

The Acceptance of Infographics for Business Performance and Optimization

J. F. Agwa-Ejon, Vaughan Batchelor

Department of Quality and Operations Management, School of Mechanical and Industrial Engineering,
Faculty of Engineering and the Built Environment, University of Johannesburg, Johannesburg, South Africa

Abstract--This study explores the acceptance of Infographics by employees as a tool for the improvement of Business Performance and Optimization. Infographics present visual information data or knowledge very quickly and clearly resulting in an improved cognition of employees by utilizing graphics to enhance their human visual systems. The current trend in employee societal development requires a new set of skills that allows workers to engage with large datasets of information. A qualitative survey was conducted at eight banks in Johannesburg, South Africa involving seventy two employees with the assistance of the Human Resources division over a period of three months. All respondents had used infographics as a viable tool in their workplace to improve business related processes. The data obtained was analyzed using SPSS version 22.0 and the results obtained indicated a positive relationship between ease of use and usefulness of infographics that translated into a general acceptance. Infographics forms part of the breaking point in the revolution and rapid adaption of digital tools and technology which is driving the democratization of information and exposure to vast amounts of information in complex streams of data. It is therefore of paramount importance that senior managers and policy makers linked to business organizations are made aware of Infographics as an innovative tool able to optimize their organizational business performance.

I. INTRODUCTION

The general acceptance of Infographics as an instrument used to simplify large datasets to drive business performance and optimization is analyzed. Acceptance in this study are determined by factors of perceived *usefulness* and perceived *ease of use* as described in the Technology Acceptance Model (TAM) proposed by Davis [6], and Venkatesh [22], in their recent study. TAM model was also adopted by Melendez, [17]. An additional study carried out by Cheung and Vogel [4], extended the use of (TAM) model to the modern times. This model demonstrates that the rapid adoption of digital tools and technology in recent years has given the opportunity to the democratization of information, making vast amounts of information and complex streams of data available to everyone. Society at large has moved from a predominantly industrial society that was focused on the production of goods and products for trading, to a knowledge society reliant on information and new knowledge creation for driving economic growth. Skills of the industrial society were developed to compliment this stage of human development in areas such as agriculture, mining and manufacturing whereas the Information society also known as the knowledge society required a new set of skills that enable workers to use large datasets of information. This aspect is supported by a study carried out by Young [23]

whose findings supported infographics as a tool which could enhance communication in some age groups but warned that to reach a multi-generation workforce both infographics and the traditional text approach would need to be used. Therefore complimenting traditional text with infographics makes complex information more accessible to the knowledge workers to assist them in realizing informed decisions that potentially can result in increased productivity and output, thereby becoming essential for business to remain competitive. In today's world competition is the driver of success as more product variables, more regulations, and more cost pressures than ever before increase the factors to be overcome. For a start, enterprises must improve the flexibility and visibility of performance across their operations. Organizations are run by numbers, therefore in order for them to communicate to their internal and external stakeholders they have to process a wide variety of data. Two common categories of information that are frequently conveyed are numbers and concepts.

Due to the increased adoption of Information Communications Technologies (ICT) in the workplace, there has been an increase in data that is being generated in-house pertaining to supply chain, engineering, operations and strategic management, marketing, finance and human resources functions. The exposure to vast amounts of information and complex streams of data, presents a blurry picture of the actual performance of the organization. Sifting through all this data takes some skill to translate and communicate to the internal stakeholders of the organization. In most cases, not all of the information is conveyed accurately, leading to the misunderstanding of numbers resulting in increased risk/bad decision making for the organization. Keim [12], reports wastage in terms of time and money because of the inadequate extraction and representation of data. He claims that visual analytics in the form of infographics had the potential to bridge the gap between available data and its actual effective use. To date not much research has been conducted in the systematic use of infographics as a data visualization tool to optimize organizational performance, quality, and risk mitigation. Little thus far is known of how the use of infographics is *accepted* as an instrument to guide decision making and also making information more generally accessible to interested parties. It is becoming essential for businesses to remain competitive and as such new findings are necessary to maintain or improve the flexibility and visibility of operational performance across business performance and optimization.

The objective of this study therefore is to explore ways on how to simplify the big data overwhelming workers on a daily basis, by making use of a visualization tool to aid and assist organizations in managing their processes. Infographics makes complex information more accessible to the employees empowering them to make informed decisions that could potentially result in increased productivity and output.

II. LITERATURE REVIEW.

In the literature review the history of infographics is briefly discussed followed by its subsequent development and current use in Business Organizations. The history of infographics started 35 000 BC where pictures were the dominant form of communicating ideas as remarkable pictures drawn on rocky walls could communicate stories to others. Even though we are no longer cavemen or cavewomen, the underlying purpose of graphical interpretation of data is still relevant as back then. Infographics became more relevant in the 1980s as newspapers started employing colourful pictures and graphics to convey news instead of the conventional text-centric, black and white format. According to Bansal [2], simple traditional visualization tools such as line, column, bar and pie graphs have been in use for centuries. Today most businesses still rely heavily on traditional reporting but are now turning to infographics due to intense global competition. More recently they have realised that with the advance of new visualisation techniques businesses are able to easily achieve the following: Argument and summarize their traditional reports; Bring about quicker deployment, resulting in faster business insights and Easily communicate new insights to others.

The analysis of business communication has revealed that in order to communicate effectively using infographics the designers must understand the true nature of the information and be able to relate to the business performance and improvements. The argument was also echoed by Smiciklas [19], in his study which found out that in order to communicate business performance effectively using infographics, the business information and its associated resources should be divided in to eight groups as follows;

- Statistics - Metrics such as accuracy, cost of quality, on-time, volume, and agility.
- Process – Manufacturing/ service supply chain, value chain, customer service, and lead generation.
- Ideas – Concepts, theories and ideology
- Chronology – History, timelines, last results, or schedules
- Geography – series of locations, metrics of each region
- Hierarchy – Organizational structure and policies
- Relationship – Internal/ external, customers, employees, and products/ services
- Personality – brand humanization and organizational culture.

The main focus of the visualization in this case would be centered on three major means of business communication goals namely:

Presentation – This type of communication would involve a large audience and is normally undertaken to present a fixed entity.

Confirmatory - In this type of communication data is used to achieve a particular goal or either prove or disapprove any given hypothesis.

Exploratory - This communication analysis is open ended and generally aim at finding useful information relevant to a given task.

Infographics as a business tool therefore aims to efficiently and effectively communicate the results of an analysis in the most accessible format. We are currently in an era of data overload and research done by Nielsen [18], suggests that our attention spans are becoming more acute as the latest technology and digital media become more dominant in our personal and professional lives. According to Freidman [8], Infographics are schematic forms of visual representing data without ignoring the variables underlining the units of information. Data visualization and information architecture is used to convey complex information to a target audience that can be visually understood and quickly consumed, [9]. Today the need for the visualizing information in newspapers and books are increasingly desirable allowing for the possibility of data being easier to understand, resulting in people able to make well informed decisions and to take appropriate action, [22]. In his studies Alberts [1] explained some common mistakes made by infographics design teams. He found out that design teams at times focusses on visual presentation other than the information appropriate to the audience. He then identified four categories of infographics design as: bullet list equivalent; snapshot with graphic needs; flat information with graphic needs and the information flow process. Alberts concluded his studies by recommending how best to craft infographics content into an integrated presentation with text and graphics supporting each other.

According to Toth [20], infographics exists in nearly all sectors of our life, proliferating in the digital age with the social media. He further explained that in the Educational arena instructors can no longer afford to ignore infographics especially when it comes to increasing awareness and exposure to customers as it continues to explode worldwide. This sentiment is supported by Lee [15] who argues that the incorporation of infographics into a course curricular provides a reflective educational space for students to improve in their academic endeavor. One of the most recent stories narrated by Knight [13] in his paper discusses the powerful visual objects displayed through infographics after the hurricane Katerina disaster. He explained the importance of infographics in communication during a crisis and summarised the lessons to be learnt in emergency instances.

An additional study conducted by Bouquin [3], on hospital libraries employees found that infographics was very effective in conveying common complex health and nutritional requirements. They also found that informatics boosts the ability of the employees to handle biomedical community. Some solutions to common problems were highlighted by Hill and Grinnell [11] in their study which concluded that infographics as tool for communication may be used to create an understanding among diverse audiences for example where there is a complex technical information there might be a disconnection between the non-expert audience and the writer or designer of the infographics information.

Various technology software tools and services can assist in the computation of large data sets. Infographics is one such ICT tool that can be used very effectively to support the goals of data visualization. It is evident that the human factor remains central to the data analytics process. Adequately trained experts/professionals in the fields of data management and knowledge presentation, knowledge discovery, and statistical analytics through their interactions with various Information Communications and Technologies (ICT) tools and services are responsible for the dissemination of large datasets. According to Scientists at the Massachusetts Institute of Technology the physiology of sight presents compelling rationale regarding the use of infographics. Visuals are hardwired to the human brain as half of the brain is devoted directly or indirectly to vision functions, [10]. In reading each letter in a word document represented by symbol, the brain has to match each letter with a shape stored in memory. The brain must then compare letters and form words to fit together in a context of sentence. All of which takes place in split seconds and requires a considerable amount of mental effort, [14]. A study carried out by Fleming, [7] based on the ideology of the VARK Model, revealed that people use four primary learning styles to process information. These four styles are listed below:

- Visual – Learning viewed by graphic format for instance charts, maps, and diagrams instead of using a text-based format.
- Auditory – Learning based on physically listening
- Read/write – Learning for reading and writing
- Kinesthetic – Learning by experience gained

Organizations using infographics are therefore able to communicate their ideas and information which in turn can bridge the knowledge gap. As infographics improve internal processes, customers can reap the benefits as prospects for engagement increase they also learn about the organization’s performance and flexibility.

III. RESEARCH METHODOLOGY

This research makes use of the Technology Acceptance Model (TAM) originally developed by Davis in 1989 [6] and later amended by Venkatesh, et al [21], to the Unified Theory of Acceptance and use of Technology (UTAUT). TAM has been used in many sectors including businesses to determine the factors that influence the acceptance of technology tools and services for specific purposes, [5]. Figure 1 presents the original TAM as presented by Davis. It is evident that the external variables that influence both perceived *ease of use* and perceived *usefulness* would determine the attitude of an individual towards using a particular technology. The attitude converts into the behavioral intention to use the specific application resulting into the actual use within the system. In this study of infographics communication the model explains the perceived usefulness and usage ability of workers in terms of their social influence and cognitive instrumental processes. The target group of the survey were the employees of a South African Commercial Bank who have used infographics or been in contact with visual information in their area of work in the past.

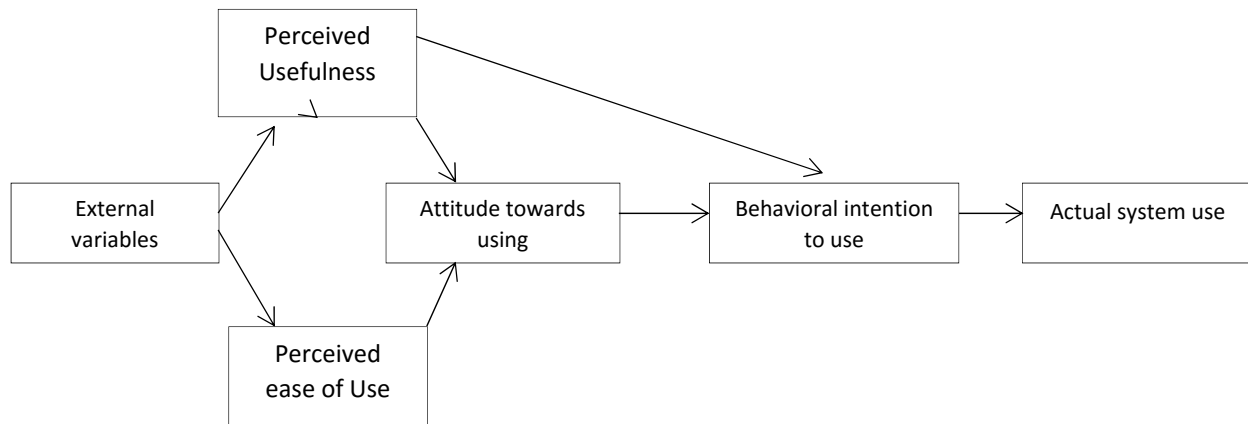


Figure 1. The TAM model as originally expressed in the study by Davis [6]

2016 Proceedings of PICMET '16: Technology Management for Social Innovation

In line with the objective of the study which is to determine the acceptance of using visual data/infographics using the notion of perceived *usefulness* and perceived *ease of use* the resultant effect on the bank employees explains the change in the business performance of the commercial bank.

The study involved the identification and itemizing subsidiary topics by formulating specific information requirements relating to each of these issues. Constructs were developed to determine the level of engagement with regards to perceived *usefulness* and perceived *ease of use*. Consequently, the research design in this research explored the latent constructs that play role in the acceptance of infographics in the work place. The study is based on a case study centered on a business unit situated in the Human Resources division of the commercial banks which has branches all over the country. The participants targeted were workers at General staff and a few from Managerial level who are known to be involved in managing data for the purpose of optimizing business. Most of the participants were chosen base on purposive sampling as all were known to be members of a specific business unit that are engaged in personnel staff datasets on a daily basis. The Questionnaire items were structured around the constructs of the Technology Acceptance Model and comprised of the ease of use and the perceived usefulness. A five point Likert scale was used for each test item to determine the level of agreement in each statement. The questioner design therefore was intended for the purpose to elicit responses, which would contribute to answering the research question. The questionnaire was intended to measure the constructs relating to the perceived *ease of use* and perceived *usefulness* of infographics as a data visualization tool in the workplace. The questionnaire comprised of 19 questions that are grouped together according to the constructs to be investigated.

In addition the demographics of the participants was taken into consideration when analyzing and interpreting empirical data. Demographics was also used as descriptors to enable

detailed information about participants in the study as suggested by Lodico, [16]. The design of this questionnaire makes provision for the inclusion of the bibliographical details and was made simple and straight forward in order for them to understand the various constructs being investigated and should take no longer than 10 minutes to complete.

IV. ANALYSIS OF DATA

This chapter deals with analysis and interpretation of data which was collected from 72 respondents that completed the survey questionnaires from the Commercial Banks, in the Human Resources division of the Bank. The questionnaire was designed using constructs based on the rationale to address the research question: *What is the perceived ease of use and perceived usefulness of infographics as a data visualization tool in the workplace?* The findings of the questionnaire will be presented in seven areas; performance expectancy, effort expectancy, social influence, facilitating conditions, quality of content, job relevance, and voluntariness in the use of infographics. Data gathered from the questionnaires were statistically analysed using the Statistical Package for Social Sciences (SPSS) version 22 to generate frequency tables, graphs and cross-tabulations (nominal data) based on respondents acceptance of infographics in the workplace. The results of each question will be presented and discussed in collective summary of each main constructs as depicted in the Table 1 below that will be informed by the descriptive statistics containing the Mean, Mode, median, and Standard Deviation.

Of the 72 respondents that completed the questionnaire 69.4% fell into the managerial level of the bank with the remaining 30.6% fulfilling general staffing duties. At managerial level employees do not only manage people but also businesses processes. As such, it is expected that they rely on a variety of data to inform their decision making.

TABLE 1: LINKING THE RESEARCH QUESTIONS TO THE CONSTRUCTS IN THE QUESTIONNAIRE

| Main constructs | Question number | Construct definition | Research Question |
|-------------------------|-----------------|--|---|
| Performance Expectancy | 1,2,3 | The degree to which an individual believes that using infographics/data visualization will help him or her to attain gains in job performance. | What is the perceived <i>ease of use</i> and perceived <i>usefulness</i> of infographics as a data visualization tool in the workplace? |
| Effort Expectancy | 4,5,6 | The degree of ease associated with the use of infographics/data visualization. | |
| Social Influence | 7,8 | The degree to which an individual perceives that others believe he or she should use infographics/data visualization. | |
| Facilitating conditions | 9,10,11 | The degree to which an individual believes that organizational and technical infrastructure exists to support the use infographics/data visualization. | |
| Quality of content | 12,13,14 | The degree to which the content information can be trusted to be accurate and representative of interpreted data. | |
| Job Relevance | 15,16,17 | Individual's perception regarding the degree to which the target system (infographics/data visualization) is relevant to his or her job. | |
| Voluntariness | 18,19 | The extent to which potential adopters perceive the adoption decision to be non-mandatory | |

TABLE 2: EMPLOYEE LEVEL DISTRIBUTION

| | | Frequency | Percent | Cumulative Percent |
|-------|---------------|-----------|---------|--------------------|
| Valid | General Staff | 22 | 30.6 | 30.6 |
| | Management | 50 | 69.4 | 100.0 |
| | Total | 72 | 100.0 | |

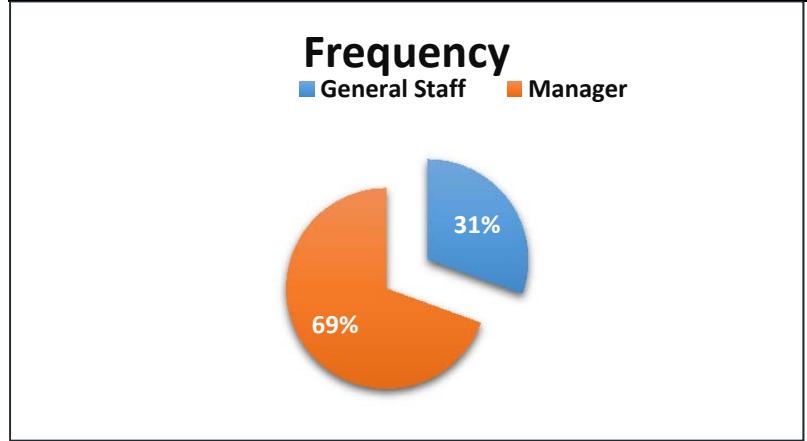


Figure 2: The distribution of employment levels

TABLE 3: GENDER DISTRIBUTION

| | | Frequency | Percent | Cumulative Percent |
|-------|--------|-----------|---------|--------------------|
| Valid | Male | 30 | 41.7 | 41.7 |
| | Female | 42 | 58.3 | 100.0 |
| | Total | 72 | 100.0 | |

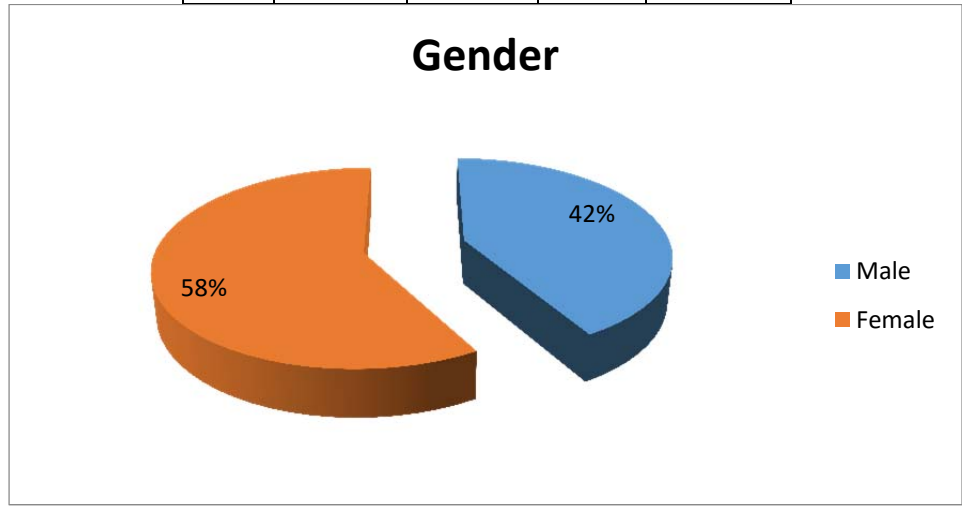


Figure 3: The distribution of gender

As displayed in Table 3, more than 58.3 % of respondents were female with the remaining 41.7% male. It is interesting to note that 58% of the woman that completed the questionnaire fulfilled managerial positions.

The mean experience for the bank respondents is 8.6; mode is 5 and median 6.5. This would mean that on average the number of years of experience in the financial services was 8.6 years. The most frequently selected number of years was 5 years. This would therefore indicate that the respondents surveyed had a good exposure to various data

visualization tools during their time as part of their job entails engaging with large sets of numbers. Table 4 below illustrates results for the age of participants. The age group between 26-35 years are well represented at 40.3% with 11.1% of the respondents just starting out in their career being younger or about 25 years of age. A further 29.2% fell into the 36-45 age group with the remainder 19.4% above the age of 46 years. The result again indicates that most of these respondents were familiar with data visualization.

TABLE 4: AGE DISTRIBUTION

| | Frequency | Percent | Cumulative Percent |
|-------|-----------|---------|--------------------|
| 18-25 | 8 | 11.1 | 11.1 |
| 26-35 | 29 | 40.3 | 51.4 |
| 36-45 | 21 | 29.2 | 80.6 |
| 46+ | 14 | 19.4 | 100.0 |
| Total | 72 | 100.0 | |

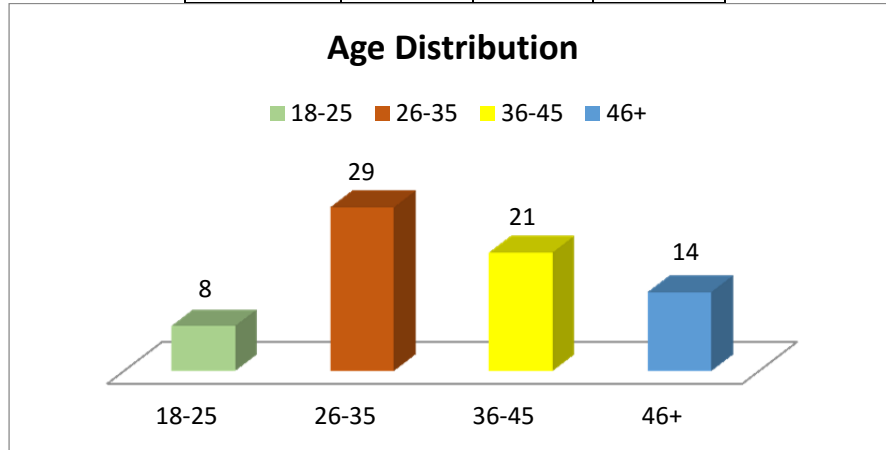


Figure 4: The age distribution of respondents

A. Constructs under Analysis

Two of the most influential components of TAM is perceived *usefulness* and perceived *ease of use*. Perceived *usefulness* implies that individuals believe that using ICT related tools and services will promote effectiveness within the workplace while perceived *ease of use* is more concerned with the idea that these tools and services will be used with less effort. The Unified Theory of Acceptance and use of Technology (UTAUT) [22], is particularly suited to study the general acceptance of infographics in the workplace. The

following external variables have been selected based on their inclusion in (UTAUT). They found that performance expectancy, effort expectancy and social influence are theorized to influence behavioural intention to use a technology (tools and services), while behavioural intention and facilitating conditions determine actual technology use. In addition, quality of content, job relevance and voluntariness also contribute the intention to use a specific technology.

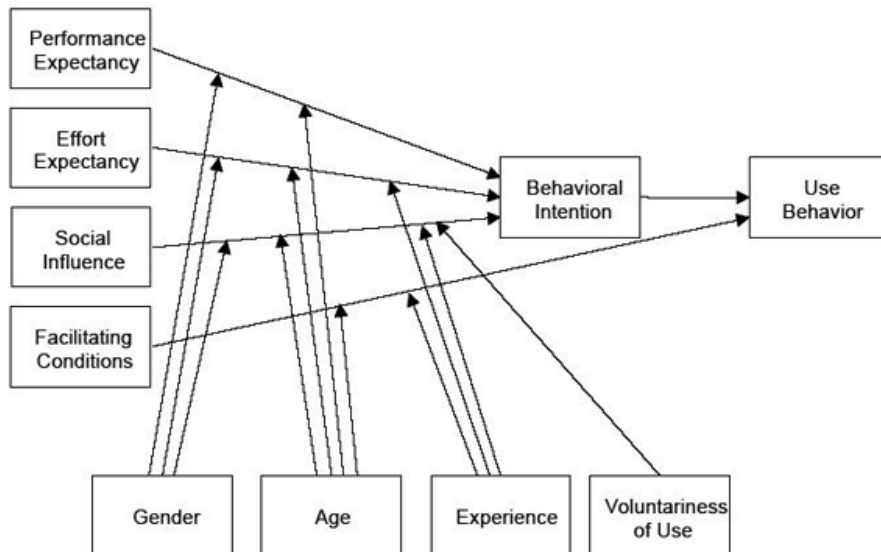


Figure 5: Reviewed unified theory of acceptance and use of technology model [22]

TABLE 5: PERFORMANCE EXPECTANCY

| | | Using infographics/data visualization will enable me to accomplish tasks more quickly. | Using infographics/data visualization can improve my productivity. | Using infographics/data visualization will enhance my effectiveness. |
|----------------|---------|--|--|--|
| N | Valid | 72 | 72 | 72 |
| | Missing | 0 | 0 | 0 |
| Mean | | 4.08 | 4.04 | 4.00 |
| Mode | | 4 | 4 | 4 |
| Std. Deviation | | .599 | .568 | .557 |

B. Performance Expectancy

All three items that relate to performance expectancy (is the degree to which an individual believes that using infographics/data visualization will help him or her to attain gains in job performance) was very similar in their results as evident in Table 5.

The Mean for these questions are respectively 4.04 and the Mode is 4.00 which indicate that most of the respondents agree that infographics can help them to attain gains in job performance. The Standard Deviation reflects only a difference of 0.581 indicating that most respondents tend to agree with the statements relating to performance expectancy. The respondents feel that infographics can improve their

productivity and effectiveness in performing their respected job functions. More than 68% of the employees agree and 15% strongly agree that infographics can contribute towards the effective communication of statistics. In total 83% of respondents support the notion that infographics/data visualization can assist in improving their business performance.

C. Effort Expectancy

All three items that relate to effort expectancy (the degree of ease associated with the use of infographics/data visualization) was very similar in their results as evident in Table 6 below.

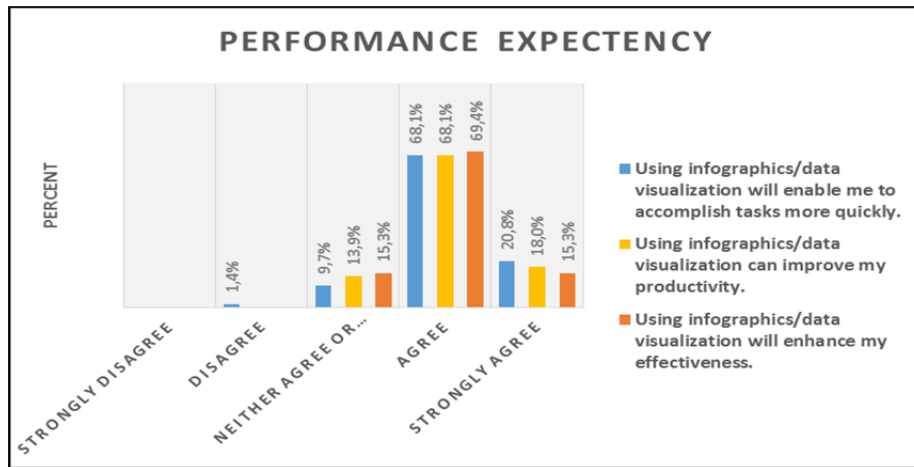


Figure 6: Graph representing the results of performance expectancy

TABLE 6: EFFORT EXPECTANCY

| | | It is easy to gain insight from an infographic/visualized data. | An infographic/ visualized data makes complex information simpler to process. | Using infographics/data visualization would reduce the time I spend on getting to grips with information/data |
|----------------|---------|---|---|---|
| N | Valid | 72 | 72 | 72 |
| | Missing | 0 | 0 | 0 |
| Mean | | 4.29 | 4.44 | 4.38 |
| Mode | | 4 | 5 | 4 |
| Std. Deviation | | .721 | .603 | .568 |

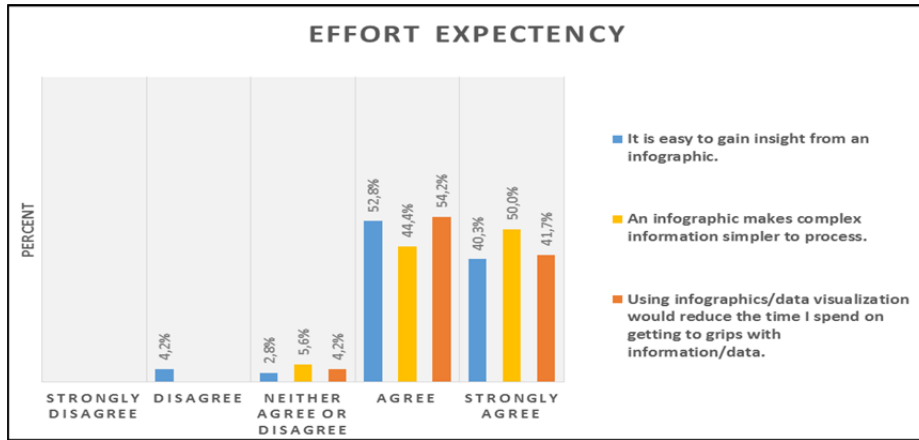


Figure 7: Graph representing the results of effort expectancy

The Mean for these questions are respectively 4.37 with a Mode of 4.00 which indicate that most of the respondents agree that new insight can be gained from using infographics. The respondents feel that infographics makes complex information simpler to process and reduces the time it takes to get to grips with new information/data. Most the respondents agree or strongly agree with a Standard Deviation amongst these three items of 0.63 that data visualization is beneficial by displaying underlining trends that cannot be seen on text-based reports.

D. Social influence

All three items that relate to social influence (the degree to which an individual perceives the importance for others to believe that he or she should use infographics/data

visualization) was very similar in their results as evident in table 7 below.

The Mean for this questions are respectively 3.54 and the Mode is 4.00 which indicate that most of the respondents agree the individuals perceives that others believe in the use of infographics/data visualization. The Standard deviation is higher at 0.813 than for effort expectancy indicating that the respondents are spread over neither agreeing nor disagreeing. The respondents feel that infographics is not necessary as it is relatively a new tool implemented in the workplace and it is not expected from employees to utilize. More than 36% of the employee neither agree nor disagree and 37% agree that infographics can convey less tangible forms of information, such as ideas and concepts although are not regarded as vital.

TABLE 7: SOCIAL INFLUENCE

| | | My immediate supervisor will soon be expecting me to use infographics/data visualization in the delivery of my work. | My team is ready to start using infographics/data visualization in our work environment. |
|----------------|---------|--|--|
| N | Valid | 72 | 72 |
| | Missing | 0 | 0 |
| Mean | | 3.47 | 3.61 |
| Mode | | 3 | 4 |
| Std. Deviation | | .804 | .832 |

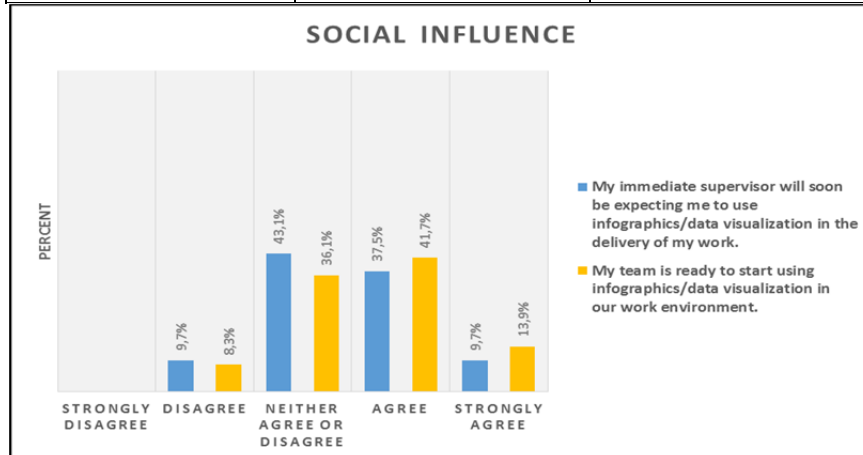


Figure 8: Graph representing the results of social influence

TABLE 8: FACILITATING CONDITIONS

| | | I believe that we have enough knowledge amongst ourselves to create infographics/ visualized data. | My division uses of infographics/data visualization instruments in our reporting. | I have enough support to understand the use of infographics/data visualization. |
|----------------|---------|--|---|---|
| N | Valid | 72 | 72 | 72 |
| | Missing | 0 | 0 | 0 |
| Mean | | 3.26 | 3.61 | 3.64 |
| Mode | | 4 | 4 | 4 |
| Std. Deviation | | 1.061 | .865 | .793 |

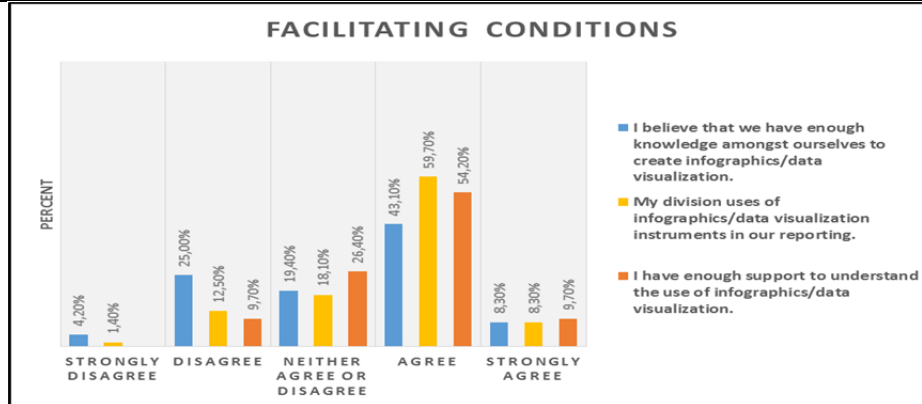


Figure 9: Graph representing the results of facilitating conditions

E. Facilitating Conditions

All three items that relate to facilitating conditions (the degree to which an individual believes that organizational and technical infrastructure exists to support the use infographics/data visualization) was very similar in their results as evident in table 8.

The Mean for these two questions are respectively 3.5 and the Mode is 4.00 which indicate that most of the respondents agree that there are organizational and technical infrastructures to support the use infographics/data visualization, however, the Standard Deviation has a greater range of 0.834 indicating that they were slightly less in agreement with each other. The question with the largest Standard Deviation of 1.061 and the lowest Mode of 3.26 was “I believe that we have enough knowledge amongst ourselves to create infographics/ visualized data”. This is also evident from that reflect a few selections in the strongly disagree section as well. The Standard Deviation is high indicating that the respondents are spread over either agreeing or disagreeing. There is also slightly less confidence amongst

respondents that there is enough knowledge and support amongst their team to create infographics/data visualization as a small number disagrees with the statement. More than 48% of the employee agree and 8% strongly agree that there is support in aiding the development and implementation of infographics. Even though there is a 56% support for this notion it would be prudent to invest more effort into providing more support in aiding employees to develop and implement infographics as 44% indicated their desire for more support. This result indicate that more can be done to create conditions that will enable the effective use of infographics to support employees in making informed decisions relating to business processes as an enabling environment does not fully exist at this stage.

F. Quality of Content

All three items that relate to quality of content (the degree to which the content information can be trusted to be accurate and representative of interpreted data) was very similar in their results as evident in table 9.

TABLE 9: QUALITY OF CONTENT

| | | Infographics/data visualization can improve the quality of my work. | There is usually sufficient information contained in an infographic/visualized data to adequately inform my decisions. | I can trust the information contained in an infographic/visualized data. |
|----------------|---------|---|--|--|
| N | Valid | 72 | 72 | 72 |
| | Missing | 0 | 0 | 0 |
| Mean | | 4.10 | 3.57 | 3.74 |
| Mode | | 4 | 4 | 4 |
| Std. Deviation | | .535 | .853 | .605 |

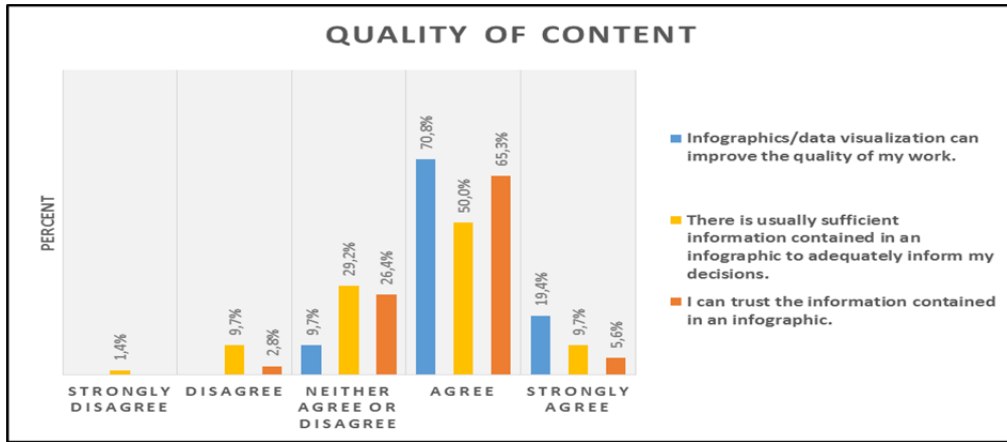


Figure 10: Graph representing the results of quality of content

The Mean for this questions are respectively 3.8 and the Mode is 4.00 which indicate that most of the respondents agree that content in infographics can be trusted to be accurate and representative of interpreted data. The Standard Deviation of 0.664 is moderate indicating that there is a small variance. The respondents believe that Infographics can improve their quality of work and the data contained in the infographics is trusted and accurate. Although there is mixed feelings about whether there is sufficient information contained in an infographics to adequately inform their decisions as reflected in a Standard Deviation of 0.853.

infographics/data visualization is relevant to his or her job) was very similar in their results as evident in table 10 below.

The Mean for these questions are 4.12 and the Mode is 4.00 respectively which indicates that most of the respondents agree that infographics are relevant to their job. The standard deviation is moderate indicating that there is a small variance between responses. The respondents believe that Infographics are relevant to their job which can support critical aspects of their job. More than 55% of the employees agree and 19% strongly agree that the engagement of infographics can draw interest from across the organisation; shared-ability can help in generating ideation and problem solving.

G. Job Relevance

All three items that relate to job relevance (the individual's perception regarding the degree to which the target system,

TABLE 10: JOB RELEVANCE

| | | Infographics/data visualization is relevant to my job. | Infographics/data visualization can support critical aspects of my job. | I would imagine that most people gain useful information from infographics/data visualization. |
|----------------|---------|--|---|--|
| N | Valid | 72 | 72 | 72 |
| | Missing | 0 | 0 | 0 |
| Mean | | 3.99 | 4.08 | 4.28 |
| Mode | | 4 | 4 | 4 |
| Std. Deviation | | .702 | .550 | .537 |

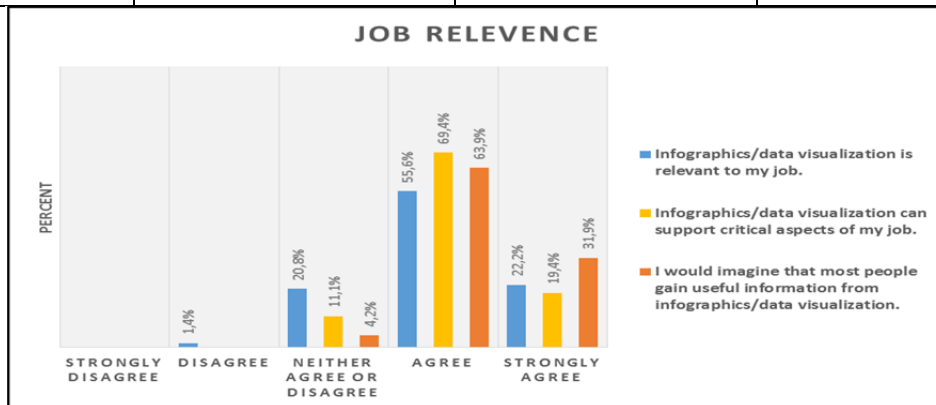


Figure 11: Graph representing the results of job relevance

TABLE 11: VOLUNTARINESS

| | | | |
|----------------|---------|---|---|
| | | Although it might be helpful, making use of infographics/data visualization is not a priority for me. | My use of infographics/data visualization is voluntary. |
| N | Valid | 72 | 72 |
| | Missing | 0 | 0 |
| Mean | | 2.85 | 3.71 |
| Mode | | 4 | 4 |
| Std. Deviation | | 1.109 | .777 |

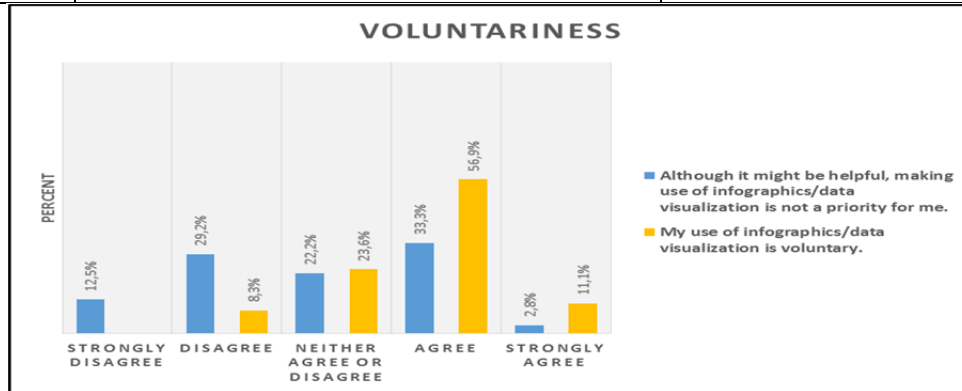


Figure 12: Graph representing the results of voluntariness

H. Voluntariness

The two items that relate to voluntariness (the extent to which potential adopters perceive the adoption decision to be non-mandatory) indicated the biggest difference between the Mean as well as the Standard Deviation in the data set as evident in table 11.

The Mean for these questions are 3.28 and the Mode is 4.00 respectively which indicate that most of the respondents agree with adoption decision to be non-mandatory. The statement of whether infographics is a priority for them returned a Standard Deviation of 1.109 indicating that they differ more in their opinion towards the importance of adopting infographics in the workplace. The Mode of 2.85 for this particular item is also the lowest of the dataset reflecting that it is not a priority for them to adopt and use infographics. The respondents believe that infographics are helpful, but they are not a priority. More than 56% of the employees agree and 11% strongly agree that infographics are voluntary.

V. FINDINGS AND RESULTS.

The usefulness of infographics as a data visualization tool in the workplace was found to add functionality and aesthetics to communicate while encouraging employees to open up their perception of visual analysis. The significance of data visualization increases the context of data-based reporting, which can be an influential, convincing and trusted means of conveying performance and feedback. Infographics reveals the graphical structure of the content and its intended message. The respondents believe that using infographics/data visualization will help them to attain gains in job performance as they agree that it enables them to

accomplish tasks more effectively resulting in improving productivity. There is a high degree of ease associated with the use of infographics/data visualization due to the insight gained from the complex information given that the least amount of effort and time is expended. This is because Infographics convey data in a limited space and an artistic format, which enables for the quick passage of facts. The perceived importance of infographics is currently not regarded as a priority as it is a relatively new tool in the business workplace even though other industries such as the newspaper industry that are using it on a continuous basis for informing the public of emerging trends. They have to managed an establish data visualization units to synthesize information, and thus present it to an audience that can make meaning of data in an accessible manner. The business world can learn from the newspaper industry on how it communicates with their clients and to their large workforce in aiding them to make informed decisions and at the same time improve their own business processes whilst empowering their employees.

Communicating information requires any stakeholder to understand the organizational environment; infographics can aid such a requirement by explaining different relationships on their business process and structure. Effective communication provides an individual with a road map through a variety of structured business activities. The use of infographics to illustrate business processes and structures can help external and internal audiences fully understand how the organization operates. The content information in infographics is trusted as it improves the quality of work hence providing adequate information to make decisions. Through the visualization technique even an underqualified

employee can understand what the data is presented to them. Data visualization is not only an easy way of conveying information but it is simple to analyze and take correct course of action. The perception of the relevance of infographics is relevant to any job as it can support critical aspects within the job so most employees can gain useful information from infographics/data visualization. The use of infographics is not a priority to most as it is currently voluntary to use and not a mandatory tool. The technical infrastructure exists to support the use of infographics and there is enough knowledge amongst most employees to create infographics, however, employees need to believe that the facilitating conditions are mature enough before they will start to voluntarily use infographics to aid their business processes.

A. Recommendations

As a follow up of the above findings the following recommendations are made to enable further research in this field.

1. A study into the tools and resources available to develop and implement infographics.
2. The comparison of other methods of communication against the use of infographics.
3. The exploration of the current state of infographics in the workplace as a newly implemented tool of communication.
4. A study on a larger scale to determine the level of voluntariness in infographics and how companies could be encouraged to adopt infographics.
- 5.

ACKNOWLEDGMENTS

The authors would like to thank the University of Johannesburg especially the Department of Quality and Operations Management for the opportunity to research and present this paper. They would also like to recognize the reviews of this paper for their valuable input in making the paper of interest to its audience. Finally we would like to appreciate the contribution in terms of funding by the office of Dean of the Faculty of Engineering and the built Environment as well as Academic Development to enable us to attend the conference in Hawaii.

REFERENCES

- [1] Alberts, Michael J. "Infographics: Horrid Chartjunk or Quality Communication." *IEEE International Professional communication Conference (IPCC) Pittsburgh* 13-15, 2014.
- [2] Bansal, K. L., and S. Sood, "Data Visualization A Tool of Data Mining." *International Journal of Computer Science and Technology*, vol. 2(3), 197-198, 2011.
- [3] Bouquin, D. and H.B. Epstein, "Teaching Data Visualization basics to market the value of a Hospital Library: An infographics as one example." *Journal of Hospital Librarianship* vol. 15 (4), pp 349 – 364, 2015.
- [4] Cheng, R and D. Vogel, "Predicting user acceptance of collaborative Technologies. An extension of technology acceptance model in e-learning" *Computer & Education*. vol. 63 pp. 160 – 175, 2013.
- [5] Chuttur, M. Y.; " Overview of the Technology Acceptance Model: Origins, Developments and Future Directions". *Working Papers on Information Systems*, 1-23, 2009.
- [6] Davis, F. D.; " User acceptance of information technology: system characteristics, user perceptions and behavioral impact". *Int J. Man-machine studies*, pp. 475-487, 1993.
- [7] Fleming, N and Mills. "The VARK Modalities: Retrieved from VARK a guide to learning styles" Retrived, 06/02/16. World Wide Web: <http://www.vark-learn.com/english/page.asp?p=categorie>
- [8] Friedman, V.; "Data Visualization and Infographics, Inspiration data visualization and infographics", 2008.
- [9] Friendly, M.; "Milestones in the history of thematic cartography, statistical graphics, and data visualization" Retrived, 20/02/16. World Wide Web., <http://www.math.yorku.ca/SCS/Gallery/milestone/milestone.pdf>, pp. 1-79.
- [10] Health, N.; "MIT Research - Brain Processing of Visual Information: Retrieved from Massachusetts Institute of Technology". Retrived, 12/02/16 World Wide Web. <http://newsoffice.mit.edu/1996/visualprocessing>
- [11] Hill, S. and Grinnell, C., "Using digital storytelling with infographics in STEM professional writing pedagogy." In *Professional Communication Conference (IPCC), 2014 IEEE International* (pp. 1-7). IEEE, 2014.
- [12] Keim, D. A.; F. Mansmann; J. Schneidewind, and H. Ziegler, "Challenges in Visual Data Analysis. Proceedings of the Information Visualization", pp. 1-6, 2006. In appropriation and coping strategies. *Research in Learning Technology*. vol.15(3), 247-258, 2006.
- [13] Knight, M.; "Usability and Business Communication" *Business Communication Quarterly*. vol.76 (4) pp 395-396, 2013.
- [14] Lane, R. and S. Kosslyn, "Show Me! What Brain Research Says About Visuals in PowerPoint". Retrieved from Microsoft Office : 12/04/16 World Wide Web, <https://support.office.com/en-US/Article/Show-Me-What-Brain-Research-Says-About-Visuals-in-PowerPoint-8b802fd7-59d6-47c9-b4df-472aa5f18f09?ui=en-US&rs=en>
- [15] Lee, J.W. and Cavanaugh, T., "Building your brand: The integration of infographic resume as student self-analysis tools and self-branding resources." *Journal of Hospitality, Leisure, Sport & Tourism Education*, vol. 18, pp.61-68, 2016.
- [16] Lodico, M. G.; D.T. Spalding and K.H. Voegtle, "Methods in educational research: From theory to practice." *Vol. 28. John Wiley & Sons, 2010.*
- [17] Melendez, P. D.;A. R. Del AgulaObara and A. G. Moreno,"Perceived Playfulness, gender difference and technology acceptance model in a blended learning senario" *Computer & Education*, vol 63, pp. 306-317, 2013.
- [18] Nielsen, J.;"How Little Do Users Read? Evidence-Based User Experience Research." *Training, and Consulting*, 2008.
- [19] Smiciklas, M.; "The power of infographics." *Indiana Pearson Education*. 2012
- [20] Toth, C. "Revisiting a Genre Teaching Infographics in Business and Professional Communication Courses." *Business Communication Quarterly*, 76(4), pp.446-457.2013.
- [21] Venkatesh.V, T. J.; "Extending the unified theory of acceptance and use of technology." *MIS Quarterly*, vol. 36(1), pp. 425-478, 2003.
- [22] Webster, F.; "Theories of Information society." *New York: Taylor and Francis Group*, 2014.
- [23] Young, A.M. and M. Hinesly, "Infographics as a Business Communication Tool: An Empirical Investigation of User Preference, Comprehension, and Efficiency." *Social Science Research Network*, 2014.