivars and thus to conserve the local germ plasm. It would be interesting to launch a multiplex ISSR genotyping platform based on current ISSR markers for imported and local *Dendrobium* cultivars identification in near future. The results from this study can be extended and further applied to tracing and monitoring of local and novel hybrid *Dendrobium* cultivars during breeding process.

6.0 Conclusions

The existence of low level of genetic diversity among the studied cultivars indicate that they are very closely related to each other. These cultivars can further be used as parental material for fixation of heterosis in *Dendrobium* improvement program. Knowledge on genetic diversity will help in the efficient management of *Dendrobium* germplasm by breeders.

In conclusion, ISSR markers have been successfully used to fingerprint and assess the extent of genetic variation among *Dendrobium* cultivars. They appeared to be a useful, quick and inexpensive molecular tool to solve the problems of morphological identification and cultivar characterization of genus *Dendrobium*. The study revealed that detection of best performing ISSR markers (12, 155, UBC 807, UBC 812, UBC 826, UBC 835, UBC 841, UBC 842) is a valuable milestone of sustainable conservation and future breeding programs on *Dendrobium*.

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High risk of eating disorders in adults shows the need for more nutritional education actions

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Abstract

Eating disorders, particularly, anorexia nervosa and bulimia nervosa have been highlighted for clinicians and researchers. They are heterogeneous group of complex psychiatric disorders characterized by abnormal eating behaviours that lead to a high rate of morbidity. Considering that early detection of predisposition to eating disorders is very important, the present study aimed to detect the risks of adults over 18 years. This choice was due to the fact that the great majority of the published researches were in samples of adolescents and young adults, not having many data in higher age. The research was carried out in 2017, in Brazil, with 142 adults participants, 107 women and 35 men. To assess the risk of eating disorders was used Eating Attitudes Test (EAT-26). According to the results of the EAT-26 the prevalence of high risk for eating disorders was 49.9%, a very alarming finding, is well above the world average. Through the detection of populations at risk it is possible to implement and intensify educational actions focused on the nutrition.

Keywords: eating disorders, nutritional education, nutrition, anorexia, bulimia

1. Introduction

The lean body has been defended as an ideal of beauty, generating an overvaluation of the body image, guiding the search for aesthetic standards that are not always necessarily healthy (Araujo, et al, 2010)

The fear of gaining weight and the desire to lose it can trigger an excessive preoccupation with eating and cause behavioral changes and even eating disorders (Alves, et al., 2008).

Dissatisfaction with body image is understood as a negative feeling that the individual has in relation to their weight and body shape and is associated with factors such as low self-esteem, depression, social anxiety states and, mainly, to inadequate control attitudes of weight, such as use of anorectic substances, anabolic steroids, purgative techniques and inadequate eating behaviors (Carvalho, et al., 2013).

According to Dunker et al. (2003), anorexia nervosa is characterized by intense fear of gaining weight, distortion of body image and significant loss of weight as a result of dietary restriction. The disease begins with the restriction of foods more caloric and later it extends to other types of food. Anorexia nervosa can generate sequelae due to a self-imposed dietary restriction that, when installed in a chronic way, leads the patient to malnutrition, dehydration, infertility, hypothermia, cardiovascular complications, among others (Vilela et al., 2004).

Bulimia nervosa is characterized by a large and uncontrollable food intake in a single moment, accompanied by inadequate compensation methods such as: self-induced vomiting, laxative abuse, diuretics, appetite suppressants, in addition to inadequate diets and excessive exercise physical properties (Sapoznik, 2005 & Diniz, 2007). Eating disorders are common multifactorial disorders, the etiology of which appears to be regulated by interplay of environmental and genetic factors. They are often associated with substantial morbidity (Mitchell & Crow, 2006) once psychological stress associated with dysregulated eating behavior and subsequent nutritional disturbances have a potent effect on several organ systems, generating diseases. On the other hand, the risk of eating disorders has been shown to be increased in some somatic illnesses (Tiller et al., 1994).

Several co-morbidities such as depression, anxiety disorder, obsessive-compulsive disorder, substance abuse, attention-deficit hyperactivity disorders, and personality disorders are prominent in patients with eating disorders. Suicide and suicide attempts are dangerous comorbidities in eating disorders. Although primary cause of pre-mature death in eating disorders are medical co-morbidities, a meta-analysis that combined the results of 42 published studies of mortality of eating disorders determined that the second most common cause of death in eating disorders is suicide (Sullivan, 2001).

In addition, even if the medical complications of late-life eating disorders are the same underlined for early onset eating disorders, the risk of death for cardiovascular, metabolic, gastric and bone disorders is considerably higher (Rabe & Ammerman, 2003).

Considering the relevance of eating disorders, and especially considering that early detection of predisposition to them is also very important, the present study aimed to detect the risks of adults over 18 years. This choice was due to the fact that the great majority of the published researches were in samples of adolescents and young adults, not having many data in higher age groups.

2. Methods

The research was carried out in 2017, in Brazil, with 142 adult participants, 107 women and 35 men, through a collection of data by online form (Google Docs Forms), with suitability of free and informed consent form for the online format. The search for practical methods and tools to collect reliable information, is constant in the area of epidemiology. The advancement of technologies and media has been an important contribution, the Internet in recent times has also become a data collection tool (Holmes 2009). To assess the risk of eating disorders was used Eating Attitudes Test (EAT-26) for all volunteers who participated in the study. The EAT-26 (Garner et al., 1982) is a self-completion questionnaire composed of 26 questions in the Likert scale of points (always = 3, often = 2, often = 1, rarely ever and never = 0). Question 25 presents inverted scores. The score is calculated from the sum of the responses of each item,

varying from 0 to 78 points, and the higher the score, the greater the risk of developing eating disorders. Score 20 or higher: high risk, score 10 to 19: low risk; score from 0 to 9: out of risk. The questionnaire consists of three subscales, each evaluating different factors of dietary behavior: diet (13 items), bulimia and food concern (six items) and oral self-control (seven items).

The questionnaire was validated for female and male populations, it was translated and validated for several languages and cultures. The Portuguese version (used in this study) was validated in Brazil (Nunes et al., 1994).

Participants were also questioned about whether or not to engage in regular physical activity and whether they were adept at intermittent fasting.

3. Results and Discussion

Eating Disorders are characterized by important changes in eating attitudes and by the presence of dissatisfaction with body image, and anorexia nervosa and bulimia nervosa are the main categories of these disorders (APA, 2013).

The diagnosis of these disorders, as well as, the appropriate treatment is fundamental to avoid more serious complications. However, equally important is the prevention, screening of people at risk for these disorders and educational actions regarding nutrition.

EAT-26 is ideal for screening studies, detecting individuals susceptible to the development of eating disorders, not for diagnosis. The test indicates the presence of abnormal eating patterns, but does not reveal the possible underlying psychopathology (Freitas; Gorenstein & Appolinario, 2002).

Studies in the area of eating disorders have been pointing to an apparent increase of their occurrence in the last decades (Hoek & Hoeken, 2003; Busse & Silva, 2004). Specific measures are necessary not only for the treatment but also for its prevention, because of the seriousness of these disorders (Agras, 2001).

According to Nielsen (2001), eating disorders present significant severity in several aspects: they present a considerable risk of emotional, psychosocial and sexual impairment, besides the high risk of morbidity (Moya, 2003) and mortality (Cordás et al., 2004).

In figure 1 are the general data of the volunteers. The high risk, low risk and out of risk were found in 70 (49.9%), 55 (38.7%) and 17 (11.9%) volunteers respectively.

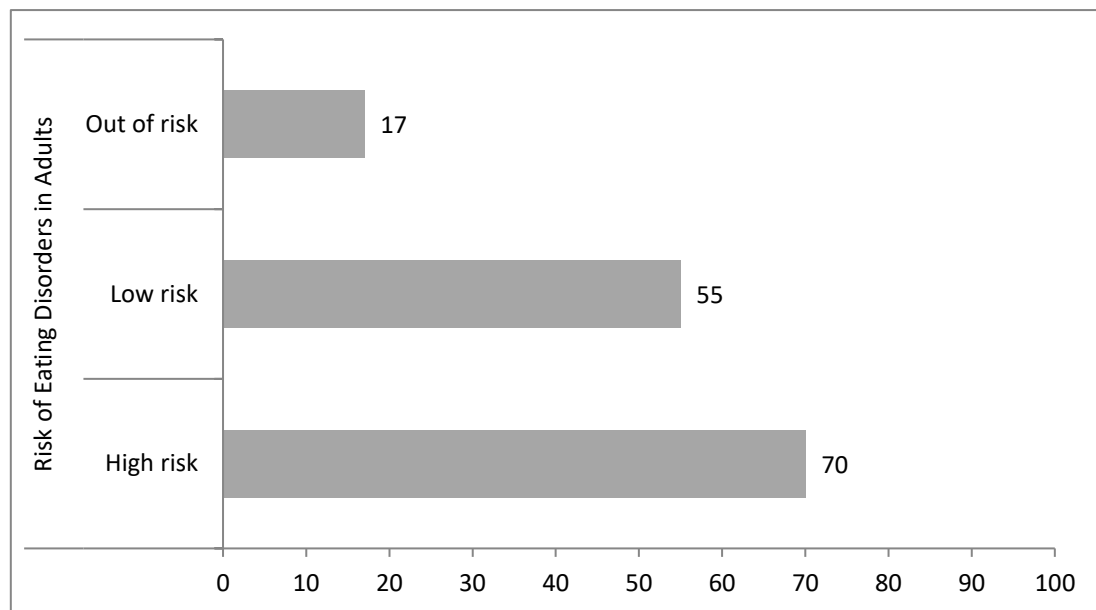


Figure 1. Distribution of the 142 research volunteers regarding the risk for eating disorders.

According to the results of the EAT-26 the prevalence of high risk for eating disorders was 49.9%, a very alarming finding, considering that a prevalence of positive EAT-26 is well above the world average, with rates of 8% or less are considered low and above 20% require a greater concern (Alves et al., 2008).

Fiattes & Salles (2001) 15 observed that 25.4% of Nutrition students presented risk. Alvarenga et al. (2011) identified that 26.1% of Brazilian university students in the health area are at risk of developing eating disorders with abnormal concerns about diet and body weight.

Table 1 presents data stratified into three groups: exercise practitioners (minimum of three times a week, for at least 50 minutes), non-practitioners and followers of intermittent fasting, considered here as volunteers who are fasting from 14 to 16 hours for day, at least five days a week. For practitioners of regular physical exercise, the respective percentage indices were 52%, 36% and 12% for high, low and non-risk. For non-practitioners, 36% are at high risk, 51.6% are at low risk and 12.4% are out of risk. Of the twenty participants who are fasting for intermittent fasting, 18 (90%) are at high risk, which leads to a special attention for these people, as well as being a basis for new research that can elucidate the issue further, in larger samples.

Table 1. Percentage distribution of participants by groups regarding the risk of eating disorders

| | Risk of Eating Disorders in Adults | | | | | |
|--|------------------------------------|----|----------|------|-------------|------|
| | High risk | | Low risk | | Out of risk | |
| | N | % | N | % | N | % |
| Physical exercise practitioners | 26 | 52 | 18 | 36 | 6 | 12 |
| No physical exercise | 26 | 36 | 37 | 51,6 | 9 | 12,4 |
| Adepts of intermittent fasting | 18 | 90 | 0 | 0 | 2 | 10 |

It is necessary to adopt effective strategies with a broad population scope for the modification of these restrictive diet behaviors and body dissatisfaction due to its relation with eating disorders and as a consequence in the long term of damages to health, besides the high financial cost and human (Dunker, 2009).

Through the detection of populations at risk it is possible to implement and intensify educational actions focused on the nutrition, well-being and quality of life of the people, which may reflect positively in preventive terms, avoiding that eating disorders effectively occur.

5. Conclusion

Based on these results we conclude that the adults of sample are at risk for developing eating disorders, and, this risk is of relevance with regard to the world prevalence, and the adepts of intermittent fasting presented greater risk.

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An analysis of adaptation of the Loanwords in Kikuyu technological Words

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Abstract

This paper examines loanwords adopted by native Gikuyu speakers to nativise English technological words using the theoretical framework of Optimality Theory as initiated by Prince and Smolensky (1993). Loanword adaptation is a linguistic phenomenon that occurs cross linguistically whenever one language interacts with another language. However, there are stipulations to borrowing because loanwords must be adapted to fit the second language's Phonology system. Drawing from a sample of 80 words collected from the domain of technology, medicine, education and agriculture, the study found that Gikuyu speakers use processes such as insertion, deletion, vowel substitution and preservation to nativise borrowed word from English. The study also found out that this process occurs because of the tolerance threshold to segment preservation within a given constraint domain and due to distinctive features in English language and Gikuyu language.

Key words: Kikuyu language, English language, Loanword, borrowing, loan adaptation

1. Introduction

One of the effects of language contact and communication is the set of loanwords that is imported into the vocabulary of the languages involved. Loanwords are lexical items borrowed from a foreign language into a recipient language. Borrowing is a natural process of language change whereby one language adds new

words to its own lexicon by copying those words from another language. The words which are borrowed are more like of stealing according to Haugen (1953) or a kind of copying according to Trask (1996). These borrowed words usually undergo “adaptation” processes to conform to the structural constraints of the borrowing language phonology. Such adaptation affects all facets of phonological structure, reflecting the segmental, phonotactic, suprasegmental and morphophonological restrictions of the borrowing language. Simply put, loanwords are lexical items borrowed from one language and incorporated into another (Crystal, 1997). Loanword adaptation on the other hand refers to the process in which a lexical form is adopted from a source language and incorporated into the lexicon of the target borrowing language, performed by a borrower (Rose and Demuth, 2006).

The phonologies of two languages are usually dissimilar enough to result in forms taken from one language being adapted in one or more ways to fit into the phonological system of the borrowing language (Hoffer, 2005; Kim, 2008). The essence of the study of loanword phonology, thus, is the investigation of the adaptations that take place when a loanword is applied to the second language’s phonological system. These adaptations reveal information about the second language’s phonological system. Crucially, there seems to be a requirement that the borrowed word remains as similar as possible to the source form (cf. Winford, 2003).

Loanword adaptation is a linguistic phenomenon that occurs cross linguistically whenever one language interacts with another language and generally when one word exists in one language but not in the second language. However, there are stipulations to borrowing; because loanwords must be adapted to fit the second language’s speech patterns. Kikuyu is a language of the Bantu family spoken primarily by the Gikuyu people (*Agĩkũyũ*) of Kenya. Numbering about 6 million (22% of Kenya's population), they are the largest ethnic group in Kenya. Phonologically, Gikuyu language has the following alphabet **a b c d e g h i ĩ j k m n o r t u ũ w y**. Kikuyu is written with seven vowels. Two of the additional vowels are **i-tilde (ĩ)** and **u-tilde (ũ)**. These are: **a** (low /central), **e** (ε Mid-low/Front), **i** (high/front), **ĩ** (e Mid-high/Front), **o** (ɔ Mid-low /Back), **u** (High/Back), **ũ** (o Mid-high/Back). A study of the Gikuyu language is important as a Bantu language. Therefore, this study is necessary to understand Gikuyu language and to facilitate more studies and documentation so that it will become a written language like other languages. This study opened research in the adaptation paving the way for its development in technological words. Moreover, the scope of this study is important to those who are interested in studying language contact, development or furthering studies on adaptation into Gikuyu technological words. Moreover, this study may springboard for further studies on Gikuyu phonology.

Some studies have been carried on loan words. Mwihaki (1998) has carried out a phonological study of Gikuyu loanwords borrowed from English. The study identifies three aspects of loanword adaptation: phonemic, phonotactic and prosodic. Phonemic adaptation addresses the grammatical constraints of unitary sound substitution. Phonotactic adaptation defines the harmonic motivation for phonemic combination and distribution in the loanword. The current study borrows a lot from Mwihaki’s study. Guo (1999) has studied Mandarin transliterated American state names and typho on names using the Optimality Theory. He examines how the consonant clusters and illicit codas are modified in Mandarin loanwords transliterated

from English. Mwita (2009) looks at the adaptation of Kiswahili loanwords from Arabic. Using a constraint-based analysis, Mwita (2009) shows the processes that loanwords undergo when they are adapted from Arabic into Kiswahili. The paper shows that Kiswahili prefers vowel epenthesis to vowel syncope or apocope in the resyllabification of loanwords. Words borrowed into a language are rarely borrowed perfectly, but instead undergo modification regarding to their realization in the source language from which they were borrowed. The study entails studying the adaptation that occurs to English technological words as they find their way into Gikuyu language.

2. Optimality Theory

Optimality Theory (OT) as propounded by Prince and Smolensky (1993) is the view that forms of language arise from the interaction between conflicting constraints. Kager (1999) defines a constraint as a structural requirement that may either be satisfied or violated by an output form. A form satisfies a constraint if it fully meets the structural requirement, while any form not meeting this requirement is said to violate it. The surface forms of language reflect resolutions of conflicts between competing demands or constraints. A surface form is 'optimal' in the sense that it incurs the least serious violations of a set of violable constraints ranked in a language-specific hierarchy.

The theory contains three basic components: the first is the GEN which states that all the realization of words take an input and generates the list of possible outputs or candidates, some candidates might be identical to the input, others modified somewhat, others unrecognizable. The second is the CON. CON provides the criteria in the form of strictly ordered violable constraints, used to decide between candidates, and the third is the EVAL chooses the optimal candidate based on the constraints and this candidate is the output. Eval chooses the candidate that best satisfies a set of ranked constraints; this optimal candidate becomes the output.

OT supposes that there are no language-specific restrictions on the input. This is called richness of the base. Every grammar can handle every possible input. For example, a language without complex clusters must be able to deal with an input such as /flask/. Languages without complex clusters differ on how they will resolve this problem; some will epenthesize (e.g. [falasak], or [falasaka] if all codas are banned) and some will delete (e.g. [fas], [fak], [las], [lak]). Given any input, GEN generates an infinite number of candidates, or possible realizations of that input. A language's grammar (its ranking of constraints) determines which of the infinite candidates will be assessed as optimal by EVAL. The GEN component of OT identified the possible realizations of the technological term in Gikuyu language.

The second constraint is the CON. In OT, every constraint is universal. CON is the same in every language. There are two basic types of constraints; Faithfulness and Markedness. Each plays a crucial role in the theory. Faithfulness constraints require that the observed surface form (the output) match the underlying or lexical form (the input) in some particular way; that is, these constraints require identity between input and output forms. The following are examples of faithfulness constraints (Kager, 1999):

- (a) The output must preserve all segments present in the input.

(b) Output segments must have counterparts in the input.

(c) Output segments and input segments must share value for [voice]

Markedness constraints on the other hand impose requirements on the structural well-formedness of the output. Markedness constraints require that output forms meet some criterion of structural well-formedness. Kager (1999) points out that markedness is the general denominator for the grammatical factors that exert pressure towards unmarked types of structures. Faithfulness constraints prevent every input from being realized as some unmarked form and markedness constraints motivate changes from the underlying form. The following are some universal markedness constraints (Kager, 1999):

a) Syllables must have onsets.

(b) Syllables must not have codas.

(c) Obstruents must not be voiced in coda position.

The universal nature of CON makes some immediate predictions about language typology. If grammars differ only by having different rankings of CON, then the set of possible human languages is determined by the constraints that exist. OT predicts that there cannot be more grammars than there are permutations of the ranking of CON. The number of possible rankings is equal to the factorial of the total number of constraints, thus giving rise to the term Factorial Typology. However, it may not be possible to distinguish all of these potential grammars, since not every constraint is guaranteed to have an observable effect in every language. Two languages could generate the same range of input-output mappings, but differ in the relative ranking of two constraints which do not conflict with each other. If rankings with ties are allowed, then the number of possibilities is an ordered Bell number rather than a factorial, allowing a significantly larger number of possibilities. The CON component was applied in analysis of the words in terms of Faithfulness and Markedness.

EVAL is the definition of optimality. Given two candidates, A and B, A is better than B on a constraint if A incurs fewer violations than B. Candidate A is better than B on an entire constraint hierarchy if A incurs fewer violations of the highest-ranked constraint distinguishing A and B. A is optimal in its candidate set if it is better on the constraint hierarchy than all other candidates. For example, given constraints C1, C2, and C3, where C1 dominates C2, which dominates C3 ($C1 \gg C2 \gg C3$), A is optimal if it does better than B on the highest ranking constraint which assigns them a different number of violations. If A and B tie on C1, but A does better than B on C2, A is optimal, even if A has 100 more violations of C3 than B. This comparison is often illustrated with a tableau.

The pointing finger marks the optimal candidate and each cell displays an asterisk for each violation for a given candidate and constraint. Once a candidate does worse than another candidate on the highest ranking constraint distinguishing them, it incurs a crucial violation (marked in the tableau by an exclamation mark). Once a candidate incurs a crucial violation, there is no way for it to be optimal, even if it outperforms the other candidates on the rest of CON. An example is the manifestation of the English plural: /'kæt/ + /z/ → ['kæts].

The underlying form surface forms would include: /kaetz/ /katz/, /gatz/, /gat/, /kat/ etc. This is the candidate set determined by GEN which takes an input then generates the most possible candidates as output. Using CON the phonological violations of each candidate are identified as below:

/kets/- none
 /katz/- deletion, insertion, voicing
 /gatz/- voicing, deletion, voicing
 /gaetz/- voicing,insertion, voicing
 /kat/- deletion, deletion

Using EVAL these candidates are ranked in an ascending order of the number of violations. The candidate with the smallest number of violations is considered the optimal candidate. Another example is the word “flask” the underlying representation will be /flask/. Different realizations of the same word can exist in different speakers of the word. Eg A child can pronounce it as /las/, /lask/, / vlask/, /flaks/ etc. In such a case, the most appropriate phonological form of the word can be realized using the optimal theory. The realizations of the word are termed as outputs or surface realizations. The most appropriate representation of the word is called the optimal character. The major components OT are used in identification of processes that technological loanwords adapt to. This was in terms of epenthesis, voicing, deletion or insertion.

3. Research Methodology

This study adopted a descriptive approach to analyze Kikuyu technological loanwords. The research targeted 100 nativized nouns in the semantic fields of technology, medicine, education and agriculture. The researcher purposefully sampled 80 words for the study. The sample size is within the limits of the minimum sample for academic studies (Shroeder, 2003). The researcher determined various semantic fields where technology plays a role and the researcher collected 20 words in each domain. The study was guided by the following research questions:

- i. To investigate the processes adopted by native Gikuyu speakers to nativise English technological words.
- ii. To account for the processes in Gikuyu technological words.

4. Results and Discussions

4.1 Loanword adaptation Processes in Gikuyu technological words and accountability of the processes involved

Borrowing relates largely to lexical items especially words in the fields of technology, government, education, and commerce according to Odlin (1989). Thus, the data for the current study comprised 80 loanwords collected from the semantic fields of Information Communication Technology (ICT), medicine, agriculture and education. The processes include insertion, deletion, preservation and substitution. The next section examines these processes in detail.

4.1.1 Insertion

This is a process that involves the insertion of a segment. The two types of insertion – epenthesis and prosthesis were found to operate on Gikuyu loanwords. Epenthesis refers to the addition of one or more

sounds in the middle or final position of a word while prothesis is the insertion of a segment in the initial position. The point of departure in this section is that inserted vowels in loanwords are "perceptually intrusive" in that they fill the perceptual gap between two consonants (or gestures) clustered in a given phonetic context. Epenthesis violates faithfulness as the inserted vowel in the output does not have an input correspondent. However, it satisfies the open syllabicity requirement (NOCODA) and helps to break consonant clusters hence achieving the unmarked syllable structures. Some illustrations are given below:

Input Modem ['məʊ.dem]

Output mondemu /Mɔndemu/

In this example, the optimal output form is selected through the interaction of highly ranked markedness constraints in Agikuyu: NOCODA and *COMPLEX and faithfulness constraint: DEP-V = no V epenthesis. The input has two syllables. The first syllable has a coda while the second one has a consonant cluster and a coda. The vowel /u/ has, therefore, been used to break the consonant cluster and deal with the illicit codas. After the resyllabification, we get an output form which has three syllables compared to the disyllabic input.

Another example from the semantic field of education is the word term

Input: term /tɜ:m/

Output: /tamu/ /tam/ /ta.mu/

The output of the word term in Kikuyu language has at least three realizations that is candidate a) /tamu/ b) /tam/ c) /ta.mu/. Candidate b. and c. seriously violate NOCODA so their chances of being optimal are very minimal. Candidate a. wins as it only minimally violates one constraint. Due to the epenthesis of /u/ to deal with the coda, the syllables in the output double.

Another example of epenthesis is from the educational domain which shows that three candidates, which are all possible realizations of the input are generated by Gen.

Input: Secondary /sekəndrɪ/

Output: sekondarĩ /sekɔndale/

In the above example the resyllabification leads to an increment in the number of syllables in the output form as the input has three syllables and the output four.

Another form of insertion is prosthesis. Prosthesis is the addition of a sound or syllable at the beginning of a word without changing the word's meaning or the rest of its structure. A vowel or consonant added by prosthesis is called prothetic or prosthetic. Prothesis is different from the adding of a prefix, which changes the meaning of a word. There were several examples in the data collected from the various domains as discussed such as new words in the field of medical practice and healthcare such as *Thibitari* (hospital),

ndagitari (Doctor) depicted forms of prosthesis. The point to note about word borrowing in this area is that the new terms were introduced and their meanings became part of new thinking and linguistic environments.

These loan words were used in a Gikuyu linguistic environment which is different from their habitual foreign groupings with other key terms while new semantic constructions were created in order to represent new ways of thinking and acting. Therefore, the word hospital (**thibitari**) is associated with new healthcare practices while the terms such as **ndagitari**(doctor), **woondi**(ward) have introduced relatively similar semantic perceptions and interpretations.

In many instances the loan words are merely simplified in order to conform to Gikuyu pronunciation patterns. The inventory of medical and scientific loan words is reasonably wide and it shows that most words were sourced from English, Latin, Italian and Hindi within the disciplines of science, medicine and engineering. Vowel insertion, both epenthesis and prothesis, has led to an increase in the number of syllables. For example, in the above mentioned words collected it is observed that syllables of the word doctor increases to 4 from 2 when prosthesis occurs

Input doc'tor (two syllables)

Output nda'gi'ta'ri (four syllables)

Insertion is a case of phonological assimilation process. The above data shows a case of Perception Approach by (Peperkamp & Dupoux, 2003). In this approach, Peperkamp & Dupoux (2003) argue that adaptation results from misperception and is processed at the phonetic level. Therefore, the loan words discussed above are a case of perceptual assimilation that maps the non-native sounds and structures at the perceptual level onto the phonetically closest native ones. Moreover, this example shows how more syllables are inserted in order to conform to the syllable structure of Gikuyu language.

4.1.2 Deletion

Deletion refers to the omission of a segment or segments from a word. This is another nativization strategy that Gikuyu speakers use to modify complex onsets and codas in loanwords. Deletion of any segment involves violation of MAX-I O (maximum input-output) that requires every segment in the input to have a correspondent in the output. There are various forms of deletion; apocope, aphaeresis and syncope. Apocope is the loss of a sound or sounds at the end of a word. In the nativization process, this is done to deal with codas and syllabic consonants which are not allowed in Agikuyu as illustrated by the word below from the medicine domain:

Input: Cell /'sel/

Output: Cero /'sero/

The output of the word Cell in Gikuyu shows that the /l/ sound is lost in the Kikuyu language. Another example is from the Agricultural domain in the word machinery as shown below:

Input Machine /mə'ʃi:n/

Output Macini /mas:n/

The output shows the loss of /ʃ/ in the Agikuyu language. This is because the word machine has a sound that is not present in the phonology of the recipient language (Gikuyu language), thus the word goes through adaptation to make the loan word sound native and less foreign. The second method of deletion is Aphaeresis. Aphaeresis is the loss of a sound or sounds at the beginning of a word, e.g., in the derivation of *adder* from *nadder*. In Gikuyu loan words this was seen in the following instance from the ICT technology:

Input: hospital /'hɒspɪtəl/

Output: thibitari / ðibitari/

In this example, the onset and the nucleus of the first syllable in the input are deleted. The intention, however, is to delete /h/ which is not found in the phonemic inventory of Gikuyu but the entire syllable ends up being deleted. In this case the Gikuyu language dominates the loan phonology. That is Gikuyu speakers try to fit the borrowed word from English into the Gikuyu phonological system.

There are instances in Gikuyu language where the voiceless glottal fricative /h, r, l/ is deleted in loan words that have the sound. This consonant is deleted in all word positions in loan words that have this sound. The main reason for the deletion is that this consonant is not part of Gikuyu consonant inventory system. The examples in below illustrate how this process of deletion takes place in loan words. Thus, in an attempt to satisfy NOCODA and *COMPLEX constraints, faithfulness is violated. Table 1 below further illustrates cases of deletion in Gikuyu language

Table 1: Consonant Deletion

| English | Gikuyu | Consonant Deleted | Gloss |
|--------------|---------|-------------------|-----------|
| /bɔ:(r)d/ | bɔndi | R | Board |
| /mə'tɪəriəl/ | Matiriũ | L | Material |
| /mə'ʃi:nəri/ | Macini | h/r/y | Machinery |

The above examples of consonant deletion in Gikuyu loan words reveal the fact that Gikuyu uses deletion as a strategy in adapting loan words into its lexicon. This adaptation strategy also shows that Gikuyu speakers try to remain faithful to the English language as much as they conform to Gikuyu language. Table 1 also show how bilinguals reflect their competences in both the donor and recipient languages to discern equivalences between phonological categories and structures that abstract away from the details of their phonetic realization in each grammar (cf. Paradis 1996).

The last method of deletion is syncope. Syncope is the omission of sounds or letters from within a word, e.g., when *probably* is pronounced 'präblē. In the data collected we observed that the word below had undergone syncope in Gikuyuloan words.

Input: picture \piktʃə\

Output: Visa \visa\

In the example above, the coda of the first syllable in the input is deleted to make the syllable open. The recipient language prefers consonant deletion to vowel epenthesis in nativizing the loanword. The consonant phonemes which have no Gikuyu equivalents with the foreign ones such as /p/, /v/, /z/, /s/, /ʃ/, /ʒ/ have been remolded and changed.

4.1.3 Vowel Preservation

Some words in loan word adaptation had vowel preservation. In vowel preservation, some vowels within the loan words do not change once they enter the recipient language. Vowels that are preserved in Gikuyu include the following, /i, o, u and a/

Table 2: Vowel Preservation

| English | Kikuyu | Vowel Preserved | Gloss |
|--------------|---------|-----------------|-----------|
| /ˈdeɪtə/ | Ndata | A | Data |
| /ˈmæʊdem/ | Mɔndemu | O | Modem |
| /əˈniːmiə/ | Animia | E | Anemia |
| /məˈʃiːnəri/ | Macini | I | Machinery |

From the above data in, it is evident that various vowels such as /a, e, i, o and u / are preserved in the loan words from English as they enter Gikuyu language.

The following consonants are preserved in Gikuyu language as loan words from English enter Gikuyu language:

Table 3: Consonant Preservation

| English | Kikuyu | Consonant preserved | Gloss |
|---------------|----------------|---------------------|----------|
| /ˈreɪdiəʊ/ | Rindio | R | Radio |
| /ˈkiːbɔː(r)d/ | Kiibondi | k/b | Keyboard |
| /ˈnjuːtriənt/ | Nutirienti | n/t | Nutrient |
| /breɪk/ | <u>mburiki</u> | b/k | Break |

The above loan words from English and Kiswahili respectively show that all consonants are preserved in loan words except for the voiceless velar stop /k/ which can be realized as /k, g, or ɣ / and the voiceless bilabial plosive /p/, which can be realized as /p, b, or β/. These findings are in line with Paradis's (1996) Theory of Constraints and Repair Strategies (TCRS) that adheres to his first principle that says that segmental information is maximally preserved within the limits of the Threshold Principle. The Threshold Principle states that all languages have a tolerance threshold to segment preservation and that this threshold

is set at two steps (or two repairs) within a given constraint domain (Paradis's, 1996). Moreover, table 2 and 3 shows cases where lexical items from English language do not conform to Gikuyu language. Gikuyu speakers in this case maintain some elements of English language intact which partially are adapted to Gikuyu language.

4.1.4 Vowel Substitution

In vowel substitution, vowels in the loan words are substituted with those found in the recipient language and it is a strategy used by the recipient language to incorporate the loan words in the language. In table 4 below /ə/ and /ɜ/ are replaced by /a/ in Gikuyu as seen in the following loan words:

Table 4: Vowel substitution

| English | Gikuyu | Gloss |
|------------------------|-------------------------|------------|
| / 'fɜ:(r)təlaɪzə(r)/ > | Batarai th a | Fertilizer |
| / 'sɜ:(r)və(r)/ > | Caba ^a | Server |

The consonants that are not found in the language (Gikuyu) are substituted with those sounds found in the language. Since most consonants in English languages are not found in Gikuyu, there is need for such sounds to be substituted with those found in the language as shown in the following examples: Labio-dental fricatives, /f/ and /v/ is substituted with the voiced bilabial fricative /B/ as shown below in examples of loan words

Table 5: Consonant Substitution

| English | Gikuyu | Gloss |
|----------------------|-------------------------|------------|
| / 'faɪbə(r)/ | Baimba | Fiber |
| //flæʃ//disk/ | Burathidiciki | Flash disk |
| / 'fɜ:(r)təlaɪzə(r)/ | Batarai th a | Fertilizer |
| /fi:/ | Biithi | Fees |
| / 'vaɪrəs/ | Bairaci | Virus |
| / ,ju:nɪ'vɜ:(r)səti/ | Unibathit ⁱ | University |

The voiced alveolar fricative, /l/ is substituted with /r/ as shown below in examples of loan words

Table 6: Consonant Substitution

| English | Gikuyu | Gloss |
|------------------|-------------------------|------------|
| / 'laɪbrəri/ | Raimburar ⁱ | Library |
| /lə'brərət(ə)ri/ | Rambūratū ^{ri} | Laboratory |
| / 'les(ə)n/ | Rɛconi | Lesson |
| /ləʊ'keɪʃ(ə)n/ | rɔk ⁱ coni | Location |
| / 'klɪnɪk/ | Kiriniki | Clinic |

The voiced alveolar fricative /z/ and /s/ is also substituted by its counterpart /c/, as seen in the following examples:

Table 7: Consonant Substitution

| English | Gikuyu | Gloss |
|---------------------|-----------|------------|
| /ˈsɒf(t)weə(r)/ | Cɔbutuwia | Software |
| /dɔʊs/ | Ndūci | Dose |
| /ˈenzaim/ | ɛnithamu | Enzyme |
| /ˈfɜː(r)təlaɪzə(r)/ | Bataraita | Fertilizer |

From the above examples of consonant substitution, it is clear that Gikuyu like any other natural language uses substitution as a strategy for adapting non-native sounds in the language by utilizing those sounds found in the language. In conclusion substitution occurs because these sounds are not present in the phonology of the recipient language (Gikuyu), thus the sounds in this language undergo adaptations or substitutions to cause the lexical item to sound more native and less foreign (cf. Major, 2001).

5.3 Conclusion

The present study is an attempt to investigate the processes adopted by native Kikuyu speakers to nativise English technological loan words. Based on the data collected English loanwords appear in the Kikuyu language in form of insertion, deletion, substitution and preservation. First the study concludes that English language has been the most popular source of lexical borrowings for Kikuyu language. Countless words describing various domains such as technology, Agriculture, Machine and Education have been borrowed from English. The study, therefore, concludes that Kikuyu language is open to the influence of the English language that has allowed the creation of news words. The study of English loanwords in Kikuyu language therefore is one of the elements which must be taken into consideration, because it supplies specific and significant material. The study established that loanwords adaptation from English language to Kikuyu language occurs due to distinctive features of phonology between the two languages. A further study should examine how cultural, political and economic factors influence the creation of loan words in Kikuyu language.

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Flexible Work Model Based on Autopoiesis Principles: A Case Study

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Abstract

This article presents definitions on flexible work and presents the case study of a company in which its model is based on the principles of autopoiesis, having as main characteristics flexibility and autonomy in the accomplishment of work. Firstly, through bibliographical research, it is possible to observe that the evolution of new work formats challenges the conventional model of fixed physical offices and defined schedules, which are models adopted in the organization of work in the industrial society. Autopoiesis is also presented, which, although it is still in a process of theoretical evolution and application in other areas, brings the original contributions of biology to justify the possibility of implanting models that consider the autonomy of individuals in self-management and self-production, allowing the work in a flexible and autonomous manner, consistent with the demands of a knowledge-based society. Lastly, the case study presents a model that uses the principles of autopoiesis to form an organization that has flexibility as the main characteristic in the accomplishment of work, based on individual autonomy. The contributions of this study point to the need for the labor market to accept new models and formats that intend to meet the demands of individuals regarding the organization of work.

Keywords: Flexible work; Autopoiesis; Organization. Knowledge.

1. Introduction

When analyzing the organization of work starting from the Theory of Scientific Administration, which began with Frederick W. Taylor (1856-1915), it is possible to observe that work had, as its main focus, the increase of productivity. For this, methods and systems that anticipated rationalization, fragmentation, hierarchization and standardization of the work were employed, and the study of time and movements was applied in order to improve efficiency (Matos & Pires, 2006).

Still regarding the Scientific Administration, Chiavenato (2003) states that there was the presupposition that the employees were passive, that they received and executed orders, but were incapable of taking initiatives, with the objective of maximizing production. The focus of the work was on workforce, on the physical force applied in production.

Analyzing the work in the post-industrial organization, De Masi's (1999) view points to the requirement of an organization where information and the exchange of tasks are disseminated, maintaining the validity of

the specialization, provided the work, in this scenario, is multidisciplinary.

One of the elements that must be considered in the organization of work is the change of focus on the factor that generates value in the productive processes. According to Dos Santos (2005), the world is in the “knowledge economy” era, which is based on knowledge as a factor that generates value, productivity and economic growth, and not just capital and labor, as they were in the industrial society.

Thus, since knowledge has taken the place of the workforce, it is understandable that new models of work arise to meet the needs of generations that produce knowledge and that can produce it regardless of the time and place, bringing flexibility to the work, regarding time and place, as characteristic of such new models.

Social and demographic shifts also need to be considered in the organization of work. Fursman and Zodgekar (2009) point to changes such as the greater involvement of families in child education, the higher number of women in the labor market, and the new family forms, such as single parenting, among other aspects, as influencers for the creation of alternatives of flexible work.

Therefore, the movements that understand work flexibility as alternatives for a restructuring of work organization can occur in an isolated or in a propositive way in organizations. As a rule, such movements come either from the gradual change of the organizational culture, or from the appearance of new organizations that are already born with the purpose of promoting the accomplishment of work in a flexible way, and, in this condition, the knowledge of the individuals is considered to be the main factor that generates organizational value.

With the proposal to be a model based on autonomy and flexibility regarding the work format, Alfa – a company founded in 2013, which is studied in this article – provides services in the area of communication, innovation and strategy. The organization has a distributed self-management model, without centralization of power and with member autonomy, appropriating autopoiesis to shape its business model, which applies flexibility to carry out the work, among other peculiar characteristics.

In order to understand autopoiesis, it is important to know that its origin is biological and was presented by Maturana and Varela in the mid-1970s. In its conception, autopoiesis had as its main definition the ability of living beings to produce themselves (Calgaro & Pereira, 2010).

Over time, following the conceptual evolution, autopoiesis received contributions from other areas, being extended to the social and psychic systems through Niklas Luhmann, respected German sociologist, being one of the most important researchers of the social sciences in the 20th century (Kunzler, 2004).

In this context, where there is a shift from an industrial society to a knowledge society, with the consequent impact on labor relations, the research problem arises: In the knowledge society, is it possible to apply models that enable work on a flexible manner, ignoring the premises of the industrial society, especially regarding the time and place being pre-defined and determined?

To answer the question, the objective of this article was defined as follows: to research the relevant concepts about flexible work and present the case study of a company that has a model based on the principles of autopoiesis.

2. Theoretical Foundation

2.1 Flexible work

Knowledge has taken the place of physical strength and of workforce as the main value aggregator in the productive processes, characterizing the knowledge society. In such a society, the organization of work starts to rely on knowledge and not only the strength of the workforce to add value. Drucker (1993) recognizes this movement as an evolutionary process that requires the use of knowledge as a factor of productivity:

"When Taylor began to study the work, nine out of every ten workers did manual labor, producing or moving objects; this was done in manufacturing, agriculture, and transportation. (...) Forty years ago, in the 1950s, people that engaged in producing or moving objects were still the majority in all developed countries. In 1990 they had shrunk to one-fifth of the workforce, and by 2010 they will be no more than one tenth. The Productivity Revolution has become the victim of its own success. From now on, what matters is the productivity of non-manual workers. And this requires the application of knowledge to knowledge" (Drucker, 1993:20, translated by the author).

Corroborating the view of Drucker (1993) on the evolution of knowledge in the productivity revolution, Wiig (1993) argues that knowledge has become the main asset of organizations, including the perceptions (insights), understandings and know-how that belong to the individual.

Given the characteristics of the knowledge society, organizations need to dedicate efforts to organizational modernization in order to remain competitive and to meet the demands of this new society. The changes generated by the knowledge society go beyond the traditional factors of production, and involve also the need to identify and manage the knowledge of the people in organizations (Rossetti et al., 2008).

In this context, the work relation between organization and individual needs to be understood with the view that the individual earns an important role of generating, managing and storing part of the knowledge that will be used strategically by the organizations. Therefore, it is up to the organizations to understand the real needs of the individual as a value generator for organizational strategy.

Despite the theoretical understanding that it is necessary to update the concepts and practices regarding labor relations in the organizations, Sparta (2003) believes that the post-industrial society uses a discourse that defends the quality of life, but in reality still maintains the bonds of productive processes.

For De Masi (1999), despite work being essential and ennobling, it is not possible to see workers with cheerful expressions as they work. In order to justify and highlight the need for changes, the author points out eight pieces of accusation against the current organization of work, among which is the workplace and the counted time.

Thus, the author questions the work environments, which in many cases still appear to be those of 100 years ago, with heat, dust, dirt, discomfort. Despite the technological inventions that facilitate communication, millions of employees still move daily between home and office in search of information, rather than information being sent wherever individuals are (De Masi, 1999).

Counted time is another relevant piece of accusation, because despite all technological evolution, time models computed by day, week, month, chronologically planned without regard to human evolution and human availability for work persist. The intellectual production that happens at any time, generated by the

self-employed professionals, managers, leaders and knowledge workers has been increasing and yet the companies assess the quality and quantity of delivery according to the time that is measured and dedicated by the worker. Thus, the author points out as a solution mainly the work done at home or elsewhere, which reduces the time of commute and increases the quality of the work, which is referred to as telework (De Masi, 1999).

Goulart (2009) explains that flexible work has a broad concept and it is possible to observe some practices and different models, such as Home Office, which is the individual working at home; Virtual Office, where work is disassociated from defined place and time, but needs the necessary resources to work, such as laptops, cell phones, wi-fi and other specific tools; Telework (Telecommuting), which is when work is taken to the worker, instead of the employee having to move to the defined work environment, which may occur partially, some times a week or fully.

Regardless of the characteristics peculiar to each format, the general concept is in the change of the work having to be executed necessarily in a certain space and time. This shift has occurred over the years, following the evolution of technologies and the behavioral changes of society. However, it is important to consider that, since not all professions are systematically linear as on a production line, not all jobs can be performed outside the organizational environment.

Considering an environment where it is not possible to separate the dimensions of work and private life, following the models implanted in the Industrial Age, Sakuda and Vasconcelos (2005) highlight the great challenge of integrating the search for balance between work and personal life, considering that the division of time does not necessarily meet one or the other separately. Many personal issues occur during the time devoted to work, much in the same manner that work can be present during the time devoted to personal life.

Tachizawa and Mello (2003) recognize that a significant change already is occurring in organizations, and mainly involves the issues of space and time where the work is done. The workspace is no longer a physical, tangible, and defined unit, where employees arrive at the designated time. This change is due to the contact with telework, which is executed anywhere and through the use of technologies.

In Gratton's (2013) view, the work performed outside the traditional corporate environments is called virtual work and is divided into three waves, each one emerging as a result either of the needs pointed out by the workers, or of the demands of employers, considering new technologies of communication and collaboration. The first wave began in the 80's, with work being done at home by so-called freelancers. This wave is characterized by the highly specific work of these professionals, and generally meeting the personal needs of those who could not leave their homes to work.

The second wave arose from the employees' desire to feel socially integrated with other professionals, as well as the need to enjoy the benefits that the traditional work model employed, but which the independent model had to give up: health care, career, equipment, technical support and others peculiar to each company. On the part of the organization, there was a need for the then virtual employees to engage with the purposes and values of the firm. In this wave, the structure of the company loses relevance and is replaced by mobile technologies and cloud computing (Gratton, 2013).

In the third wave, the companies needed to resume teamwork, to intensify coexistence, in order for the

latent knowledge to be shared, a process that was impaired in models of remote work. On the part of the worker, the restlessness was in social interaction, in the sense of community. Then the shared offices appeared, with a process called coworking. In these spaces, working hours are flexible, social interaction occurs with other professionals and because there is a wide range of coworking spaces in the market, it is common to find options that are located near the employee's home, thus avoiding the often exhausting commute to the workplace (Gratton, 2013).

It is possible to observe that labor relations have already been adapted by demands pointed out mostly by individuals themselves, creating work formats different from those practiced for decades, which were based on the production line of the industrial age. However, it is up to employers and individuals to identify the needs of companies, as well as to know the profile of employees to find the ideal model. Table

2.2 Autopoiesis

Of biological origin, autopoiesis is a concept presented by Maturana and Varela in the middle of 1970, having its origin in a search for answers to some questions about biology and philosophy of life (Calgaro & Pereira, 2010).

Maintaining the original definition through the view of biology, Maturana and Varela (2007) define that living beings are characterized as an autopoietic organization because they are capable of producing themselves, as well as producing themselves in a continuous fashion. The authors also state that autonomy is one of the most immediate properties of the living being, which is also what characterizes the autopoietic system. In other words, an autopoietic system is autonomous, self-producing and capable of autocorrection. However, the biological view of Maturana and Varela in the 1970s was only the beginning of the definition and use of the term autopoiesis. Despite the richness of the definition, it is understood that applying the original concept of the term in the study of the social sciences, without examining the definitions and unfolding of other authors, is somewhat limited. Therefore, it is important to understand the evolution of the term and its application in other fields of study, beyond its biological origin, especially with the evolution of the theories in the scientific world.

When inserted in a knowledge-based approach, such theories reflect a world model, the perceptions and values of that historical and social context, ie, they represent the language used to dialogue with the world, through a certain perspective, of a scientific paradigm. Then, a given paradigm can be expressed by different languages (Correa et al., 2015).

In this context, we seek to understand autopoiesis beyond the biological perspective of Maturana and Varela, since the term was adapted and used in other fields of study, such as in sociology. One of the authors who contributed the most to the advancement of the concept of autopoiesis was Luhmann, who presented other types of autopoietic systems, considering living, psychic and social systems (Rodrigues, 2012).

Kunzler (2004) considers that Luhmann brought from biology the view that autopoietic systems are capable of reproducing themselves, but extended the concept to areas of sociology and psychic systems, where he considered that the production is performed internally with the elements that make up the system, and in the case of social systems the element is communication, and in psychic systems, thought.

For Calgaro and Pereira (2010), the definition of autopoiesis by Maturana and Varela was an attempt to answer some questions of biology and philosophy of life, and Luhmann's use of the theory in sociology amplifies in such a way its application, that it can be considered a theory of autopoietic systems, enabling its unfolding for other areas. Luhmann freed the term from its origin associated with living systems and elevated it to an overview of systems.

Thus, it can be said that Luhmann's studies are consistent with the origin of the term autopoiesis, maintaining autonomy and ability of self-production as the main characteristics. However, the definitions came to be applied mainly under the optics of social sciences, extending the use of the term systems for purposes other than only the biological model, which allows it to be applied in other studies.

Calgaro and Pereira (2010) affirm that the theory of autopoiesis foresees an organizational enclosure, a self-referential closed system, by the fact that the autonomy of each organism derives precisely from a unit of its own organization.

Rodrigues (2012) understands that autopoiesis characterizes the system that self-references and self-produces, being seen as a closed system from the point of view of internal operations, but always operating in the midst of an environment that surrounds and feeds it.

Capra (2006) observes that the environment in which such systems are inserted is responsible for feeding, which through interactions with the environment provides tools and elements necessary for production, but without affecting autonomy, without directing or steering, only feeding.

Schatten and Bača (2010) provide a critical review of autopoietic theory, and find that, even in the face of much scientific research, there is still a need for consensus that builds a common ground of study. The authors' analysis broadens the visions beyond biology and sociology by bringing the autopoiesis approach to the point of view of biology, sociology, organization theory and information systems. They suggest the main contradictions and incompatibilities, which are devoid of further studies and definitions, and that can be applied to any system considered autopoietic, being it living, social, or organizational: 1_ The reproduction of structure (components), 2_ preservation of organizational identity (of the system), 3_ structural coupling, 4_ the life cycle of the system and of its dynamics (birth, evolving, reproduction, aging, death), 5_ distinction between structure and organization, as well as 6_ operational and organizational conclusion.

Bringing this view to organizational structures, it is understood that human beings who occupy their functions as collaborators are systems that, through autonomy, can be responsible for their own expected output as a result of organizations, as well as for the very production of the elements of the system, but not isolating themselves from the environment in which they live, since they seek in the external environment elements for their self-production.

However, like all theoretical constructions, autopoiesis is evolving, being applied and studied under different paradigms and worldviews. It is up to scholars to extract the pre-existing concepts as a primary basis, but seeking improvement with the inclusion of new definitions and their applications for corresponding purposes.

3 Methodology

The method used was the bibliographical research, which sought to answer the research question from the study of articles, books, theses, dissertations and other scientific publications. According to Cooper (1998), the bibliographical research seeks to integrate the contents captured from other authors, criticizing previous works, building links between related themes, as well as analyzing and identifying the central ideas of a particular study, being able to do this alone or all these actions at the same time.

Complementing the answer to the presented research problem, the case of the company Alfa was studied. The reported information about the firm was obtained through an open interview applied to the founding partner, as well as consulting the company's website.

It is important to note that the names of the company and its partners have been changed to fictitious names, in order not to reveal the real identities.

4. Case Study

Knowledge society requires dynamic and rapid adaptations, such as individuals adjusting to the market, or the market having to offer alternatives that meet the new needs of individuals. If, on the part of workers, there is a tendency to seek flexibility in the performance of work in the face of social changes, on the part of entrepreneurs there is a challenge for creating and offering models of work that meet these needs, in order to attract and retain talent. Both with knowledge as a factor that generates value.

With the proposal to meet the objective of this work, this third part presents a case study. The company which was studied has a work model based on flexibility regarding the hours and the place to perform the work, as well as on the autonomy of individuals. These two characteristics are based in the presented concepts of autopoiesis, which inspired the founder of the company. They are also consistent with the changes in the organization of work, which are necessary as a result of the transformation of the industrial society into a knowledge society.

The company Alfa was originally created in October, 2013 by professionals John and Mary. Both accumulated more than ten years of experience in consulting and agencies in the areas of planning and strategy. In the beginning, the business model followed the conventional standards of a company, with a staff still reduced to three employees, a headquarters in which the office was located and the work processes that also followed conventional wisdom, including payroll, an eight-hour workday, and a customer portfolio to be met.

4.1 Model based on autonomy and flexibility

The change of model happened with a practical provocation, when a candidate interviewed by John to join the workforce proposed a model of work in which he would be available only for six hours per day, as well as he would do the work in his house, without commuting to the office. The offer made by the candidate, which was not initially accepted by the partners because it did not fit into the policies of the company, coincided with an issue that was relevant and caused some discomfort from the standpoint of the founders: the projects that Alfa proposed to deliver to its customers were innovative, requiring creativity and

unconventional models to seek solutions and responses to customers. But, at the same time, the work model of the company itself was not flexible, creative and innovative, but rather traditional, rigid, conventional, just as the common labor market. With these questions, the founder of Alfa was faced with a desire to also have greater flexibility of time and place to carry out his own work. This situation created all the questions about the current work model and, in August, 2014, on the initiative of the partners, there was a change from a conventional model to a model that could be flexible and adaptable to the needs of the work teams. However, before making any decision that would impact on the day-to-day of the company, as well as on the format of a new work model, John reports that he sought models practiced in the market, in order to find something that could be replicated or that could be at least an inspiration. He cites some of the formats he studied, which are trending in the market, bringing to each model his point of view regarding the positive and negative factors:

- Freelance: it presents flexibility, but with low commitment of the professionals, which are involved in extremely punctual deliveries.
- Partnership: it has a high commitment, because the partners themselves respond for the results, but with low freedom, since reporting to the other members for all decision making is required.
- Model of holocracy: it has a lot of autonomy, but it maintains the figure of the owner in which it formalizes the existence of hierarchy.
- Business model of the company called Patagonia: a sporting goods company that has adopted an exclusive model of community-based management, marked by a sense of belonging and a high degree of involvement with company values. However, this model presents low scalability as the organization grows.

Despite the innovation of such models, the search was still for a work format that presented flexibility of time and place, but maintaining the commitment of the teams, with a sense of community and belonging and with a lot of autonomy. None of the studied "ready-made" models addressed these issues, which had become the driving force behind the creation of an innovative and flexible working format.

The sources that have brought in the necessary insights for the creation of the new operating model used in Alfa came from the concepts of Maturana and Varela (1974), with the definition of autopoiesis cited in this article, which originally has its root in biology in the mid-70s, and was later reinforced by other authors, also receiving the contribution of Capra (2006). Both authors are cited by John as inspiration for creating the Alpha model of activity.

Thus, with the understanding of the concepts presented by the aforementioned authors, John defined his management model as an autopoietic entrepreneurship, and conceptually the changes followed some previously defined principles:

- The principle of Common Goods, which provides the view of sharing, construction based on networking, and collaboration considering the common good of all involved.
- The second principle is that it would be an open model, in which entering and leaving the projects could be a reality, as long as there was alignment with the principles, the culture and the company proposal.
- Another principle that guided the model was that of distribution, ie, without hierarchy or definition

of leadership, and no centralization of power.

- The freedom to act in other projects, as long as it does not jeopardize assumed deliveries, represents another guiding principle.
- And finally, the collaboration, treating the projects as a result of work done in teams, together.

4.2 Practical Changes

The first change suggested was the extinction of a headquarters to carry out the work. The office ceased to exist and the employees were invited to work by projects. Payment was also changed and the proposal was that the partners would receive a higher percentage on the revenue generated by the team, as a way of compensating the property of the company and the responsibility over its creation. Therefore, without an office, the teams were organized over projects, and the partners were rewarded with a higher percentage because they officially represented the company's owners.

However, the rule regarding partner payment still caused discomfort, which was not yet acceptable in the idealized model. The image of leadership represented by the partners caused the centralization of decisions, and the principle of autonomy did not exist. Another change was necessary: leaving aside the higher wages of the partners in all projects. Thus, a model that allows for maximum autonomy, sense of freedom, flexibility and the power of the collective union has been implemented.

4.3 What is Alpha, after all

The company is classified by its founders as a shared organization, which provides services in the area of communication, innovation and strategy. All members collectively undertake projects in a distributed self-management model, in which there is no centralization of power and hierarchy.

4.4 About the brand and company constitution

Alfa is not registered as a brand, because the goal is for it to be perceived as a "common good" of all those who participate in it through its projects. Conceptually, the brand is considered to be a temporary property of all those who are collectively working with it at any given time. Alfa is an organization without its own CNPJ (the Brazilian federal business registration number), there is no legal constitution through a company name or a CNPJ. It consists of all individual CNPJs of its members. Therefore, it can never be bought by a person or company.

4.5 The work dynamics

The professionals themselves are responsible for prospecting clients and projects, for the formation of the team, the schedule, the result that will be delivered, and for the dynamics in which the project is developed. The person that prospected the client and the project receives a commission bonus of 10% on the total value of the project, as an incentive to acquire new clients, as well as a form of recognition. The remaining total revenue is equally distributed among the professionals who worked on the project. Because it is a model based on self-management, there is no definition of positions or hierarchy. But there is a sense of belonging and responsibility for deliveries, regardless of who prospected the project.

Meetings are held every two weeks in order to maintain contact between members, keeping everyone informed about the clients and the progress of projects. The meeting place, the organizer and the topics to be discussed vary with each meeting, again without a defined hierarchy. Communication technologies like WhatsApp and Facebook are used for sharing information and content, as well as for communication between members.

The operating and common costs of the members are maintained by a monthly fee, which has been set to cover Alfa's regular communication costs. Also, 3% of the revenues of all Alfa's projects is also destined for the common good of the organization, being managed by common agreement among the members.

4.6 Other relevant informations regarding the model

Alfa can not be considered a network, nor a model of work of professionals who act as freelancers, working punctually for unique projects. The idea is flexible, but it requires commitment and dedication of time, and there is a process in order to be accepted in the group. All who are part of the group are considered entrepreneurs of the business, people who intend to expand activities, prospect new projects and generate revenue for the group. If one of the members accepts any proposal for formal work in another company, it is necessary to leave Alfa, as this commitment calls into question the willingness to endeavor collectively with the other members.

4.7 Negative points of the model, from the point of view of the founders themselves

For the partners, there are not only good points. There are issues that require attention and care so that the model is not weakened exactly on such issues. One of the points that were raised is the tendency for loss of control, precisely as a result of lack of centralization. Because there is no leadership and hierarchy, it is necessary to trust the collectivity to make things happen, but there is a risk that they will not happen because there is no single direction. But despite being a point of attention, it is a characteristic of organic, decentralized and horizontal models.

Another issue that deserves attention is maintaining the commitment and motivation of all members in an autonomous way, as each one is responsible for the results of everyone, for attracting new clients and projects, and for delivering results.

In addition to presenting the work model of the company Alfa, the description of the characteristics and practices is intended in order to place the model at the disposal of new studies and adaptations, in order to be considered as an alternative to organizations that want to adopt new forms of work in a sectoral, partial or integral manner, based on flexibility and autonomy.

5. Final Considerations

With the bibliographical research on the terms flexible work and autopoiesis, and with the presentation of the case study, it was possible to achieve the objective of this article, which is to research the relevant concepts on the respective themes, and to present a work model based on flexibility and autonomy, which differs from the basic premises of the work organization in the industrial society.

The reading of articles, books, theses and other publications made it possible to conclude that there is a

movement occurring on the part of individuals, based on the changes generated by the transformation of the industrial society into a knowledge society, and by the search for models of work that present greater flexibility and autonomy. Such changes also become relevant from the point of view of organizations that need to adapt to new needs in order to remain competitive.

The case study is based on the principles of autopoiesis to create a model that considers as basic pillars the common good, an open and distributed model, with freedom and done through collaboration, while the fundamental concept still focuses on autonomy, self-management and self-production. The presentation of this model is not intended to cause a radical change in the organization of work, as it has specific peculiarities of the activity for which it is intended. On the other hand, the appropriation of a concept that is still evolving and presents divergence among scholars, such as autopoiesis, is something of boldness. However, the Alfa company model can inspire the creation of other companies that have the same purpose, depending only on an adaptation to their own reality. One can also use autopoiesis as a theoretical reference, making the boldness of appropriation a provocation of thinking, in order to construct new developments, enriching the theories and proposing new practices.

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