A STUDY TO IDENTIFY AND EVALUATE THE ROLES AND CHALLENGES OF MODERN ART MUSEUMS – WITH SPECIAL REFERENCE TO THE INCORPORATION OF DIGITAL TECHNOLOGY IN ART MUSEUMS IN THE GAUTENG PROVINCE OF SOUTH AFRICA

by

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ABSTRACT

This research briefly introduces the roles of art museums and presents selected digital technology implementation challenges and benefits in art museums in the Gauteng Province. An art museum is a building or space for the exhibition of work of art, usually visual art. Art museums collect objects of art and other historic artefacts that are documented and exhibited for different purposes, such as aesthetic value, social, historic cultural and educational, significance and research values that are traceable to a specific society or group of individuals.

In South Africa, particularly in the Gauteng Province, art museums are failing to keep pace with international trends about the use of digital technology. It is, therefore, important for art museums as information dissemination centres to incorporate digital technology in their daily museum business as it may offer the opportunity for these museums to become more effective and competitive in the global information society.

A literature review is done to understand the trends of different digital technologies in other first world international cities. The examined literature revealed that the Internet and other technological applications of the new millennium prompted a re-evaluation of cutting edge museum research, education roles, and documentation capabilities. Consequently, digital technology became an integral component of the digital policies of many art museums, allowing them to satisfy the demand for online information sharing abilities. A qualitative research approach together with a constructivism educational theory is used to fully understand South Africa's position regarding the use of digital technology. In South Africa, digital technology usage in art museums is predominantly limited to email exchange, electronic invitations to exhibitions, data capturing of collections and viewing of basic websites. In other words, digital technologies are not optimally used in the South African art museum environment.

The study explores the benefits of digital technology interfaces at art museums against fixed traditional art museum information dissemination practices. The objectives of the study are to create an awareness of best practice in the implementation of digital technology interfaces at art museums in Gauteng.

The findings in this study indicate that digital technologies have proved to be useful in several spheres of public life resulting in the popular utilization of e-learning, e-mail, e-health, e-government and e-commerce. It is, therefore, proposed that art museums in South Africa embrace digital technologies to enhance the transformation of these museums. In essence, the implementation of digital technologies such as 'virtual tours' and other popular social media

platforms and applications may raise the profile of art museums and market their contents to wider audiences, and may also help to popularize their heritage collections for leisure and scholarly purposes.

Keywords: Digital technologies in art museums; art museums; art museum technologies; information and communications technology and art

Disclaimer

I hereby declare that this submission is my own work and that, to the best of my knowledge, it contains no material previously published, or written by another person, or material which to a substantial extent has been accepted for the award of any other degree or diploma by another university, or other institution of higher learning, except where due citation and acknowledgement is made in the text.

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1. CHAPTER ONE

INTRODUCTION

This study identifies and evaluates the roles of art museums in the Gauteng Province of South Africa regarding the incorporation of digital technology and online functions in museums spaces as enhancement tools for museum exhibitions and good practice. The museum institutions investigated are Wits Art Museum (WAM), Pretoria Art Museum (PAM), Edoardo Villa Museum (EVM) at the University of Pretoria, and the Johannesburg Art Gallery (JAG). It is the aim of this study to research and explore the benefits of incorporating digital technology in art museums in the information age. These benefits will be made available to the art museum communities in South Africa[1].

For the past ten years, museums around the world have shown an increased inclination to what is often described as information communication technology (ICT) exploration. Scholars such as Scott Beardsley (et al.) (2010) mention that the use of digital technology interconnects the world. Through digital technology, many international museums have access to information and can establish good technological networks for progressive business goals, corporate governance and best practice[2]. Beardsley (et al.) (2010) are of the opinion that the ICT industry is perfectly positioned to help build a more socially sustainable future for the world to benefit economically. This opinion is further acknowledged by Ribeiro-Neto (1999) who believes that it has become a norm that various organizations are incorporating digital technology as part of their day-to-day business practices to capture data, market and communicate with their clients. Based on the latter statement it can be proposed accordingly that the pivotal tool for the proficiency of modern museums is the incorporation of a functional technological infrastructure that can be used in different ways to market, communicate, and share information about the collections in art museums.

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[1] The term digital technology (technologies - plural) describes the use of digital resources to effectively find, analyze, create, communicate and use information in a digital context. It covers the use of web 2.0 tools (World Wide Web websites), digital media tools, programming tools and software applications). Digital technology uses digital streaming apart from analogue systems. Whereas information communication technology refers to communication infrastructure that use both analogue systems and digital streaming.

[2] Information communication technology (ICT) includes any communication device, such as radio, television, computer and network hardware and software. Information communication technology uses both analogue systems and digital streaming. For the purpose of this study digital technology and ICT are combined under the common phrase digital technology.

1.1 Brief overview of art museums

According to the ICOM Statutes, adopted by the 22nd General Assembly in Vienna, Austria on August 24th, 2007: A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for education, study and enjoyment. An art museum is a building or space for the exhibition of art, usually in the form of art objects from the visual arts[3].

Art museums, around the world collect, organize and disseminate information and knowledge about art to different user groups. This is confirmed by the International Art Museums Division of Smithsonian Institution (2001) that states, "art museums are established as repository entities of various collectable items". This statement is backed up by the American Association of Museums (AAM) that states that: "museums are non-profit entities set up for educational and public viewing purposes". Such entities have well-structured mission and vision statements, and are managed professionally by dedicated curatorial staff. The AAM's definition of museums is further endorsed by the definition of the Oxford Companion of Art Dictionary that defines museums as "special institutions that keep and display works of art and antiquities to educate the audience" (Osborne: 1970).

This study evaluates how art museums worldwide have evolved from being mere art object collection venues to generators of information about objects and works of art in their possession. Furthermore, the researcher evaluates how international art museums such as the Museum of Modern Art, in New York, the Rijks Museum in Amsterdam, the Tate Gallery in London and the Louvre Museum in Paris, France, evolved to become both disseminators of digital information and distributors of electronic art images through virtual tours. This evaluation is done against the backdrop of few South African museums that are using digital technology advancements to share and populate information in their possession, one of the few digitally advanced heritage institutions is the South African Resource Agency in Cape Town. The study also presents a critical argument, that the incorporation of digital

[3] Throughout history, works of art have been commissioned by religious institutions and monarchs and displayed in churches, temples and palaces. They were private collections but sometimes made available for public viewing. From the 17th century private museum were established and were open to the public. In second half of 18th century many private collections of art were nationalised and opened to the public. Art museums eventually became generators of information about artworks which were made available for all to see.

technology may assist local art museums in Gauteng to market, communicate and disseminate information to the general audience.

In South Africa, particularly in Gauteng, the following art museums: Wits Art Museum (WAM), Pretoria Art Museum (PAM), Edoardo Villa Museum (EVM), and Johannesburg Art Gallery (JAG) seem to lag behind the aforementioned international museums and SARHA with regard to the incorporation of digital technologies practices such as embedded virtual reality applications and google cultural institute an art project that is a collaboration between the project's architects and selected art institutions[4]. In many instances South African art museums are perceived as institutions that struggle to change their roles and functions from being collectors and preservers of non-inclusive art collections, to becoming collectors and preservers of demographically representative and democratically inclusive objects and works of art that support social and national cohesion (Rankin & Hamilton, 2008: 3). In addition, to rectifying a skewed history of inclusion and exclusion in South African art museums, this study proposes to support the incorporation of digital technology at art museums in Gauteng so that the concerned museums can be marketed to audiences irrespective of geographical location. This study reviews published literature and museum websites to formulate an argument that the incorporation of digital technology could prove beneficial to art museums in South Africa and may give them a more competitive edge in the global information age.

1.2 Digital technology processes

Examined literature reveals that since the beginning of the Internet era (the 1960s), digital technology developments have expanded exponentially (Captain: 2012) playing a fundamental role and link between business to business, business to people, and people to people. Ashton and Robertson (2000: 21) elaborate further by stating that the advent of the Internet and modern technological applications such as 360-degree virtual and reality tours, blog spots, and interactive websites[5] prompted a re-evaluation of the roles and functions of art museums. The mentioned roles and functions include amongst other, research, documentation of art objects, art management, art

[4] [Online]. Available: https://www.google.com/culturalinstitute/about/artproject. [Viewed 11 November 2016].

[5] Web 1.0; 2.0; and 3.0 are interfaces whereby 1.0 is a single way application whereby the user reads the information as a primary programmed data; 2.0 is interactive interface application whereby the user can respond to the published information good examples are blog pages and user's feedbacks and contact pages. 3.0 is the application that incorporates virtual tours and social media as secondary interfaces.

administration, art education, community outreach roles and the dissemination of electronic art information.

Although the use of digital technologies may prove beneficial, the challenges of incorporating them into an existing system should also be stressed. Therefore the objective of this research is to investigate several art museums' digital technology perspectives and practices, firstly by arguing that digital technology requires specialized skills that are not commonly part of a museum curator's expertise. Furthermore the implementation of the digital information dissemination roles are very often derailed by the lack of adequate budgets. These skills and digital technology implementation need to be acquired through specialized training on technology applications, which is expensive and which most South African art museums cannot afford.

1.3 Problem statement

This study strives to introduce the incorporation of digital technology activities in their communication, educational and marketing drives that may enhance information sharing for visitors to art museums.

In proposing such an incorporation, the study demonstrates the radical constructivist[6] research method as to how the museums should deal with the material objects as in constructing and designing realistic digital technology information sharing strategies that can enhance visitors' learning growth goals towards the understanding and enjoying of works of art, and the gaining of knowledge concerning exhibits in an art museum. The study also attempts to find methods on how the challenges regarding digital technology in art museums can be alleviated.

1.4 Theoretical framework

This research is based on the constructivism learning theory that gained popularity between the years 1930 and 2012. Constructivism in pedagogy has been approached from different perspectives. This study focuses on learning and knowledge development perspective in the museum space. As Elkind suggests: "Constructivism is the recognition that reality is a product of human intelligence interacting with

[6] Van Belt, H. 2003. How to engage with experimental practices? Moderate versus radical constructivism. *Journal for General Philosophy of Science*, *34*(2), pp. 201-219.

experience in the real world. As soon as one include human mental activity in the process of knowing reality, then one has indirectly accepted constructivism" (Elkind, 2005: 334).

Through the constructivism theory, it can be argued that the museum visitor may be able to learn from the museum displays in a constructivism manner. The constructivism theory was initially used by Lev Vygotsky around 1930 to frame learning processes from a social constructivism point of view whereby cultural and social constructs influence the individual learning process[7]. Around the same period - 1930 Jean Piaget theorized that individuals can build their knowledge through cognitive learning experiences in their daily interactions with the world (Fosnot: 2005). The constructivism theory was later packaged as a social construct and language development tool to harness cognitive dialogue, the zone of proximal development, social interaction, culture and inner speech (Powell & Kalina: 2009). In the current century, this theory is used to denote technological effectiveness as Machado states that:

> Today individuals are finding new ways of being and functioning in the 21st century that look much different from those of generations before. Mindfulness is on the rise and not just by those who embark on the path of yoga or meditation. Today schools are focusing more on social and emotional skills with their student population. Helping them to be aware and mindful of what they are feeling and how to self-regulate those emotions in order to sustain themselves within the demands of the classroom and world today. In other words giving students the ability and skills to construct their own way of being. Constructivist classroom fosters critical thinking, flexibility, creativity, active learning, and more. All of which are standards of what a 21st-century classroom should reflect. It is not just about technology, as the Creative Educator article reinforces. To sustain a 21st-century classroom educators need to move from a transmission instructional practice to a constructivist and transactional model. (Machado: 2011)

Hooper-Greenhill (2010) elaborates further on the concept by stating that if appropriate constructivist learning environments are not provided, some learners will be disadvantaged, and this will account for the emphasis on learning rather than teaching. Therefore, this theory is relevant to be coupled with learning tools such as digital video

[7] McLeod, S. 2007. Lev Vygotsky- developmental psychology. [Online]. Available: http://www.simplypsychology.org/vygotsky.html. [Viewed 11 November 2016].

clips that can be used in art museums to facilitate the processes of audience learning experiences and communication networks.

According to this theory people interpret and make sense of the world around them by experiencing various educational elements and components, and then reflecting on such educational experiences to formulate their understanding and knowledge (Giesen: 2005). It is, therefore, important that exhibits in art museums allow different kinds of visual points by using various stimuli to present many conceptual angles for varied visual consumption of exhibits (The museum and the needs of people 1991).

1.5 Rationale of the study

The fundamental objective of this research study is to evaluate conceptions and misconceptions that digital technology is good or bad for art museums' information sharing, communication, and marketing roles. The study presents the pros and cons of digital technology (DT) incorporation strategies that can widen horizons of digital technology utilization in art museums.

In this study, relevant questions are specifically directed to art museum curators, seeking answers on the status quo and prospects of digital technologies usage in local art museums. The answers to these questions are used to plot the model projections of how to incorporate and utilize digital technology in art museums to benefit the museum audience it be visitors or remote end users. With these answers, guidelines are used to create a common understanding of benefits and challenges linked to the roles of digital technology in art museums in South Africa.

1.6 Parameters of the study

The study is limited to the following art museums in Gauteng: Wits Art Museum (WAM), Pretoria Art Museum (PAM), Edoardo Villa Museum (EVM), and the Johannesburg Art Gallery (JAG).

The findings of this study are generalized for all South African art museums, and can be used as 'DT[8] incorporation guidelines' regarding exhibition marketing, communication and knowledge dissemination in art museums.

[8] The term Digital Technologies is used to describe the use of digital resources to effectively find, analyze, create, communicate, and use information in a digital context. It encompasses the use of web applications, and digital and social media tools (Enabling the 21st learner, Ministry of Education 2006).

1.7 Methodology (Detailed methodology is discussed in chapter 3)

A qualitative research method is used in this study focusing on observation research methods. Data from both primary and secondary sources is also used to inform the study in response to the research problem statement.

Struwig and Stead (2001: 243) explain qualitative research as an approach that puts emphasis on the description of what the study is about. Using the qualitative research method, an in-depth analysis and examination of the dynamic interaction between individuals and context is investigated. The qualitative research approach is an ideal paradigm for investigating the benefits and challenges pertaining to digital technology in art museums because it helped to contextualize the content and elicit more open-ended responses from respondents.

Qualitative case study[9] research method is used in this study because it is an ideal approach to investigate complicated phenomena and it will assist to evaluate digital technology programmes in art museums whereby interventions can be offered towards incorporating DT in art museums in South Africa.

Characteristic of a case study research tradition are presented by Hancock and Algozzine (2006: 10) as follows:

- Research identifies topic or question(s) of interest, determines appropriate unit to represent it and defines what is known based on careful analysis of multiple sources of information about the “case”.
- Research process is defined by systematic series of steps designed to provide careful analysis of the case.
- Information collection may last a few hours, a few days, a few months, or as long as is necessary to adequately “define” the case.
- Report of outcomes of the process is generally narrative in nature, consisting of a series of illustrative descriptions of key aspects of the case.

For the purpose of this study, the author employed a case study research approach through which an observational data collection and case study analysis exercise is conducted. This informed a digital technology incorporation model projection for the following South African art museums: WAM, PAM EVM, and JAG.

[9] Critical case study refers to research approach that ask questions that go beyond prevailing assumptions and understandings thus critiquing the norms and standards of a particular case and situation.

In addition to the case study approach the researcher used the hermeneutic research and hermeneutic analysis technique.
These research approaches are discussed further in chapter three namely research method.

Kafle (2011) states that hermeneutic analysis is an umbrella term that looks at a range of approaches involved with various methods of analysis, which is based on interpreting the content against the context. In fact hermeneutic research is focused on subjective experience of observed social group (Kafle: 2011). The hermeneutic research strategy assists the researcher to interpret and gain an in-depth understanding of the researched phenomenon, which focuses on an independent form of interpretation in the formation of new knowledge[10]. In this study, an hermeneutic analysis is applied to source information on how art museums can use digital technology to communicate, market, network, and disseminate information about works of art on display.

Key elements of qualitative research[11] are used in the study to explore and understand experiences and sectoral perceptions of different art museums' atmospheres, thus granting the author in-depth knowledge on the incorporation of the digital technologies phenomenon, which the author approached without any prior influenced assumptions. The study, therefore, explores various occurrences and logistics related to the digital technology status quo in art museums in South Africa.
Hooper-Greenhill (2010) harmonizes the hermeneutic research approach and constructivism learning theory by stating that the hermeneutic concept is close to constructivist learning theories. Both hermeneutics and constructivism propose that knowledge is constructed through active interpretations of experience. Knowledge is not a single, self-contained body of facts that can be transmitted, unchanged, from one individual to another. Knowledge is plural, and fluid brought into being by the processes of knowing. Both hermeneutics and constructivism assert that knowers, or learners, are active in the process of making sense of the educative experience including the formal and informal experience of learning (Hooper-Greenhill: 2010).

[10][Online]. Available: https://koppa.jyu.fi/avoimet/hum/menetelmapolkuja/en/methodmap/strategies/hermeneutic-research. [Viewed 27 July 2015].
[11] The goal of qualitative phenomenological research is to describe a "lived experience" of a phenomenon. As this is a qualitative analysis of narrative data, methods to analyze its data must be quite different from more traditional or quantitative methods of research.

1.8 Data collection

This study utilizes several data collection methods, namely in-depth interview; direct and indirect observations; questionnaires; focus group forums; literature reviews and casual conversations that is synonymous conversation interviews. (A detailed data collection procedure is shared in chapter 3).

Target group

The target group of this study is curators, education officers, and visitors of art museums / galleries[12], (WAM, PAM, EVM, and JAG).

This study is supported by a survey research technique that enabled the collection of data through a questionnaire and structured interviews, from various respondents.

Observation methods

Observational research is concerned with correlations in which the researcher observes ongoing behaviour of a phenomenon or society[13]. Therefore, the author found it worthwhile to incorporate the observation method as a data collection tool because of its advantages to be exposed to various respondents' behaviours.

Focus group

A focus group is defined as a group of interacting participants who have a common interest and brought together for a common purpose to gain and share diverse information[14]. Delegates (focus group) from two local conferences[15] were interviewed during the author's data collection period.

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[12] Art museums are responsible to collect and conserve visual art objects for the enjoyment of art lovers and visitors. The same description fits art galleries that are established for non-commercial purpose. For the purpose of this study art museums and art galleries is used synonymously.

[13] Observational research. [Online]. Available: http://atlasti.com/observational-research/. [Viewed on 6 June 2015].

[14] Marczak & Sewell. Using focus group for evaluation. [Online]. Available: http://ag.arizona.edu/sfcs/cyfernet/cyfar/focus.htm. [Viewed 6 June 2015].

[15] Nine museum curators (representing 9 South African provinces) who were at the South African Museum Association conference 2015 & 2016 were interviewed on DT benefits at museum exhibitions; education; communication and marketing.

Development of a data analysis plan

Document data analysis[16] is an important component of the research because it complements the data collected through the questionnaires and the scheduled interviews as well as focus group observations. The data analysis includes newspaper reports on art museum technology usage and critical reviews on local and international art museum digital technology utilization.

Target group and sampling procedure

Critical sampling is a process of selecting a small number of important cases that can produce appropriate information and that can share new knowledge. It is, therefore, conclusive that although sampling critical cases might not produce generalizable findings, they allowed the author (as the researcher) to develop logical generalizations from the rich evidence produced when studying the following art museums' technological status quo and effective prospects:

Wits Art Museum
Pretoria Art Museum
Edoardo Villa Museum
Johannesburg Art Gallery

The act of selecting the sample group is based on the availableness and accessibility of these institutions since there are a limited of registered art museums in South Africa. The sampled art museums are clustered to make up a population since there are only few art museums in Gauteng. Furthermore, it is a commonly known fact that curators at these institutions are faced with tasks of managing the art collections, administering the day-to-day running of the art institutions, communicating, marketing, and conducting educational programmes using DT as learning aids to disseminate information and knowledge to audiences in general. The curators at the four sampled art museums curators, education officers, and visitors are therefore the ideal target group to be interviewed because they own abundant information related to DT incorporation benefits and challenges at their museums. This group of respondents is prioritized owing to their constant exposure to art museum environments, and they are central to the objective of this study of projecting a DT incorporation plan for local art museums.

[16]Document data analysis refers to the various procedures involved in analyzing and interpreting data generated from the examination of documents and records relevant to a particular study. It involves reading lots of written material on a particular subject.

For the purpose of the study a questionnaire and structured in-depth interview schedule are used to source information in a hermeneutic (interpretative) manner. The major emphasis is based on the exploration, benefits, and challenges of DT incorporation at art museums. As DiCicco-Bloom and Crabtree state that “in-depth interviews are used to discover shared understandings of a particular group. The sample of interviewees should be homogenous and share critical similarities related to the research question. Selecting in-depth interview participants is based on an iterative process referred to as purposeful sampling that seeks to maximise the depth and richness of the data to address the research question” (DiCicco-Bloom & Crabtree, 2006: 317).

Questionnaire design

A questionnaire is a set of printed or written questions with a choice of answers, devised for a survey or statistical study. It is worth noting that a questionnaire has limitations and disadvantages, which include: fewer respondents completing and returning the questionnaire; respondents misinterpreting the questions; and respondents being biased in their response (Struwig and Stead, 2001: 93-95). The questionnaire became, however, a useful tool for the purpose of this study to collect data from art museum curators and visitors at the sampled art museums.

Interview schedule

An in-depth structured interview is used as a follow-up data collection tool to probe questions, which could not be answered through the questionnaire and it helped to ensure the validity and verification of some of the responses from the questionnaire. It can occur in different environmental settings, for example, via the telephone, face-to-face, and in a lined-up questionnaire (Struwig and Stead, 2001: 240). Interviews are conducted on a face-to-face basis using an in-depth structured interview schedule that is sub-divided into headings that refer to the research question and additional questions. A clearer perception is attained into the problems attached to the incorporation of DT in art museums as the interviews progressed with the sampled museum curators.

It is known that there are limitations and disadvantages attached to the use of interviews as a primary data collection tool, such as time-consuming processes and biased attitudes due to the presence of the researcher (Struwig and Stead, 2001: 240). However, this helped to probe questions and created ample opportunity for snowball

follow-up questions related to the research question, namely what are the main DT incorporation benefits for art museums?

Furthermore, data is also obtained from authentic print and electronic publications (see text references chapter 7). Additional data is also sourced from the sampled art museum websites and prospectuses finding out about successes and failures of DT in art museums.

Reliability

In qualitative research, reliability is synonymous with consistency of data collection tools (Struwig and Stead 2001: 134). During the research the consistent questions are posed during the interview process to cross-check answers sourced through the questionnaire.

In this introductory chapter, the requirements of applying the hermeneutic research methodology are identified about the research problem statement of this study. The research target group, sampling and data collection tools, data analysis, reliability, and validity are presented. A detailed research methodology is presented in the methodology chapter (see Chapter 3).

1.9 Glossary

Archives refer to a collection of original documents. These are multiple authentic materials worth preserving for future studies and related subjects of interest to the institution that holds the collection, (Turner, 1996:363).

Art museums are institutions that preserve and display works of art. Historically, museums collected various objects of interest. However today's museums collect specific artefacts and are categorized according to the nature of the objects they collect. Very often the term `art museums' is used to refer to museums that solely collect works of art, and the same definition applies to non-commercial art galleries that only collect works of art for the purpose of enjoyment and education of art visitors or researchers. (In this study the term `art museum' is used to refer to both an art museum and non-commercial art galleries).

Works of art refer to two-dimensional photographs, drawings, paintings, mixed-media, new media and multimedia art pieces, as well as three-dimensional metal, stone and wood sculptures. It also includes new media such as videography as well as art installations. Throughout the research the term `works of art' is used to refer to both works of art and art objects.

The ***constructivism theory*** states that in a normal learning process people construct their understanding and knowledge through the experience of objects and reflect on those experiences to gain an understanding of the world (Giesen: 2005). This theory is supported by Hooper-Greenhill (2010) who adds that constructivist learning theory states that learning is both personal and social.

Digital technology refers to electronic resources that can create, communicate and share information in a digital context. It encompasses the use of web applications, and digital and social media tools (Enabling the 21st learner, Ministry of Education 2006).

Information communication technology is a catchphrase, which describes computers and their use. Good examples of information communication technology are: the Internet, telecommunication systems, digital projectors, television sets and audio visuals (Poole, 2007:1). For the purpose of this research the term information communication technology is coupled with the term `digital media' to refer to all digital technology elements and aspects. Therefore, digital technology is the common phrase used.

Metropolitan is a district in which a group of individuals is represented. A metropolitan region is a giant urban regional system (Simpson and Weiner, 1989:701).

Semantic web refers to interconnected information sharing activities whereby data can be distributed following the semantic theory that refers to congruent connection of terms and items to establish interoperability between systems, information, and ICT networks (Shadbolt, 2006:96).

Virtual tour is a simulation of a particular venue or location captured through an audio-video. It shows a sequence of hyperlinked still or motion images. Virtual tours are commonly accessed on a personal computer (PC) via the Internet.

1.10 Division of chapters - The study consists of five chapters:

Chapter One: An introductory chapter that provides an overview of art museum concepts, and DT processes. The chapter also briefly refers to the historical state of the art museums in South Africa.

The chapter describes the benefits and the parameters of the study, and presents the research problem statement this study seeks to address. It also includes an overview of the research methodology, definition of terms used in the study and a synopsis of the research chapters.

Chapter Two: This chapter deals with the discourse of DT incorporation benefits and challenges in art museums against the backdrop of standard roles and functions of art

museums, and continues to outline different ways of overcoming these challenges. It is done by compiling a literature review.

Chapter Three: This chapter presents the research methodology of this study.

Chapter Four: Critically discusses the digital technology model projections.

Chapter Five: This chapter presents an analysis of the respondents' results. The first part deals with inputs by art museum visitors' responses from the questionnaires. The second part deals with responses from art museum curators on their perspectives of DT incorporation in art museums in South Africa.

Chapter Six: This chapter present the conclusion and recommendations. It make a composite presentation of the strategy to implement digital technologies in museums in Gauteng and shares a summative conclusion of this study. It also elaborates on the suggestions of DT incorporation strategies in local art museums.

2. CHAPTER TWO

CONTEXT OF DIGITAL TECHNOLOGY AND ART MUSEUMS (LITERATURE OVERVIEW)

This research explores the benefits of DT incorporation in art museums in the Gauteng Province of South Africa. As mentioned in the previous chapter the following museums are investigated: PAM, WAM, JAG, and EVM. It is the aim of this study to research and explore the benefits of digital technologies in art museums in the information and technology age.

The chapter presents a literature review on the incorporation of digital technologies in art museums. The research problem statement is addressed with a focus on the incorporation of digital technologies in art museums.

2.1 Art museums and digital technology

Information communication technology is explained as an umbrella concept that covers any product that stores, retrieves, manipulates, transmits, communicates and receives information in an electronic manner. It includes computers, analogue and digital devices, email, World Wide Web (WWW), and electronic robots. Consequently, information communication technology can be viewed as an all-inclusive term that focuses on different uses, storage, retrieval, manipulation, transmission or receipt of analogue and digital information communications. In general, the information communication technology phrase includes all analogue computer based technologies that people use as tools to communicate, as well as all digital technologies that people use as platforms to share information[17].

Digital technology (DT) and information communication technology (ICT) are often used synonymously and interchangeably. In essence DT is a subset of information communication technology. DT is not independent; it uses information communication technology as a vehicle for its functionality and manifestations[18].

[17] [Online]. Available: http://www.tutor2u.net/business/digital technology/intro_what_is_digital technology.htm. [Viewed 16 November 2015].
[18] [Online]. Available: https://www.quora.com/What-is-the-difference-between-IT-and-ICT. [Viewed 16 November 2015].

Information communication technology in modern society has proved to be of great importance in the use of customized digital technological services, portals and interface-applications such as e-health, e-government and e-commerce (Scupola: 2011).

Many information institutions across the globe continue to advance the functionality of information communication technology by means of digital television, cyber connected radios and advanced computer processors and smart cell phone applications (Othman, 2011: 93). Such technological developments are designed to convert information poverty into information opportunities and bridge the digital gap in South Africa. The acknowledgment of the benefits of the Internet by the South African government has narrowed this digital gap. Metropolitan municipalities in South Africa, such as the City of Tshwane, City of Johannesburg and Ekhuruleni municipality have implemented a programme by providing and implementing free Wi-Fi connections to the general public as a means to enable the government to communicate with the people electronically (Mphidi: 2008). This is an improvement seeing that in the past government communications with the people were done via public meetings, the printed media, radio broadcasts, and street haulers. Communication is presently done through electronic means and emails to the people (Mphidi: 2008). Mphidi's and Kamal Othman's statements are further endorsed by Oliver Stock (2011) who states that:

> "Technology can play a crucial role in supporting museum visitors and enhancing their overall museum visit experiences. Visitors coming to a museum do not want to be overloaded with information, but to receive the relevant information, learn, and have an overall interesting experience"(Stock, 2011:11).

Conceivably, after the digital gap has been narrowed, art museums like all other institutions that house and care for works of art of historical importance, may be enabled to compete and succeed globally. Global competition is an international phenomenon that links the world through the economic and trade channels amongst others. For South Africa, globalization as an effective process became eminent when South Africa was excluded from the globe's economic trading by enforced sanctions before 1990 due to the apartheid system's human rights violation practices. A global effect further manifested itself when South Africa was reaccepted by the international trade world and invited to resume sports relations and economic trading as a token of respect of the country's intentions to establish a democratic government in the early 1990s. Consequently, South Africa as a country had to comply with the demands of

the global economic forces and deal with the increased trading competition terms and conditions[19].

In the current millennium and the present information economy, globalization has a refined meaning. This new meaning has now diversified information communication technology and digitalization regarding information and electronic interconnections network that link several countries and continents across the world with the assistance of the Internet (Zembylas & Vrasidas, 2005: 66). The global DT infrastructure has worldwide potential to uplift institutions such as art museums and enables them to maintain a competitive edge in the information age[20].

It is eminent that the world has merged to become a single global village through the popular usage of DT as a subset of information communication technology. It is within such a global village that the incorporation of DT in museums has helped global art museums such as the Museum of Modern Art (MoMA) in the United States of America to reach the highest standards in museum marketing, communication, and information dissemination[21]. This also allowed Tate Museum visitors in the United Kingdom to be educated through DT applications such as online and virtual Galleries[22] (Cere, 2008: 14). In South Africa online advantages have been used by SAHRA based in Cape Town that connected with the public through SAHRIS[23] and the Nelson Mandela Centre of Memory based in Johannesburg that published Mandela's archives online[24]. The advantages of DT as explored by the MoMA, the Tate Museum, SAHRA and Mandela Centre of Memory make a compelling case for similar responses by art museums in Gauteng. If the latter fail to embrace optimal DT incorporation, they will continue to lose ground on maintaining the highest DT applications and communication

[19] Rispa Akello. 2013. How Globalization has affected South Africa. [Online]. Available: https://getanessay.wordpress.com/how-globalization-has-affected-south-africa/. [Viewed 17 November 2015].
[20] Information communication technology as a global tool has turned the world into a single village with fast communication channels. Art museums can also benefit from this.
[21] MoMA links with the world through a structured digital technology art lab that respects social and ethics protocol. [Online]. Available: http://breannamegsykes.weebly.com/applying-social-and-ethical-protocols-and-practices-when-using-digital_technology/moma-art-lab. [Viewed 18 November 2015]
[22] Online galleries offer the museum audience opportunities to engage with museum exhibitions remotely by making online exhibition viewing and making downloads of research information [Online]. Available: http://www.bl.uk/onlinegallery/onlineex/. [Viewed 18 November 2015].
[23] [Online]. Available: http://www.emeraldinsight.com/doi/abs/10.1108/JCHMSD-01-2016-0002. [Viewed 30 June 2017].
[24] [Online]. Available: http://archive.nelsonmandela.org/home. [Viewed 30 June 2017].

standards and thus not be able to reach out to art audiences in the province and further afield.

2.2 The roles and functions of art museums

As indicated in the introduction, art museums house art objects and display works of art for the enjoyment, research and educational benefit of their audiences. The museum functions that stand to benefit museum visitors are well expressed in the illustration below.

Figure 1: Museum functions according to Keene's model
(Source: Keene, S. 1998. *Digital collections: Museums and the information age*, p. 22.

The fundamental roles and functions of art museums are best expressed by Keene (1998:22) as follows:

- The research role: this deals with the analysis of works of art and the creation of academic information as well as scholarly reviews.

- The information dissemination role: whereby art museums are concerned with the sharing of information through multimedia publications that address audience enquiries. It is also concerned with general information gateway activities.
- The education role: here, art museums offer the public life-long learning opportunities by structuring education programmes for schools and general museum audiences.
- The exhibition role: this is about displaying works of art in the museum space so that the general audience can enjoy and understand the exhibits.

These roles and functions of art museums demand that art museum curators know and understand all information aspects needed to be retrieved by the museum visitors and ensure that such retrieved information is authentic (Lankford, 2002: 143). This research study explores these roles to evaluate and argue how the incorporation of DT infrastructure in art museums stands to benefit art museums in Gauteng as illustrated in the above diagram.

Hooper-Greenhill (2010) summarizes the roles of museums by streamlining the roles museums play in the modern society by stating that "the modernist museum adopts a particular stance towards its visitors. The communicative aim of the modernist museum is to enlighten and to educate, to lay out knowledge for the visitor such that it may be absorbed. The information offered is that of the academic discipline from which the collections are viewed. Thus, in art galleries, the paintings are grouped to materialize 'art history'. The educational aim of the museum is to transfer or transmit information about art history" (Hooper-Greenhill: 2010). Seemingly the art history information dissemination activities may best be enhanced through the incorporation of DT in museums as discussed in the next section.

2.2.1 Information dissemination through digital technology in art museums

According to Tony Fyler (n.d), information dissemination refers to the distribution of information through written or oral means to the general public to keep the public informed about concerning topics. For him, such information deserves to be of quality and should be put in context by the distributor[25].

[25] What does dissemination of information mean? [Online]. Available: http://references-definitions.blurtit.com/35904/what-does-dissemination-of-information-mean. [Viewed 18 November 2015].

The role of information dissemination in art museums is of fundamental importance because exhibited works of art are synonymously equivalent to library books. They possess valuable information that stands to be retrieved by the end users[26]. It is equally notable that DT has made it possible for information in libraries to be disseminated electronically. Art museums can make use of DT to distribute information about the artworks on display through electronic monitor devices and online newsletters. However, as mentioned before, the implementation of the digital information dissemination roles are very often derailed by the lack of adequate budgets at South African art museums[27].

Rey & Casado-Neira (2013) state that the exploration of ICT and DT by modern societies is not a new phenomenon. They argue that explored benefit of ICT must be extended to facilitate and benefit the relationship between museums and the general public. Their argument is of valuable standing however a known challenge facing art museums around the world and also in South Africa is the lack of proper DT budget allocations. Under the current budget constraints, South African art museums constantly struggle to stay abreast with basic computer software and hardware upgrades, which is an expensive exercise given the fact that art museums operate under tough financial conditions (Rey & Casado-Neira, 2013: 1422). Despite this challenge Rey & Casado-Neira (2013) are of the opinion that ICT hold essential role in the field of education and museums.

Other technological benefits and barriers are highlighted by Poole (2007:1) who states that information communication technology provides art museums with an effective set of tools essential for both their day-to-day duty of managing their museums as well as responding to the general user's information needs. Poole (2007:1) further adds that there are other challenges such as high purchasing costs, unpredictable technology infrastructure breakdowns, and ongoing DT maintenance. It is, therefore, evident that sophisticated DT infrastructure could create a new set of problems even while it aims to solve others for various institutions.

It can, therefore, be stated that DT challenges vary from institution to institution. Computer monitors and workstations installed at other art museums that include the

[26] Museum end users refer to day-today museum visitors and distant museum audience.
[27] Reference is made to these museums WAM, PAM, EVM and JAG.

McGregor Museum in Kimberley[28] are limited to one user only. This limitation indirectly affects art museum visitors' time and flow through the exhibitions. As a result, visitors' time limits also add another negative dimension to the information dissemination role, because a larger proportion of visitors are unable to watch lengthy multimedia video clips regardless of its high quality and high levels of information it presents (Dierkings & Falk, 2000: 63). Most art museum visitors prefer to learn about works of art on display at their own pace rather than being rushed through a multimedia video clip (Dierkings & Falk, 2000:66).

It would be better for museum curators to do a feasibility study that conforms to the information dissemination role before embarking on drastic changes regarding the procurement of DT devices at local art museums. Such a feasibility study is aimed at preventing art museums from investing in non-customized and non-essential DT products. Poole (2007: 1) suggests that the following strategic DT assessment questions can serve as a self-evaluation guide for art museums in general:

- Who will be using the DT equipment?
- Which of the art objects in art museums need to be enhanced using DT?
- How much DT utilization experience does the end user or visitors have?
- Is technical support for DT provided for?
- Is there a budget set aside for DT service and maintenance requirements?

These questions also appeal for the provision of persons with specialized roles and responsibilities in art museums. Poole (2007: 1) classifies these persons as follows:

- DT ambassador – someone who is familiar with technology equipment.
- DT manager – someone who will assume decision-making responsibilities about DT.
- DT administrator – someone who will be responsible for the ongoing maintenance of the functional DT equipment.
- DT technician – someone who can deal with queries and respond to troubleshooting regarding technical problems relating to the particular DT equipment.

The information dissemination and educational elements in art museums are therefore dependent on excellent management of DT infrastructure.

[28] [Online]. Available: http://www.museumsnc.co.za/home.html. [Viewed 13 November 2015].

2.3 Education elements in museums

The purpose of museum education is to enhance the visitors' ability to understand and appreciate museum collections. The American Association of Museums (AAM) in 1992 identified the educational role of museums as the core to museums' service to the public[29]. In a formal report, the AAM states that due diligence by museums is to perform most fruitful public service by providing an educational experience in the broadest sense. For the AAM the public education responsibility of museums has two sides, excellence, and equity. The AAM reveals that excellence and equity are not isolated issues but inclusive concepts that are based on a benefiting drive that endevours to grow the public's knowledge base through public exhibitions, museum based publications, and public relations[30].

In response to the educational role, it is argued that the fundamental quest of most art museums is to attract and educate visitors by any possible means, whereby these museums share their education value to information seekers (Hooper-Greenhill, 2000: 11-15). The educational role can be achieved using educational DT infrastructure in museums. Furthermore, the incorporation of DT in art museums put museums in an advantageous position to promote and market works of art inside and outside the museum premises. Such a concept is bound to popularize works of art in the communities thus inculcating the culture of art appreciation within the concerned art societies and museum visiting communities who have access to information communication technology and the Internet. The active incorporation of DT systems and strategies is likely to make art educational information more readily available at local art museums, given the fact that curators act as the sole gatekeepers of art information in museums (Keene, 1998: 88-87) in a world inclined towards uniformity.

The incorporation of DT in art museums is a necessity since the world is gradually migrating from hard copies documentation to electronic documentation whereby information centers and art museums in the world are being confronted to replace paper documentation with electronic documentation (Borgman, 1999: 234). With

[29] Excellence and equity. Education and the public dimension of museums. A report from the American association of Museums, 2008. Published by Metlife Foundation. [Online]. Available: http://www.depts.ttu.edu/museumttu/CFASWebsite/5333/Required%20Readings%202011/Hirzy_Excellence%20&%20Equity.pdf [Viewed 18 November 2015].

[30] Excellence and equity. Education and the public dimension of museums. A report from the American Association of Museums, 2008. Published by Metlife Foundation. [Online]. Available:http://www.depts.ttu.edu/museumttu/CFASWebsite/5333/Required%20Readings%202011/Hirzy_Excellence%20&%20Equity.pdf [Viewed 18 November 2015].

acclaimed museums such as the Smithsonian museum taking the lead in substituting hard copy catalogue system with e-catalogue[31].

DT explorations stimulate museums to reflect the society's plural educational interest by creating new platforms for information dissemination, education development as well as public relations engagements. One of the traditional tools used to assess plural interest and dissatisfaction at art museums is the visitors' book, in which visitors enter their comments and evaluations about the value of the information the set exhibitions convey. In contrast to the traditional approach is the modern approach, whereby virtual tours of art museums become more popular, resulting in most art museums receiving lesser walk in visitor volumes[32], because modern visitors find the online museum education versions and electronic art viewing more accessible and convenient. This calls for museums to adopt new social and educational initiatives that would maintain the clients volumes and the connection of the museums and their clients.

Museums are taking more and more literacy initiatives by forming broad-based partnerships with the communities, thus addressing educational issues by inviting schools to the museums as part of educational tours. This initiative is aimed at improving public education activities and visitor volumes in museums[33].

On the contrary, visitor volumes at South African art museums indicate otherwise. According to the South African statistical report, the number of trips undertaken by South Africans who travel for leisure, tourism, including museum tourism is decline[34]. This statement is substantiated by Yoshiara (2008) who attributes the lack of interest in museum visits to the legacy of apartheid and its influence on the repression of museum appreciation and visits among the previously disadvantaged societies. Based on this reference one may infer that the culture of visiting art museums in the current information age and society, still need to be developed and promoted locally and internationally. Lessons are learned from American museums particularly the MoMA which recognizes that its audience composition consists of different societal

[31] Smithsonian Institution Research Information System. [Online]. Available: http://www.siris.si.edu/. [Viewed 18 November 2015].
[32] [Online]. Available: https://www.tendenci.com/help-files/meaning-of-hits-visits-page-views-and-traffic-sources-web-analytics-definitions. [Viewed 30 June 2017].
[33] Joel N. Bloom and Ann Mintz. (1990) Museums and the Future of Education. *The Journal of Museum Education* Vol. 15, No. 3, pp 12-15.
[34] Domestic tourism in the decline in South Africa. [Online]. Available: http://www.statssa.gov.za/?p=9652. [Viewed 18 November 2015].

dimensions. These societal museum marketing dimensions prompted the MoMA to form formal and informal relationships with schools, universities, libraries, civic groups, and social service organizations, and encouraged art curiosity by distributing tangible and electronic educational publications to their audience groups[35] to optimize museum visits. The education role of museums further encourages lifelong learning, and the stimulation of such learning is often achieved by marketing and promoting 'virtual museum tours' to various audiences, and by engaging such audiences in art debates on social networks This line of argument is supported by Nina Simon (2010) who states that:

> "This is great news for museums, both in the physical and virtual world. While Web developers scramble for object catalogs upon which to base new online ventures, cultural institutions can tap into pre-existing stories and connections between visitors and collections. And that needn't happen solely on the Web. Objects can become the center of dialogue in physical galleries as well. This chapter focuses on how to make this possible in two ways: by identifying and enhancing pre-existing social objects in the collection, and by offering visitors tools to help them discuss, share, and socialize around the objects" (Simon, 2010: 128-129).

Museums are cultural authorities that can develop and enhance heritage and cultural interests[36]. Their expertise has informed visitors about the past, present, and future through interpretation and education for decades. Yet new Internet technologies are challenging this model of 'museum as authority'. New tech enables visitors to become active participants in the museum experience — contributing to knowledge and creating their own meaning within museum spaces. A primary new mode of museum communication has been the website: a portal to new worlds for those who visit — and don't visit — the museum. The possibilities for virtual interpretation are nearly endless, but many museums struggle with balancing this new tech and their age-old role as authorities[37].

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[35] Excellence and equity. Education and the public dimension of museums. A report from the American association of Museums, 2008. Published by Metlife Foundation. [Online]. Available: http://www.depts.ttu.edu/museumttu/CFASWebsite/5333/Required%20Readings%202011/Hirzy_Excellence%20&%20Equity.pdf. [Viewed 18 November 2015].

[36] Cultural development: A response to the challenges of the future? A symposium organized within the framework of the 35th session of the General Conference of UNESCO in collaboration with Sciences Po and with the support of the Government of the Kingdom of Spain. Paris, 10 October 2009.

[37] Komarova, M. *Audience Engagement: New Ideas from a Study on Art Museum Websites.* [Online]. Available: https://museumhack.com/study-on-art-museum-websites/ [Viewed 18 November 2015].

For Maria Komarova (n.d) the biggest question is: How are museums utilizing their websites? How visitors are engaging with the museum online in relation to the latter statement and questions, the use of DT in art museums in Gauteng is bound to assist in creating wonderful digital-media experiences for museum visitors. It is therefore imperative for such an experience to be embraced.

Mohd Othman (2011) states that "It is important for art museums to embrace new technologies to engage and stimulate the visitors' interest during art exhibitions. However, the use of information communication should not be regarded as replacement of the curatorial functions but rather as an alternative to connect and engage audiences with displayed exhibits" (Othman, M.K. Petrie, H. (et al.), 2011: 93).

As far as the educational role of art museums is concerned, Morrissey and Worts (2000: 161) state that if the technology is too advanced for the recipient audience, it may alienate some museum visitors and favour others. In order, not to compromise the educational role of art museums, visitors may constantly be orientated on the use of technological interfaces, since both sophisticated and less sophisticated museum audiences may not be aware of the available benefits of DT interfaces in art museums. Visitors may also be unaware of the amount of information and knowledge they stand to gain to increase their understanding of the works of art on display (Dierkings & Falk, 2000: 59). This can be perceived as an educational enrichment experience achieved through DT interfaces.

There is furthermore an additional challenge to the above stated educational, technological benefits for art museum visitors in Gauteng. When referring to 'local', it is constantly evaluated according to Western standards, while it's African and South African contexts are overlooked[38].

It is noteworthy that art museums, in general, have continued to explore alternative ways to diversify art education, communication, and marketing through showcasing artworks to reach more audiences. To achieve this museums have options to use various DT applications through online social media networks such as Twitter; WeChat; WhatsApp; Instagram; and Facebook as well as various World Wide Web

[38] The evaluation and assessment of museums in South Africa are generalised using Western models of functional museum accreditation.

(WWW) social networks and web blogs. These, in turn, creates possibilities for online exhibitions, interactive multimedia art shows, interactive web interfaces, as well as online educational programmes (Bearman & Trant, 2000:3).

The various social media interfaces have different advantages, strengths, and disadvantages, although most of them have similar features. Tumblr is the second generation of the blogging platform. It was developed by David Karp and is currently owned by Yahoo! Inc. It evolved from being a micro-blogging platform to allow users to post multimedia, photos, quotations, web links, music, videos and other content onto to the short-form of a blog system. Users can follow other users' blogs, as well as make their blogs available to the public from a web browser, smart phone or desktop (What is Tumblr? 2013).

Facebook is a social network platform through which users create profiles, upload photos and videos, send messages and keep in touch with friends, business associates and colleagues on the e-page timeline. Currently, the platform is available in different languages and offer the user opportunities on international marketing or to post upcoming events. Whereas, Twitter is presented as real-time social network platform; it is a network that is commonly used for sharing instant information as and when it happens throughout the world. On the other hand, WhatsApp is explained as a messaging platform linked to a smartphone number. It was developed in 2009 by two former Yahoo employees, Brian Acton and Jan Koum. Another popular social media platform is WhatsApp provides a low-cost texting system through which pictures, music and videos can be added as attachments (Brown: 2016). Finally, Instagram is an effective social network through which users can exchange and share videos and high-resolution editable pictures with their friends and family internationally (Buchanan: 2013).

The discussed social media platforms can be used by art museum curators and visitors to share educational knowledge market and comment about features that exist in present exhibitions. Social media can also be used to review and critic exhibitions within peers' and friends' networks and, in turn, the critical reviews of visitors can enlighten and educate the museum's curatorial team on how to improve educational information within art museums.

The use of social media as a component of DT in museums seems to be mutually intertwined to benefit the museum visitors, such benefits are discussed below.

2.3.1 Art museums and information sharing

There seems to be a significant challenge regarding the use of DT in art museums, given the fact that web blogs information and other related information sites such as Wikipedia are not standardized and unregulated, and are therefore perceived as sites with unreliable content[39].

Given the above statement, Hooper-Greenhill (2003: 152) suggests that art museums have major roles to play regarding reliable information sharing. In her view, it is the educational role that faces serious challenges in museums. These challenges include art museum audiences accessing non-verified information from trusted art museum e-information platforms through downloads. Although most people trust content from Internet sources and are keener to use Internet content these days than in the early days of the Internet.

Another information sharing benefit of DT in art museums relates to people with visual disabilities and the physically challenged. Nightingale (2005: 42) is of the opinion that DT audio playback applications should be used to pre-record descriptive and analytical information about works of art. These information sharing recordings should be placed in art museum spaces to benefit and educate the visually impaired and physically challenged art museum visitors to enhance educative information and act as self-guide tours for the physically challenged individuals. This information sharing approach could be achieved by using digitally accessible editorials, as well as supported audio touchscreen points that are installed at accessible art museum spaces (Simon, 2008:41). Pan (et al.) (2007) in their paper entitled 'Developing Web-Based tourist information tool using Google map' reports that first world art museum websites around the world offer navigated 'virtual tours' and 'Google map-based tours'. These tours enable web browsers to view works of art remotely.

Examples of good museum practice and the utilisation of international museum DT trends can be benchmarked against the British museums[40] that use technology infrastructure to attract new audiences. At the UK museums technology is used to reach out to people who are not able to visit the museum in a remote manner, and is

[39] The reliability of Wikipedia information has been contested for many years. [Online]. Available: https://en.wikipedia.org/wiki/Reliability_of_Wikipedia. [Viewed 22 October 2015].
[40] Loran, M. (2005). "Use of Websites to Increase Access and Develop Audiences in Museums: Experiences in British National Museums". In: CARRERAS, Cèsar (coord.). "ICT and Heritage". In: *Digithum*. No. 7. UOC. [Online]. Available: http://www.uoc.edu/digithum/7/dt/eng/loran.pdf. [Viewed 13 October 2015].

used to entice those individuals who are not inclined to visit exhibitions (Loran: 2005). The Tate Museum, for instance, uses the Internet to reach out to global audiences. In South Africa similar online communication, marketing, and educational have been established by South African Heritage Resource Agency (SAHRA) that introduced the South African Heritage Resource Information System (SAHRIS) in 2011. This digital development created opportunities for information seekers to access necessary information remotely. In addition SAHRIS facilitates online contact forms for heritage resource agency inventory which is in the form of a database and repository enquiries[41].

Contrary to British museums websites, the Tate museum Internet options, and SAHRIS, art museums in Gauteng seems to be limited and compromised as far as 'virtual tours' and 'Google map-based tours'[42] are concerned. If one compares this with the EVM[43], which runs its website as a non-interactive web-application with no open access to self-guided 3D virtual tours; the difference becomes obvious that EVM's public education abilities are limited.

2.3.2 Art museums and public education

Sandell (2007: 25) highlights the benefit of e-learning in schools by stating that, subsequent to the incorporation of information communication technology in the classroom, teaching and learning processes improved for the better in most schools. It is against this background that the author proposes that art museums might benefit through the incorporate information communication technology to mirror e-learning infrastructure benefits as demonstrated at schools. This initiative may help to diversify the scope of public education regionally and at local art museums. For Sandell (2007: 25), the sharing of information in the first world is no longer as expensive as it was decades ago. The WWW era has created avenues to access educative information content directly and freely, for the use of various public education purposes.

Prew (2011) confirms that South Africa is faced with high-cost of education and has a low performance education system in relation to other education system in third world

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[41] [Online]. Available: http://www.emeraldinsight.com/doi/abs/10.1108/JCHMSD-01-2016-0002. [Viewed 30 June 2017].

[42] Gere, C. 2004. 'New Media Art and the Gallery in the Digital Age', *Tate Papers*, no.2, Autumn 2004. [Online]. Available: http://www.tate.org.uk/research/publications/tate-papers/02/new-media-art-and-the-gallery-in-the-digital-age.[Accessed 27 June 2017].

[43] The Edoardo Villa Museum is a division of UP Arts Museums based at the University of Pretoria.

countries[44]. It is under such educational circumstances that Yoshiara (2008), notes that the disadvantaged public in South Africa is faced with multiple barriers. As a result the researcher agrees with Yoshiara that post-apartheid museums should challenge inner minds and ethical issues that barricade social and educational emancipation. Yoshiara (2008) emphasises that such socio-educational freedom must be initiated by museums through the understanding of the nature of challenges that limit the audiences from understanding art exhibition (Yoshiara: 2008).

However, despite known public education constraints in South Africa such as the digital divide, art museums in Gauteng must strive to deliver DT programmes that fulfil educational functions and render educational services that benefit the public. These functions cover regular school trip visits to museums (Blake, 2006: 10).

2.4 Benefits of DT in art museums

As discussed above optimal use of social media and DT might benefit museums in the global information network. Morrissey and Worts (2000: 157) identified the benefits of DT in art museums as follows:

- DT provides interfaces through which audiences can post their opinions about the works of art on display. Their interpretative comment can be integrated onto the web page under the rapid response system (RSS) and form part of the frequently asked questions (FAQ) section of the interactive digital media.
- DT cannot reproduce the physical, social and historical contexts in life, but it can create a link between people and works of art, as well as places or purposes.
- DT advancement is becoming a popular infrastructure between art museums and the public. Through these technological infrastructures, dialogues can be initiated between and among people in different countries, across different career and research disciplines and involve different age groups.
- DT can sharpen and shape communication according to the audience and target groups it serves. In this way, art museums can use the capabilities of electronic connectivity to provide access to museum resources and archives using online services.
- The website through DT infrastructure can be the central research resource and repository base for subject content for both art educators and researchers.

[44] Prew, M. 2011. *Challenges facing education in South Africa*. Retrieved on 12 December 2016, [Online]. Available: http://www.cepd.org.za. [Viewed 1 July 2017].

The studied literature revealed that the Internet gained amazing popularity in recent years, to the extent that it is now the first stop for information seekers, with the average user spending at least two hours or more online each day[45]. This statement is substantiated by Becker (et al.) (2010) who state that, Internet access is now one of the most sought after services, and it is used by nearly half of all visitors at public libraries. Based on this fact, it may be profitable for local art museums to embrace technology and begin to explore and experience its technological advantages by sharing essential art education information online. Cèsar Carreras (2005: 5) states that over the years information communication technology applications have been applied and accessed by information and knowledge institutions such as art museums, libraries, and archive repositories for the benefit of the general public. In some cases, there have been spectacular results in terms of public education initiatives. Technology can assist art museums to:

- Compose, and disseminate relevant information in an effective way.
- Carry out academic art content productively in a more inspired manner.
- Conduct art business and administrative functions efficiently.
- Conduct art research on works of art for the benefit of the public.
- Offer digital innovations and interventions to improve the livelihood of the community and art information retrievals.
- Provide information continuously in a lifelong learning manner.
- Provide modern platforms for information searches.

2.5 Educational component and art museums

It can be proposed that DT may become the standard infrastructure for all art museums in South Africa whereby non-artistically inclined guests can learn about the displayed works of art through the assistance of self-guided DT tours.

Other DT interventions ideal for art museums include educational recordings of conversations and interviews of visual artists that are pre-recorded as movie clips (mp3 and mpeg4)[46] digitally played alongside displayed works of art in a looped format. This educational input is important because it can assist museum visitors to gain insight of the artists' production perspectives through pre-recorded artists' art work analysis.

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[45] Poole, N. 2007. ICT for museums. [Online]. Available: http://www.ictfir museums.pdf. [Viewed 22 October 2013].

[46] Mp3: A means of compressing a sound sequence into a very small file, to enable digital storage and transmission. Mpeg-4 is a method of defining compression of audio and visual (AV) digital data.

Harper and Moyer (2007) state that "…by dismissing the artist's voice as interpreter, art museums are indirectly throwing out everything else the artist might say in helping the viewer to understand the artworks". They further add that the non-inclusion of the artist's interpretation of a work of art on display is equivalent to losing a valuable opportunity to visualize the inside process of making the artwork and understanding the artist's rationale towards the created masterpiece. For Harper and Moyer (2007: 6), readers and listeners of the artist's interview receive insight into the creative world of the artist, his influences and stimuli, as well as his interaction with the materials and ideas, and on how different materials are used to develop into a visual form.

Most artworks in art museums may be contextualised by creating a video in which the curator and or the artists explains the depiction of particular art work so that end users particularly museum visitors can understand the narratives presented by art works on display.

Consequently, it can be argued that the incorporation of DT in art museums may create a platform for art innovation and diverse art education, with the understanding that art is a complex subject that requires a creative mind for interpretation and conceptualization in the art museum space[47].

Concerning the above statement, it is important for art museums in Gauteng to embrace information communication technologies and deploy interactive high definition (HD) monitors in museum spaces alongside displayed works of art. This innovative educational concept may assist art museum guests to gain remarkable knowledge about the artist's ideological intuition. Furthermore, this might indirectly level the playing fields and bridge the digital and visual cultural divide, and bridge the gaps that seem to overshadow most South African communities' levels of art understanding. For Harper and Moyer (2007: 11) the educational art interviews that present the context of showcased works of art are aimed at developing a lasting educational interest for general art museum visitors.

As a result of the evident success of DT infrastructure and the popularity of smart mobile device applications, most art museums are in an advantaged position to share educative information and promote the culture of art understanding and art

[47] Jensen E. 2001. Arts with the brain in mind. *Association for Supervision and Curriculum development*. USA.

appreciation. Thereby diminishing misconceptions that art museums only draw interest from elite societies and are of secondary importance to the general public whose main interest is at the lower end of Maslow's scale of needs[48] since the need for shelter and food is a greater priority is South Africa.

Despite the popular use and benefit DT infrastructure in international art museums and other related institutions such as SAHRA that house and care for works of art and heritage documents, the elderly museum visitors still prefer to acquire art information using traditional practices to observe of displayed art[49]. As a result there needs to be a well-maintained balance between modern and traditional art education forms. For Dierkings & Falk (2000: 66) the latter statement pose a challenge for digitalized art museums, as the public might prefer to visit museum spaces to engage with art works on life exhibitions that engage with them on virtual exhibitions. On the other hand the use of virtual exhibition tours can encourage the public to visit museums to witness the physically displayed art works. In this case DT may act as an excellent marketing tool for museum exhibitions.

2.6 Opportunity of introducing digital technology in museum exhibitions

DT has proven to be of significance in Britain and the United States of America (USA) by digitizing art collections and making digitized contents electronically accessible to the public in general. This valuable potential is yet to be realized in South African art museums whereby DT can be used to improve education, communication, and marketing strategies for art museums exhibitions. Unfortunately this opportunity might not materialize in South Africa at a fast speed in the near future, despite the fact that throughout the world 'information' has become an important commodity in the business world, with the USA and other First World countries enjoying the information sharing and educational benefits of this commodity (Fahy, 1995: 82). However, certain South African public sectors have already experienced an increased recognition of the

[48] Maslow's hierarchy of needs is often portrayed in the shape of a pyramid with the largest, most fundamental levels of needs at the bottom and the need for self-actualization at the top. The most fundamental and basic four layers of the pyramid contain what Maslow called "deficiency needs" or "d-needs": esteem, friendship and love, security, and physical needs. If these "deficiency needs" are not met – with the exception of the most fundamental (physiological) need – there may not be a physical indication, but the individual will feel anxious and tense. Maslow's theory suggests that the most basic level of needs must be met before the individual will strongly desire (or focus motivation upon) the secondary or higher level needs.

[49] Bardes, C.L (et al.) Learning to look: developing clinical observational skills at an art museum. Vol 35, Issue: 12, December 2001. Pp. 1157 – 1161.

importance of DT that empowers communities in general and stimulating the need to learn and gain basic knowledge through for example the Internet and free Wi-Fi[50].

In South Africa information technology is starting to offer the opportunity to improve the flow of information between citizens and government, thereby building dialogue and significant social participation. What has been called 'e-government', offers access to information and the opportunity to comment on issues, policies, and laws. It is thus a critical tool in the expansion of public participation and closing the digital divide. The opportunities presented by the Internet in respect of public participation are self-evident. Although government is increasingly using the Internet, performance is uneven and the pool of users extremely small relative to the developed countries[51]. Despite some initiatives, including the development of telecentres free Wi-Fi at metropolitan cities, and an information network for schools, it is clear that neither the infrastructure nor the necessary hardware and software required for universal access is available to the majority of South Africans[52]".

Based on this line of argument, one concurs with Fahy (1995: 82) that the advent of new technology has presented art museums with lucrative opportunities to develop their information sharing and public education roles and acquire the educational riches offered by art museums through the developing Internet infrastructure. Such new technology might benefit South African museums in the sharing and education roles and in the audience development role. For Fahy (1995: 84), there is an increasing emphasis on increasing access to archives and information on works of art and art museums in general. The incorporation of relevant in all art museums seems to be the ideal way of in which to fulfil the DT need.

DT quick response (QR) codes[53] and video kiosks are gradually gaining popularity as support structures at art exhibition venues across the globe. The popularity of QR

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[50] Free Wi-Fi connections in selected areas of the metropolitan municipalities such as Tshwane, Ekhruleni, and Johannesburg. Wi-Fi is a facility allowing computers, smartphones, or other devices to connect to the Internet or communicate with one another wirelessly within a particular area.
[51] De Villiers, S. 2001. A people's government, the people's voice. [Online]. Available: https://www.parliament.gov.za/peoples-government-peoples-voice. [Viewed 27 June 2017].
[52] The role of information technology. Section 2 public participation in the current political environment. A people's government, the people's voice. [Online]. Available: (http://www.parliament.gov.za/live/content.php?Item_ID=307). [Viewed 22 October 2015].
[53] A QR code (abbreviated from Quick Response Code) is the trademark for a type of matrix barcode (or two-dimensional barcode), first designed for the automotive industry in Japan. A

codes also promotes the use of technological applications in art museums by introducing interactive exhibition tours for visitors with smart phones[54].

It is worth mentioning that the use of QR codes is being replaced by more sophisticated modern technological applications such as augmented reality (AR) mobile applications and the Google Maps application that deals with the 3D interactive virtual tours and videography that are popularly used by modern art museums all over the world[55].

Statement of work of art

This sculpture is created by Anton Van Wouw (1862 - 1945). The art work is entitled Self Portrait. The elegant garments make reference to the late 1930 fashion of the day.

Medium: Bronze

Figure 2: Quick response / quick reference scan model.
(Source: EVM - Van Wouw collection – University of Pretoria, Pretoria)

Through QR codes visitors to art museums are granted the opportunity to have an enhanced art education experience. They can learn from the exhibits since they are brought alive through an interactive DT mobile scan-and-save technique. Once scanned, the QR application redirects the end user to a video that is a pre-recorded clip, text or website (Wheeler: 2011).

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barcode is a machine-readable optical label that contains information about the item to which it is attached.

[54] Walsh, A. (2009),"Quick response codes and libraries", *Library Hi Tech News*, Vol. 26. Issue: 5/6 pp. 7– 9.

[55] AR is a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view.
There are two major types of augmented reality that seem to be academically applied in the coming five years, 'markerless' and 'marked'. Markerless augmented reality uses the location determined by a cell phone to serve as a basis for adding local information to the camera view. Marked augmented reality uses a two-dimensional barcode to connect a cell phone or personal computer to information, usually on a web site. Both approaches are already being used in museums and college libraries. Marked augmented reality is especially powerful because it makes physical objects clickable, such as a web page. Augmented creates exciting new opportunities for libraries (Pence: 2011).

Although QR codes are slowly getting popular in South Africa, most international museums are finding the codes to be helpful, fascinating and innovative to the end users. A project at an American museum showed that the use of mobile phones by museum visitors at international museums increased visitors' interest in the exhibits. (Wheeler: 2011).

Newer museum applications are readily available at overseas art museums such as the Tate Britain Mobile Guide app. The app is downloadable on smart mobile devices, and it features:

- Detailed information on art works on the Walkthrough British Art displays.
- Curators' commentaries.
- Opinions from a range of other commentators.
- Background information about British history and art history.

The Tate Britain Mobile Guide app is one example that is used as an audio guide by visitors at the Tate Britain Museum. The self-guide app has options for visitors to listen to the commentaries by peers and critics while viewing the image of the artwork discussed on a smart mobile device while the commentary is played[56].

2.7 Limitations of digital technology in art museums

Keene (1998: 20) argues that art museums should be cautious when it comes to the protection of their property, especially against the unauthorized use of images from their art collections. This authorization problem can be overcome by the global endorsement of digital watermarks on electronic images of works of art that are posted on the WWW network (Keene, 1998: 20).

Whether art museums should go fully digital is a contentious issue throughout the world. According to Keene (1998:39), the limitations and challenges at art institutions revolve around several issues such as cost and lean budgets. One may also add the issue of copyright infringement[57].

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[56] The Tate Britain Mobile Guide app is an audio guide app that is produced to accompany the exhibitions at Tate Museum whereby visitors can walk through 500 years of British art, seeing and studying various masterpieces. [Online]. Available: http://www.tate.org.uk/context-comment/apps/tate-britain-mobile-guide. [Viewed 23 November 2015].

[57] Copyright infringement is the use of works protected by national copyright law without permission, infringing certain exclusive rights granted to the copyright holder, such as the right to reproduce, distribute, display or perform the protected work, or to make derivative works.

In respect of electronic archives, Keene (1998: 40) presents two schools of thought. One school declares that it would be ideal to build a DT related digital artefact archive portfolio, which can be accessed online using the customized portals and portable document formats (PDF). The other school claims that digital platforms such as those for archives are prone to constant changes and will ultimately require more funds to keep abreast with constant software updates. Regarding copyright and intellectual property rights, Keene (1998: 41) points out that there is a certain degree of paranoia about millions of Internet users downloading images from art museum collections and using them free of charge for commercial purposes. This seems to pose a threat to the artworks owned by art museums. As a result, many art institutions would be hesitant to publish authentic images on the web. However, there is a positive side to this version about authentic art images going viral on the Internet. It can be argued that through social media networks and free distribution of museum images, the culture of museum visiting and art appreciation can be enhanced.

It is now factual that the Internet is gaining popularity throughout the world even though digital divide is still prevalent in certain countries including South Africa whereby the cost of the Internet is still high indirectly and directly excludes the poor from the global Internet benefits[58]. Contrary to the good that the Internet provides, it is very often adversely abused by unscrupulous users. For example, network criminals can hack an art museum's network server and gain unauthorized access and cause severe damage[59].

Another challenge related to the use of DT in art museums appears to be to be that their email inboxes are constantly flooded with new mail and curators have to spend a lot of time every day reading and replying to these eMessages. However, despite this problem it can be emphasized that email is useful to promote an art museum through correspondence with its public audience and responding to enquiries about the museum and its collections.

2.8 Managing digital technology incorporation in art museums

A DT management plan for art museums is the ideal way to deal with an ICT incorporation strategy and problems. Strategic management in art museums is defined

[58] Plantema, S. 2016. South Africa takes positive steps to close the digital divide. [Online]. Available: http://thenerveafrica.com/6225/south-africa-takes-positive-steps-close-digital-divide. [Viewed 26 June 2017].

[59] Williams, R. Why, and how, to teach computer hacking. [Online]. Available: http://www.theguardian.com/education/2015/jan/06/computer-hacking-security-teaching-schools. [Viewed 26 November 2015].

as a set of actions and decisions designed for the formulation and monitoring of plans to achieve short-, medium- and long-term objectives (Pearce and Robinson: 2000). Nolan and Pfeiffer (1992) state that strategic planning is the process by which the decision makers of art museum environments envision the future, and develop the necessary procedures and operations to achieve that envisaged future. Through the use of good DT strategic management, art museums are in the position to transform their existing mandates to serve the knowledge base of their audiences profitably.

Figure 3 Digital technology touch screen LED model for the Edoardo Villa Museum - Sculpture Collection
(Source: EVM – Villa Sculpture Collection, University of Pretoria, (Photograph: Daniel Mosako - 2015)

The LED touch screen (illustrated in Figure 3) adds to the ICT incorporation strategy. This demonstrated an ideal DT driven information source whereby audiences can use the touch screen by double-clicking on any sculpture of interest to view pre-recorded information of selected artworks. These strategies will also align art museums with other similar international art institutions. The art museums of Gauteng can, for example, be benchmarked against thriving art museums in the USA. Sources reveal that American museums have managed to diversify traditional museum operations in

the teaching and learning departments of their institutions by incorporating DT in their daily activities, as well as sharing information with other art museums (Poole: 2007).

The fundamental reason for introducing DT strategic management is to transform the 'face' of art museums by using DT to create good educational outputs and to implement a successful art museum knowledge base. This is in line with the constructivism theory that states that learning can be achieved through a shared social experience (Giesen: 2005), thus expanding the information, knowledge and education bases of museum audiences.

This literature review can be summarised by saying that the benefits of incorporating DT in art museums include the following: the use of digital cataloguing of the works of art, the e-Marketing of the art museum contents, the use of electronic information sharing and public education, and assisting art museum curators with administrative and operational activities. Another observation made is the use of 'virtual tours' that form part of innovative processes in art museums to offer information sharing solutions regarding educating the public. However, the key challenges are the following: visitors' inexperience and lack of expertise of digital devices, financial constraints of art museums in terms of the purchasing and maintenance of DT infrastructure, security, and copyright of published artworks.

3. CHAPTER THREE

RESEARCH METHODOLOGY

This chapter presents the methodology applied in this research. It includes the data collection method, questionnaire design format, sampling of the chosen art museum population, as well as data analysis procedures. In this section, all the protocol requirements of qualitative research methodology are explained and followed as a procedure in this study. The pros and cons of the target group, sampling and data collection tools are presented, and an explanation is offered on how reliability and validity are addressed in the study.

The section is based on the research methodology followed in response to the research problem statement, namely to introduce the incorporation of digital technology activities in their communication, educational and marketing drives that may enhance information sharing for visitors to art museums. Art museums are explained as a single catchphrase for both non-commercial art galleries and art museums. This section of the study also includes the research target group, the sampling technique and the data collection instruments used in the study.

For the purpose of this study, curators, and museum visitors from four art museums in Gauteng are chosen to constitute the surveyed sampled research population. The selected art museums are: the WAM, PAM, EVM, and JAG.

Questionnaire and interview schedules are used as complementary data collection tools that add value to observational data collection method that is employed by the researcher in this study. Data is also obtained from authentic print and electronic publications that are included in the list of references. Additional data is sourced from the websites and prospectuses of art museums sampled. With the aid of the reviewed literature a questionnaire and interview schedule are compiled to retrieve specific information about the incorporation challenges of DT in art museums.

3.1 Research design

Struwig and Stead (2001: 243) explain qualitative research as an approach that emphasises the description of what the study is about. Using qualitative research in-depth analysis and examination of the dynamic interaction between art museum visitors, education officers, curators and information communication technologies are investigated and observed. The hermeneutic research approach was identified as an

ideal paradigm to be used to interpret and gain an in-depth understanding of the researched phenomenon on the benefits and challenges pertaining to DT incorporation in art museums. This in-depth analysis helped to contextualize the content of the study and elicit more open-ended responses from respondents.

A questionnaire and a structured interview schedule are used to source information about the pros and cons of DT incorporation in a qualitative manner. The major emphasis is based on the exploration of the benefits and challenges of DT incorporation at local art museums.

This research used key elements of the hermeneutic research approach that enabled the author to explore and understand experiences and sectoral perceptions of different art museum atmospheres as far as the incorporation of DT is concerned. Thus, granting the author in-depth knowledge on the incorporation of the DT phenomenon which he approached without any prior influenced assumptions. The study therefore explored various logistic occurrences related to DT usage in art museums in Gauteng (South Africa), such as efficiency and non-efficiency of DT in art museums as communication, marketing and information dissemination tools.

3.2 Target group and sampling procedure

The selected art museums (WAM, PAM, EVM, and JAG) are clustered to make up a population since there are few art museums in Gauteng. Curators at these institutions are faced with the task of managing the art collections, administering the day-to-day running of the art institutions, and conducting educational programmes using DT as technological aid to communicate, market and disseminate information and knowledge to museum visitors in general. Art museum visitors, education officers and curators at these clustered museum population are addressed as the ideal research target group because they supplied abundant information related to DT incorporation benefits and challenges.

(Museum visitors were further sampled using random sampling procedure guided by the email addresses written by guests in the museum visitor's books)

The critical case sampling method [60]is explored in this research as a procedure for qualitative research paradigm. This sampling encompassed art museum curators and museum visitors who were selected because they are central to the development of a strategy to incorporate DT in art museums for effective information dissemination, communication and marketing operations. Struwig and Stead (2001: 123) state that people or sites that will provide the most important information are regarded as critical cases and are particularly useful if a small number of units can be sampled. This sampling benefit was factored by the researcher in this study. A critical case sampling is associated with the statement 'if it happens there, it will happen anywhere' (Struwig and Stead, 2001: 123). Therefore art museum curators, education officers, and visitors were prioritised critical respondents for the benefit and findings of this study.

3.3 Questionnaire design

A questionnaire[61] became a useful tool to be used for this study to collect data from art museum curators, education officers, and visitors. It also gave respondents some time to deal with questions of the emailed questionnaire and saved travelling costs, despite known disadvantages such as someone other than the intended art museum visitors might have completed the survey questions.

A pilot survey is conducted to test the questionnaire's reliability prior to it being sent to intended respondents. This pilot questionnaire was done at the EVM, because of its convenient proximity. The questionnaire also included the covering letter in which the reasons for the survey are explained. A total number of fifty visitors per chosen art museum were kindly requested to complete the questionnaire (attached), the questionnaire included dichotomous (yes or no), Likert-type (1, 2, 3, 4), and open-ended questions[62].

Received data had to be treated with utmost confidentiality, and is used to inform the findings of this study.

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[60] The process of selecting a small number of important cases - cases that are likely to yield the most information and have the greatest impact on the development of knowledge.

[61] It is noted that a questionnaire has its limitations and disadvantages which include: fewer respondents completing and returning the questionnaire; respondents misinterpreting the questions; and respondents being biased in their response (Struwig and Stead, 2001: 93-95).

[62] An open-ended question is designed to encourage a full, meaningful answer using the subject's own knowledge and/or feelings.

3.4 Interview schedule

Scheduled interviews were used as a follow-up data collection tool to probe questions, which could not be convincingly answered through a questionnaire and it helped to ensure the validity and verification of key responses received through the questionnaire. An interview is explained as a method of gathering information by asking interviewees structured[63], unstructured[64] or semi-structured[65] questions (Struwig and Stead, 2001: 240). In this study, interviews are conducted on a face-to-face basis using an in-depth interview schedule subdivided into headings that refer to the research problem statement. Four curators from the sampled art museums (WAM, PAM, EVM, and JAG) were interviewed whereby more insight was gained as the interviews progressed about the challenges related to the incorporation of DT in art museums.

In order to avert the known challenges of time consumption posed by the interview process, the author grouped his visits to Johannesburg to interview curators at the WAM and the JAG. He also made a joint visit to interview the curators at the PAM and EVM. The scheduled interviews made it possible to probe questions and created ample opportunity for follow-up questions related to digital incorporation challenges and advantages at the former and latter mentioned art museums.

3.5. Data and content analysis procedure

The collected data is analysed using quantitative forms. Firstly, the analysis is done by coding answers in the collected questionnaire related to the positive aspects of the effectiveness of DT in local art museums. Secondly the negative aspects of DT are coded and analysed. A statistical analysis is also done to quantify responses received from museum visitors and interviewed curators. Reliability and validity are the two criteria commonly used when collected data are analysed. The above-mentioned data analysis methods enabled me the researcher to organize data and bring meaning to a large amount of collated data. The above-mentioned qualitative content analysis is conducted on the interview responses, and the quantitative data analysis is applied to

[63] A question that can only be answered a specific way: yes, no, don't know, not good, good, fair or very good, etc.
[64] Unstructured questions are used in qualitative research and most predominantly, in face-to-face interviews, as conversation is able to flow more naturally between the researcher and the respondent.
[65] A semi-structured interview is a qualitative method of inquiry that combines a pre-determined set of open questions (questions that prompt discussion) with the opportunity for the interviewer to explore particular themes or responses further.

the questionnaire responses. The analysed and interpreted data helped to formulate the DT incorporation projections for art museums.

3.6. External and internal criticism process

Literature sources used are appraised and referenced in chapter 7 to authenticate the provenance of the referenced text in the research chapters. Since this study is problem-oriented, the researcher's intelligent scepticism is used to accept relevant sources and reject irrelevant ones. Furthermore, different book reviews and article abstracts were read to assess the ingenuity of the documents and their potential to give answers to the problem statement. Furthermore, an oral presentation on the 'relationship between digital technology and museums' was done at the South African Museums Association (SAMA) National Conference (held in Durban 26-29 October 2015) and spontaneous questions from the conference delegates were used to refine the research direction of this study. The conference also acted as a focus group platform whereby stakeholders from various museums converged to gain common understanding related to the use of DT museums in South Africa[66].

3.7. Reliability and validity of data

Construct validity or effectiveness can be described as that element of the validation process to test the dimensions that a research tool is designed to measure (Franzen, 2000: 15). Whereas, reliability refers to the level of consistency or stability in the value of the score that an instrument elicits (Franzen, 2000: 34-39). This study used the triangulation validity method[67] as a form of cross-checking data retrieved from literature, the focus group, interviews and questionnaires to evaluate contradictions on the issue of DT incorporation in art museums, this also helped to confirm the research findings regarding the DT incorporation projection models development.

According to Tosh (2006: 61-32), the most common factor that affects the reliability of the source is the intention and prejudice of the author, culture-bound assumptions and stereotypes, and context misinterpretations and distortions. This common factor was acknowledged and observed during the literature review process in this study.

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[66] 2015 SAMA National Conference, Durban, October:" Museums for a sustainable society".
[67] Triangulation is a technique that facilitates validation of data through cross verification from two or more sources. In particular, it refers to the application and combination of several research methods in the study of the same phenomenon.

3.7.1 Reliability

Struwig and Stead (2001: 130) further present other reliability factors by stating that reliability in quantitative research is the extent to which test scores are accurate. The validity of a test score depends on the reliability score and according to Struwig & Stead (2001) it is better to determine the score's reliability before assessing its validity. Struwig and Stead (2001: 131) say that there are four types of reliability in quantitative research, namely:

Test-retest reliability, which tests the reliability of a score over a period of time;

Parallel-form reliability, which considers the problems of the participants' reactivity in relation to the first testing;

Split-half reliability, which focuses on the internal consistency of the test score; and

Internal consistency reliability, which is an index that calculates the extent to which the test items all reflect the same attribute.

The parallel-form and quantitative research reliability techniques are used in the pilot questionnaire, and the questionnaire questions were redesigned based on the outcomes of the pilot questionnaire to suit the targeted art museum curators and educational officers.

In qualitative research, reliability is viewed as consistency (Struwig and Stead 2001: 134). The consistency test is applied to the interview process to cross-check answers in the questionnaire in accordance with the research problem statement. Struwig and Stead (2001: 134) present types of reliability in qualitative research as follows:

Quixotic reliability, which refers to observation methods that give the same findings;

Diachronic reliability, which refers to stable observation over specified time; and

Synchronic reliability refers to the extent to which observations from different variables are similar within a specific time period.

In this study, the diachronic and synchronic qualitative research reliability technique is implemented to ensure reliability of the retrieved data from sampled art museums (WAM, PAM, EVM, and JAG).

3.7.2. Validity

Validity in qualitative research refers to the degree to which the researcher can rely on the concepts, methods, and inferences of the study. On the other hand, validity in quantitative research refers to the extent to which a study is conducted in an objective manner (Struwig and Stead, 2001: 13). In this study on the incorporation of digital

technology in art museums validity is used to assure the trustworthiness of the research findings, based on the triangulated data collected through the questionnaire, structured interview and direct and indirect observations at WAM, PAM, EVM, and JAG.

4. CHAPTER FOUR

DIGITAL TECHNOLOGY INCORPORATION MODEL PROJECTION

This chapter deals with scenario projections of the benefits of incorporation digital technology in art museums in South Africa. It is evident that DT has revolutionized the way art museums operate in the information environment of today. Following on this line of understanding, one could say that art museums in Gauteng might benefit from this DT revolution should they adopt and implement the following illustrated model projections.

4.1 An ideal digital technology model – Gauteng art museums

Museums in Gauteng should be better equipped with modern digital technology server networks that are capable of processing multiple functions such as collections management data processing, electronic document search systems for filing and data repository purposes. Such an upgrade might offer Gauteng art museums the edge to be digitally relevant to the societies within which they exist and to be on par with the UK and USA benchmarked museums. The ideal DT model should include a Wi-Fi network that is open to all museum visitors. Furthermore, modern and authentic software should be installed in all network computers with a networked printer, photocopy machine, and a scanning facility for visitors' use and scholarly research purposes.

4.2 Information search patterns for art museums

Synchronised Internet computer stations may assist art museums to monitor the search enquiries of audiences, it be physical museum visitors or website museum visitors. Such a synchronisation may assist curators to note and observe commonly searched files that would require to be educationally enriched for future searching exercises by other information seekers in the museum environment.

4.3 Use of computer work stations in a museum

Over the years websites have evolved from the Web 1.0 that operates as a 'read only interface' to interactive websites that use Web 2.0 and Web 3.0 applications. DT has also evolved to the point where inferior technological interfaces are in an outdated status. The web 1.0 is outclassed by newer technologies that include applications such as museum based YouTube uploads, semantic web applications that present

synchronised Internet information. Netvibes[68] serves as an alternative for finding and using all personalized internet information and social media that related to art museum information and document searches. These latest technology interfaces may assist art museums to enhance audiences' knowledge and experience, and create platforms for collaboration between multiple audiences. (What is web 3.0? n.d).

Furthermore, DT in art museums will be more effective if it has reliable and credible Internet service providers in order to provide uninterrupted Internet connectivity.

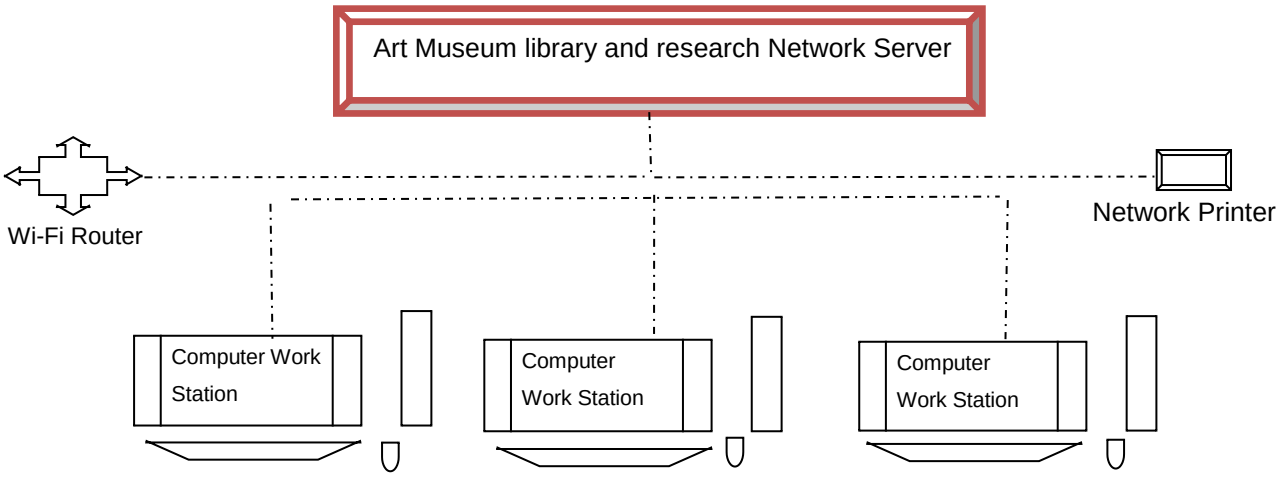

Figure 4: Computer network stations for local art museums. (Assimilated projection model: – Daniel Mosako).

The installation of such a computer network station in the sampled art museums such as at the Edoardo Villa Museum has the potential to enable researchers and museum users to source online educational information about the artworks. This initiative would also create a conducive climate for peer–to-peer information dissemination activities and refined information search activities using smartphones, tabs, and modern mobile technology devises as well as active Wi-Fi routers.

[68] Netvibe is an Internet application that is used as a personalised computer dashboard.

4.4 Visitor experience by means of technology interfaces

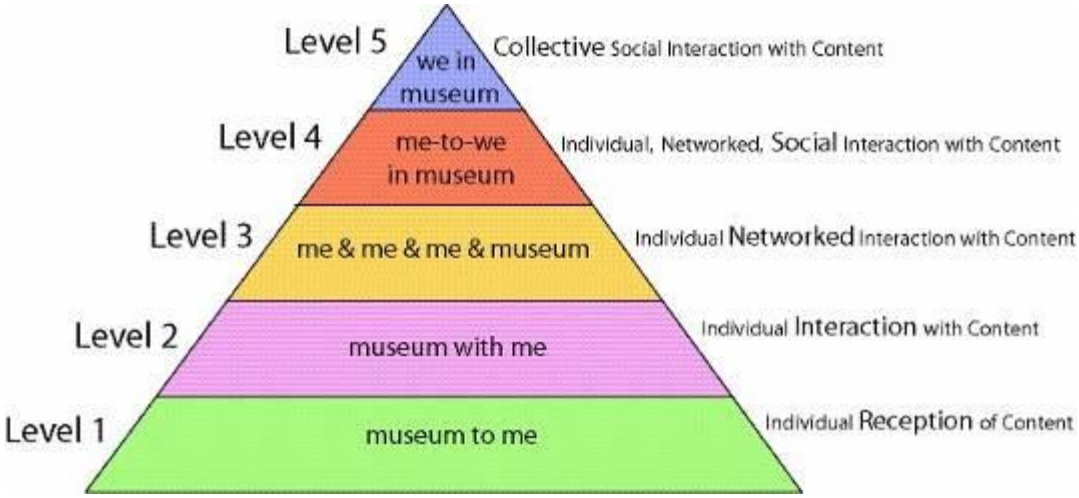

Figure 5: Model showing interaction with museum audiences and displayed works of art. Extracted from Museum 2.0 social participation Source: (http://museumtwo.blogspot.co.za/2007).

The above illustrations (Figure 4 & 5) demonstrate how art museum audiences at WAM, PAM, EVM, and JAG can be enabled to interact with art content at different levels.

In Figure 5 the first level of the graph shows that museum audiences interact with the displayed works of art, either by reading the labels or by watching a video clip about the artwork on display. The second level shows how audiences interpret the content about a particular artwork by engaging with it. The third level shows how audiences interact with one another about the artwork's content. The fourth level demonstrates how audiences share the content received via the social media about the art museum and the artworks that interest them. The final level demonstrates how social media generates the content received at multiple information stations (Museum 2.0: 2007). This level is confirmed by Louis Lankford in the constructivism theory. He states the following:

> Constructivist theory of learning and recent research into aesthetic experience suggest that most people actually benefit by instruction in various means of engagement with art, and that engagement is most fulfilling when it actively challenges, builds on, and extends the knowledge, aptitudes, and abilities of the museum visitor (Lankford, 2002: 141).

This theoretic model and line of argument is endorsed by Hooper-Greenhill (2005) who states that within the constructivist learning theory, the curator is also seen as a learner. The curator needs to work in a collaborative and consultative manner, together with museum audiences, to develop new approaches to an interactive learning process, working as a museum social group to solve problems and explore dynamic ideas, concepts and processes. (Hooper-Greenhill, 2000: 25).

4.5 The need for digital technology incorporation in museums

In response to the research problem statement, namely, the incorporation of digital technology activities in art museums, the communication, educational and marketing drives can be prioritised upon to enhance information sharing for visitors to art museums. Four interview sessions were conducted at the sampled art museums in Gauteng. The curator at PAM responded to the interview by emphasising the critical need for effective DT incorporation and a definite need for its implementation at their museums. According to the PAM an active interlinked technological art museum can assist this institution to diversify information sharing channels that would benefit end users, visitors and scholars.

A large proportion of art museum visitors who responded to the questionnaire indicated that the incorporation and implementation of DT in art museums would provide audiences with the ability to learn from the works of art on display independently. This could be done through DT applications and services that can also be used to display pre-recorded video narrations based on the context of the displayed artwork. Furthermore, an analysis of the questionnaire responses revealed that interactive DT infrastructure is not readily available in art museums in Gauteng.

In response to the above input it is evident that the incorporation and establishment of DT will have a positive outcome on the functionality at local art museums for the following reasons:

It may assist to:

- Create an electronic art information resource for national and international tourists.
- Create a remote digital art exhibition using a Google Map infrastructure for the maximum benefit to the public.
- Create digital links for the public to access the art museums' electronic resources such as eBooks and eArchives.

- Assist to convert non-digital reference documents and 2D photographic resources into digital media so that they can be viewed remotely.
- Create a viable social media culture that is found world-wide.
- Conduct in-house DT training sessions for art museum personnel on current digital applications and global art trends.
- Create platforms for electronic documentation and e-documentation exchanges through channels such as 'Instagram'.

The inclusion of DT in the temporary exhibition entitled 'Wathinta ba fazi women of stature', put up by the curator at the EVM proved that effective and efficient DT in art museums is of great importance. The exhibition provided multiple audience perspectives on the content and context of art exhibits. Here general art museum visitors responded positively to the 'installation' of a digital art museum that is accessible through Google Maps and virtual tour applications (apps). This outcome is in line with the constructivism learning theory, which advocates that students learn through an active process of interaction. The same principle is relevant to art museum audiences who would also gain knowledge through interaction with artworks that are projected through DT applications such as the art geographic position system apps (GPS) that also assists audiences to deal with the art world through active digital technologies interfaces in art museums (Giesen:2005).

4.6. Art museum identity in the information and technology era

Responses from interviewed museum staff affirmed that DT can give art museums a unique identity. Regarding the issues of art museum identity, the researcher is of the opinion that the incorporation of DT may encourage new avenues through which art museums in Gauteng can be shaped to assume a personalized character in the DT age.

Internationally DT assisted exhibitions are found to be inviting robust visual art debates thereby stimulating direct and indirect learning through interactive art on the art museum blogs sites.

5. CHAPTER FIVE

RESULTS OF THE STUDY

The researcher used qualitative data analysis approached. By applying this approach, the benefits gained by visitors who used QR codes as a digital application in the EVM, spaces were evaluated. In addition, interviews were conducted and focus group discussions held, that formed part of interactive engagements during the 2015 & 2016 South African Museums Association (SAMA) conference. Furthermore conversation interviews were conducted during the site visits exhibition walkabouts at sampled museums namely the: WAM, PAM, EVM, and JAG. Here, the constructivism learning method is applied whereby the author positioned himself within the context of Gauteng art museums. As a museum curator the researcher focused on the DT implementation and incorporation phenomenon whereby he is in the position to validate the findings of data collected at the four sampled art museums. During the interview engagements open-ended questions regarding the benefits of DT in art museums and the roles of museum in the current information era were asked.

5.1. Perspectives of visitors on the implementation of DT in art museums

This study is enriched by 154[69] responses received from the questionnaire survey done on sampled museum visitors who responded to the structured questionnaire that was emailed to 200 randomly chosen museum visitors through the help of visitors' books[70] from the WAM, PAM, EVM and JAG. They had to complete an emailed questionnaire about various museum roles and the incorporation of DT in museums. Their responses were collated and analysed. Accordingly, 54[71] of the respondents were of the opinion that the incorporation of DT may make modern art museums more efficient and effective as disseminators of information. The results received from the questionnaire data collection approach are based on structured questions and this approach was interchangeably by in-depth interviews and the outcomes are as follows:

When asked to define DT in terms of social economy in your museum the following answers were received:

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[69] Each museum was served with 50 randomly chosen emails from the guest book 154 responses were received, EVM (48); JAG (34); WAM (30); PAM (42).
[70] The visitors' books included the email addresses of good number of museum visitors.
[71] The responses received from the sampled art museums (WAM, PAM, EVM, JAG) were collated and treated as a single collection. This collection was then coded according to key questionnaire questions responses.

The WAM curator responded by saying: “Wits Art Museum is by definition part of the social economy. DT (email, Facebook, Twitter), allows us to build and connect with our audiences much more quickly and cost effectively than was previously possible. The database for the collection resides digitally and provides more staff members with easier access and the possibility of providing different levels of input and control into the collection information, resulting in improved efficiency. In the longer term we hope to make this information widely accessible via the World Wide Web which would be advantageous to larger numbers of people. We have used DT (Selfies and Facebook) to run a marketing campaign and encourage visitors into the museum and, through exhibitions and programmes, the museum has supported both formal and informal development of DT education”. This response reflects the benefits that museums stand to gain if DT becomes a standardised norm in art museums.

In response to the same question. The curator at the PAM responded by saying:
“DT such as virtual tours have the potential to promote PAM to a wider audience including audience that might not have the means to visit the museum. PAM runs a very successful Visual Arts Education and Development Programme in collaboration with friends of the art museum. The aims are to build an interest on art objects to the community and to involve the broader Tshwane societies, to develop an understanding of, and create social and cultural foundations of aesthetic development in young children and adults. This is done by supplementing the museum exhibitions with educational tours; thereby making art understandable to visitors. Aesthetic education, as well as an inquiry-driven engagement with a work of art, may be a catalyst to bringing about change. The objectives of PAM are to promote cultural service through the facilitation of development programmes and coordinating events; thereby promoting cultural awareness. In this case DT might further assist the museum in reaching this objective”. This reflect good aspiration that DT may assist museums with communication, marketing and information dissemination strategies. Such assistance have potentials to reinforce the current educational role facilitated by the museum educator and the vast catalogued reference material in PAM library that that cannot benefit the remote audience.

Subsequent to the analysed responses from the scheduled questionnaire and the interviews conducted, it can be deduced that modern museums need to share adequate information remotely through DT to fulfil museum visitors’ learning interests beyond the museum’s confined time schedules.

5.2. Value of DT in art museums

In response to the following question: Do you think DT should be integrated in art museums? 27 Visitors from PAM felt that they would be more relaxed if they could use DT at their own pace as they are still accustomed to human educational officers in the museum whereas 15 respondents said they are accustomed to human educational officers.

In response to the following statement: The value additive of DT in art museums - is it good or bad, 40 respondents confirmed that the utilization of DT at EVM is good and offers efficient digitized information using QR codes. 8 respondents ticked the not good questionnaire box. A similar question was posed to museum 20 randomly selected walkabout (walk-in) visitors at EVM, they all responded by stating that DT consumes their cell phone data when scanning QR codes. Thus, calling for EVM to install free Wi-Fi network.

The main findings of this study indicate that the incorporation of DT in art museums may yield the following benefits:

Providing increased knowledge for visitors.

Present a unique identity for the art museum through DT.

Providing new experiences for art museum visitors.

Offer unique virtual tours experience.

The purpose of the questions asked during the walkabouts and museum tours was to identity and evaluate the benefits and challenges of utilizing DT in art museums.

The quantitative survey done at the four art institutions tested perceived benefits and challenges of the use of DT in art museum spaces voicing out how visitors would like to witness the benefits of DT in museums. A total number of 120[72] walk-in visitors were randomly sampled at the four mentioned museums. The questions asked also link up with the stated objective of this study, which is focused on exploring the possibilities of DT incorporation in art museums in Gauteng.

The qualitative analysis of this study revealed new perspectives such as visitors using social media platforms (Twitter and WhatsApp) to benefit both the museum as an

[72] A random selection of 120 museum walk-in visitors was done at WAM (30); PAM (30); EVM (30); JAG (30).

indirect marketing tool and on the other hand visitors sharing their excitement about artworks of choice displayed in the museum as an information sharing practice).

The qualitative findings of this study amplified the perceived opportune values that come with the incorporation of DT at art museums that allow museum audiences to visit museums remotely through virtual tours, as noted in the discussions in chapter two on literature review. Whereby UK and USA museums as well as the Iziko museums explored the DT features to benefit their visitors and distant audiences.

5.3 DT exploration in art museums

A broad spectrum outcome from the observational data collection approach is noted as follows: - this observation include the scanning of QR codes through smart phones and mobile devices that gave visitors instant contextualised information on the displayed art works. The QR code information included the context and image about the displayed artworks. This feature is fully explored at the EVM through available free Wi-Fi connection. The other three museums (WAM, PAM, and JAG) did not provide QR codes options and only uses standard textual labels. Through the optimal incorporation of DT, art museums in Gauteng may begin to compete globally with similar institutions elsewhere in the world. Furthermore, they may be able to disseminate information to a wider audience, thereby creating an extended and increased audience experience as well as creating learning through DT across all levels of visitors spectrum and age gaps. However when asked about the innovative means to explore QR codes as a DT tool in museums. The curator at PAM confirmed that QR codes bring an interactive experience to museums as visitors engage with exhibits through snap-scans (The exploration of QR codes was a once off exercise initiated during the 2016 ‘Sasol New Signatures Awards exhibition). The Curator at PAM also shared observational feedback regarding the use of QR codes during the latter exhibition these include:

- Visitors not being acquainted with their smart phones QR code scan functions.
- Some smart phones were not proficient to scan the QR codes.
- Visitors obscuring each other in anticipation to get a chance to scan individually provided QR codes (The QR code extravaganza took place on the official opening of the Sasol New Signatures Awards exhibition, however the QR codes experience at PAM was not explored further at upcoming exhibitions as this was a once off debut for the 2016 Sasol New Signatures Awards exhibition).

- Some visitors were not keen to download the QR code app, because it would deplete their data bundles.

The EVM as one of the museum sites researched, presented findings that key information embedded in the QR codes is an essential innovation for knowledge gain and academic research, as more embedded information could be drawn from the QR codes beyond the standard labels put next to displayed artworks. Here qualitative findings demonstrated that DT facilities created knowledge links between the displayed artworks and the audience.
The general observation by the researcher on the QR codes exploration exercise is that most museum in Gauteng are unfamiliar with QR codes and their purpose as a digital tool.

Collective qualitative findings across the four sampled institutions showed that the benefits of DT is imperative and can act as a channel to disseminate educative information about the displayed artworks to various visitors. There were unanimous consensus about the importance of DT at the four observed institutions that are summarised as follows:

- DT may also play an important role for sharing knowledge across race and cultural boundaries.
- DT inspires social networks and “friends of the museum” social structures.
- DT creates electronic platforms for mailing list data bases.
- Marketing (also communication) of exhibitions through virtual tours.

When referring to the responses to the questionnaire, it became evident that the respondents confirmed that DT is an opportunity for museums to get market coverage, particularly through virtual tours.

The unexpected findings of this study are:

- The hesitation of art museum curators to publish authentic artworks on the Internet. This fear should be addressed urgently because the popularization of an artwork on the WWW could go viral thus creating an interest for audiences globally to visit a particular art museum. The risk of curators breaching copyright must be considered even though artworks going viral online may be good for art museum marketing. This also highlights the importance of DT

incorporation in art museums and could therefore serve to market art museums worldwide.

The triangulation method has been used to summarise the findings by linking the stated objective with the analysed results as well as with the data collection method used to fulfil the rationale of this study. According to Figure 5 the following were observed:

The DT status at the EVM is at an early stage. The labels of the artworks are limited to the name of the artist, and the dimensions and production date of the artwork. The curatorial aspiration is to incorporate a QR code for each sculpture that bears digital information about the contextual information of the individual artworks. The visitors' expectations exceeded the status quo of the EVM by expecting the art works to be linked to the GPS coordinates apps. The visitors also expected this Museum to have a Google maps embedded virtual tour link posted on the Museum website. Since a large proportion of the visitors visiting the EVM consists of students, they expect the museum to have e-Archive (digitised archives) documents, as well as a computer research station in the museum for research purposes. The research necessity was noted during conversation interviews with walk-in visitors who were enrolled students. They in indicated that sitting in a museum conducting research about exhibited museum objects would be enriching than visiting the museum and taking notes thereafter relocating to the library in-search of a free computer to refine the notes taken during the museum visits.

The PAM's DT status is basic and is operated through a central intranet network computer system for the office staff. The hard copy artwork labels are limited to the name of the artist, and dimensions and production date of the artwork. Apart from these labels, there is also a leaflet available that provides general information to visitors about the museum and staged exhibitions. Curators would like to produce video clips that inform the visitors about the background of the exhibition and its theme as an additional advantage to the valuable hard copy reference materials in the Museum's library collection. The DT devices and applications need by the Museum would be placed in different display rooms at the Museum as well as uploaded on their website. The visitors would like to have self-guided tours with digital recordings that narrate the backgrounds of each artist as well as the context of each displayed artwork. The visitors also would like the museum to provide virtual tours so that the exhibitions can be viewed remotely.

The status of DT at the JAG is also basic and consists of network computer systems that are used by the employees to process daily data. The artwork labels display basic information about the producer of the artwork, and the size and the medium used. Curators would like to turn the entire gallery into a Wi-Fi hotspot with the first Wi-Fi registration page displaying the signature artwork that the gallery is known to have in their collection. The audience expectation is to experience the gallery through self-guided tours and through GPS pre-audio recoded narrations about the history and collection of the Gallery.

The DT status at the WAM also reflects standard technological development. The artwork labels are in a hard copy form and are limited to the name of the artist, and the dimensions and production date of the artwork. The curatorial aspiration is the incorporation of a smartphone application that can be used by the visitors as a self-guide art museum map. The audience also expected the Wits Art Museum to have a virtual tour link and the digitised archives link to be available on the museum website. However, in response to the question: What is your opinion about the use and incorporation of DT in art museums? The curator at WAM added a positive DT perspective by stating that “Other than the research, publicity and marketing related functions described above, DT can play an exciting role in exhibition formats. WAM has scheduled digital art exhibitions and has used DT as part of activating displays in more traditional research formats or providing opportunities for audience participation and feedback. Enhancements such as the incorporation of QR codes, cell phone technology or headsets have not as yet proved possible at WAM, mainly because of the absence of a dedicated budget to support this development. Given the significant competing demands on available budgets, WAM has not considered the costs of acquiring, maintaining and updating equipment as well as the technical support necessary to be cost effective at this stage”.

This study has set out to foster an understanding of the diverse and intricate meanings of artworks that can be understood by the general public through DT applications, and which can be used as an information dissemination tool to record the context of the art on display for the benefit of the audience. The concluding deduction of this study is that the benefit of DT as observed in the USA can also be realized in the South African art museum context in terms of information dissemination.

6. CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

The conclusion chapter focuses on the research problem statement and the outcome of the analysis thereof. As mentioned earlier, this research focuses on the incorporation benefits of DT as communication, educational and marketing strategy in art museums in the Gauteng Province of South Africa. Reviewed literature indicates that art museums in South Africa are not on par with other international art museums in terms of the dissemination of information to those seeking it such as researchers, scholars and other diverse audiences. The shared questionnaire revealed through the qualitative research approach how respondents felt. Respondents are of the opinion that art museums would be more efficient and effective in disseminating information via the use of DT.

The author of this study therefore recommends that South African art museums join the 'DT incorporation drive' and buy into DT optimal use and all that it offers about information dissemination, communication, educational and marketing benefits. Not only would these benefits be effective for sharing knowledge but also efficient in the time management of audience tours in museums and bridge traditional and modern approaches whereby virtual tours of art museums creates new forms of best practice. These new practices diminish museum statistics of walk-in visitors since contemporary audience find the online museum education versions and electronic art viewing more accessible and convenient. To address this dichotomy of e-versions versus tangible versions, and to stay abreast with museum visitor volumes and statistics[73], it is worth acknowledging that museum website visitors' statistics counters are now being accepted as an alternative mechanism to indicate the popularity of museums and their ability reach out to various audiences remotely.

This data analysis also reveals a range of outcomes on how valuable art museums are within the local Gauteng communities. It is significant for museums to maintain constant relationships with their audiences and keep communities informed about current and future museum developments. DT infrastructure have proved to be successful in many academic, government and corporate institutions resulting in the

[73] Henk Voorbij, (2010) "The use of web statistics in cultural heritage institutions", Performance Measurement and Metrics, Vol. 11. Issue: 3, pp.266 – 279.

establishment of e-Learning, email, e-Health, e-Government and e-Commerce being widely used. It would therefore be suitable that art museums in Gauteng embrace DT transformation, application and implementation. Digital apps such as virtual tours, social media and other related apps may prove profitable because they may raise the profile of art institutions and market their contents to wider audiences, and will in addition help to popularize the works of art at these art institutions. Such DT apps and infrastructure could be used to the optimal advantage of local (referring to museums in Johannesburg and Tshwane) art museums which could actively and regularly incorporate e-newsletter circulation in their daily activities in order to constantly updating art museum end users about current and upcoming museum activities. Such online communication strategies may inform art museum visitors about new acquisitions in their collections and an interpretation of displayed artworks. Furthermore, advanced information communication technology interfaces at the above mentioned museums are not adequately used to post the collection documents that can be remotely accessed by museum scholars using various devises such as smart phones and computer networks.

It may also be deduced from discussions that the optimal incorporation of DT in art museums in Gauteng may enable these museums to compete at higher levels globally. Furthermore the optimal exploration of SAHRIS provides evidence that the incorporation of DT at SAHRA assisted to improved information sharing between SAHRA and end-users by improving good practice, heritage compliance, service delivery and corporate governance[74]. It is against this background of e-catalogues and online access that archive documents in local art museums may gain popularity by converting hardcopy documents into digitised electronic versions using technological systems to scan documents and make them readily accessible to visitors and scholars as digitized educational reference materials.

Based on the evidence that DT incorporation carries some benefits, this study supports the rationale that DT interfaces at art museums may broaden the culture of art appreciation, art awareness and art education in many societies thereby making positive contributions to local and global art knowledge. To broaden the scope of DT incorporation benefits at museums, local art museums need to launch rigorous campaigns to promote the culture of art appreciation and information sharing within

[74] [Online]. Available: http://www.emeraldinsight.com/doi/abs/10.1108/JCHMSD-01-2016-0002. [Viewed 30 June 2017].

their immediate environments and societies, and to widen educational initiatives under South African context through a DT infrastructure. The information sharing concept promoted by DT, the Internet and social media applications (Apps) appears to be a good option for art museums in Gauteng to adopt to reduce information poverty among art museum audiences in general. It is therefore through the technological incorporations that art museums in Gauteng can diversify their information sharing strategies and begin to render customized services to a wider audience constituency.

It would therefore be prudent for art museums to balance the need to implement DT with the need to transform the attitudes of staff and audiences. In other words, both human and technical factors are crucial. The author of this study further agrees with Dierkings and Falk's (2000: 67) statement that in most art museums, DT should not be compromised by budget limitations since the use of inferior electronic equipment could jeopardize the integrity of such museums. It is for this reason that museums must consider the social challenges and the class differences that govern and influence the South Africa socio-economic circumstances when incorporating educational DT infrastructures.

Furthermore DT has proven to have great potentials to enhance information sharing, marketing, and communication in art museums in Gauteng. However, technological applications should go hand-in-hand with end-user orientation or public education. Morrissey and Worts (2000: 170) explain as follows:

> "At its best, technology can facilitate experiences in which audiences can both transcend and live more fully in their daily lives, thoughts, and activities. It can challenge audiences to reconsider or create new meanings. It can help audiences see their experiences in a context that connects them to other people, places, and times. It can help museums realize their institutional potential as they help people acquire new knowledge" (Morrissey and Worts, 2000: 170).

It should be emphasized that even though the use of DT may prove useful in managing and promoting art museum collections, communication channels, education and marketing strategies they are prone to crash at any time, and a human intervention should be used as an alternative backup for trouble shooting purpose. The susceptibility and the high maintenance costs of DT that is commonly beyond ordinary museum budgets endorses that curators at these institutions should not be too complacent with new technology and abandon the traditional methods. Traditional

curatorial methods of imparting educational knowledge to visitors, such as educational conducting regular walkabouts in art museums and publicizing works of art in review publications and art journals should always be explored as backup solutions to DT shortfalls. The author, therefore, agrees that good educational consideration must be done by striking a balance between innovative DT and traditional educational tour guides at art museums as a form of good museum practice. Furthermore in order to combat unscrupulous and any illegal museum Internet network activities, Poole (2007: 7) advises that a regularly updated firewall coupled with alphanumeric (using letter and numerals) passwords and secured portals, as well as frequent updating of antivirus and anti-spam software, must be a first priority. Art museums also need to be wary of email attachments containing malicious software, notwithstanding the fact that a determined hacker will not be deterred by anything. Hence museum curators need to be constantly vigilant when sharing art information on the Internet.

In addition the incorporation of a digital technology model in art museum in the Gauteng province is essential as its incorporation might ensure that DT services in art museums are not interrupted, a formal service level agreement may be signed between the registered DT service provider and the art museum concerned. The signed agreement may also enforce terms and conditions concerning the warranty of the acquired DT equipment, software and applications.

Finally, the author of this study concurs with scholars who are of the opinion that art museums have the power to influence the knowledge base of their audiences through the exploration of digital applications in the current millennium. On the other hand this study agrees with Dierkings and Falk (2000: 60) who state that DT and the multimedia should not be seen as the absolute solution for curators and educational officers to transform education practices in art museums. The prime focus should be on curatorial ability to disseminate information, display and interpret works of art for the benefit of the audience's understanding and enrichment of knowledge. Dierkings and Falk (2000: 66) further acknowledge that while the implementation of DT in art museums is good for the youth and international audiences, such an implementation can pose a challenge to some visitors who may not be familiar with technological advancement. This study topic clearly needs to be taken further to understand other undetermined factors that cause some adults to experience claustrophobia where children are crowded together at technological and electronic media terminals. Further studies would inform art museums about the demands of DT on children to sensitize the art

museum communities to the demands of DT in museums for junior art museum users, such as young school children.

This study ultimately indicate that the DT transformation and incorporation benefits at art museums can be identified, and that ways of overcoming the challenges can be found. Future evaluations and investigations in this field of study will be guided by visitors' suggestions and reports on how to digitized art museums can improve social relations in South Africa.

7. CHAPTER SEVEN

REFERENCES

Akello, R. (2013). How Globalization has affected South Africa. [Online]. Available: https://getanessay.wordpress.com/how-globalization-has-affected-south-africa/. [Viewed 17 November 2015].

Ashton, S. & Robertson, S. (2000). Re-casting our net: broadening information access at the National Marine Museum. *Museums and the web 2000: Selected papers from an international conference*, USA: Archives & museum informatics.

Baniotopoulou, E. (2001). Art for whose sake? *Modern art museums and their role in transforming Societies: the case of the Guggenheim Bilbao. Journal of Conservation and Museum Studies*, 7 November 2001: pp.1–15.

Bardes, C.L (et al.) 2001. Learning to look: developing clinical observational skills at an art museum. Vol 35, Issue: 12, December 2001. pp. 1157 – 1161.

Barillaro, P. (et al.) (2009). Constructivist epistemology: An analysis. [Online]. Available: http://admn502awiki.pbworks.com/w/page/10245610/Constructivist%20Epistemology [Viewed 28 November 2016].

Beardsley, S. (at al.) (2010). Fostering the Economic and Social Benefits of ICT. *The Global Information Technology Report 2009-2010 @ 2010 World Economic Forum*.

Becker, S. (et al.) (2010). Opportunity for All: How the American Public Benefits from Internet Access at U.S. Libraries. USA: Institute of Museum and Library Services.

Bearman, D. & Trant, J. (ed) (2000). The year in review: Researching audience and assessing results. *Museums and the web 2000: Selected papers from an international conference*. USA: Archives & museum informatics.

Bennet, S. (2014). Facebook, Twitter, Instagram, Pinterest, Snapchat-social

(Inforgraphic). [Online]. Available: http://www.adweek.com/socialtimes/social-media-user-cheat-sheet/501627#disqus_thread. [Viewed 7 October 2015].

Bissel, T. (et al.) (2000). Protecting a museum's digital stock through watermarks. *Museums and the web 2000: Selected papers from an international conference*. USA: Archives & museum informatics.

Blake, M. (2006). Navigating our Pacific heritage: *Museums preserving traditions, mediating development and building local, regional and international relationships.* [Online]. Available: http://www.intercom.museum/ documents/4-4Blake.pdf. [Viewed 20 October 2013].

Borgman, C. L. (1999). Information Processing and Management. *What are digital libraries? Competing visions.* Department of Information Studies, Los Angeles: University of California, Vol.35, pp. 227-243.

Borysewicz, S. (2000). Networked media: The experience is closer than you think. *The virtual and the real: media in the museum.* Washington, DC: American Association of Museums.

Bredekamp, H. (2007). The cultural heritage of democratic South Africa. *Libraries for the future: Progress and development of South African libraries. World library and information congress, 73rd IFLA General Conference and Council.* SA: Department of Arts and Culture.

Brown, A. (2016). WhatsApp: How to forward a text message, picture, video or file to another contact. [Online]. Available: http://www.express.co.uk/life-style/science-technology/681615/WhatsApp-How-To-Forward-Send-Message-In-Reply-iOS-Android-Chat. [Viewed 26 June 2017].

Buchanan, M. (2013). Instagram and the impulse to capture every moment. *The New Yorker.* [Online]. Available: (http://www.newyorker.com/tech/ elements/instagram-and-the-impulse-to-capture-every-moment). [Viewed 10 June 2015].

Captain, S. (2012). The Internet Was Invented in 1934. *Tech News Daily Managing*

Editor *June 6.* [Online]. Available: http://news.yahoo.com/Internet-invented-1934-sorta-162230693.html. [Viewed 3 April 2014].

Carreras, C. (2005). Digital technology and heritage. *E-Journal of the Humanities and Philology Studies of the UOC*, No. 7: pp. 1 - 38.

Cere, C. (2008). New media art and the gallery in the digital age. [Online]. Available: http://69.167.155.165/content/chapters/10362.ch01.pdf. [Viewed 20 May 2014].

Corsane, G. (ed) (2005). Heritage, museums and galleries: *An introductory reader*. Canada: Routledge.

Craig, T. & Van Lom, M. (n.d). Theories of educational theory: Impact constructivist learning theory and mobile technology integration. [Online]. Available: https://sites.google.com/a/boisestate.edu/edtechtheories/craig_and_vanlom. [Viewed 20 May 2014].

Dawes, S. S. (2008). The Evolution and Continuing Challenges of E-Governance. *Public Administration Review*, Volume 68, Issue: Supplement, December. pp. 86–102.

DiCicco-Bloom, B. & Crabtree, B.F. (2006). The qualitative research interview. *Medical education*. Vol.40, issue 4, pp. 314-321.

Dierkings, L. D. & Falk, J. H. (2000). Audience and accessibility. *The virtual and the real: Media in the museum*. Washington: American Association of Museums.

Elkind, D. (2005). Response to Objectivism and Education. *The Educational Forum*, 69: Summer, pp. 328-334.

Ernst, T.T. (et al.) (n.d). *How to Use Twitter.* [Online]. Available: http://www.wikihow.com/Use-Twitter. [Viewed 18 June 2014].

Fahy, A. (1995). New technologies for museum communication. *Museum, Media, Message.* London: Routledge.

Fyler, T. (n.d). *What Does Dissemination of Information Mean?* [Online]. Available: http://references-definitions.blurtit.com/35904/what-does-dissemination-of-information-mean. [Viewed 18 November 2015].

Fosnot, C.T. (2005). Constructivism: *Theory, perspectives, and practice*. New York: Teachers college press.

Franzen, M.D. (2000). *Reliability and validity in neuropsychological assessment.* New York: Plenum Publishers.

Gere, C. (2004). 'New Media Art and the Gallery in the Digital Age', *Tate Papers*, no.2, Autumn. 2004. [Online]. Available: http://www.tate.org.uk/research/publications/tate-papers/02/new-media-art-and-the-gallery-in-the-digital-age. [Accessed 27 June 2017].

Giesen, J. (2005). Constructivism: *A Holistic Approach to Teaching and Learning.* [Online]. Available: http://www.niu.edu/facdev/programs/handouts/constructivism.pdf. [Viewed 22 October 2013].

Goodstein, L. Nolan, T. & Pfeiffer, J. (1992). *Applied Strategic Planning: How to Develop a Plan That Really Works*. USA: Mcgraw-Hill.

Hancock, D.R. & Algozzine, B. (2006). Doing case study research. A practical guide for beginning researchers. New York: Teachers college press.

Hargittai, E. (2002). *Second-Level Digital Divide: Differences in People's Online Skills*. Volume 7, Number 4 - 1 April.

Harper, G. & Moyer, T. (2007). *Conversations on sculpture*. Hamilton: New York.

Hein, G. E. (1991). Constructivist Learning Theory: *The Museum and the Needs of People. International Committee of Museum Educators (CECA). Conference*. Jerusalem-Israel, 15-22 October. [Online]. Available: http://www.exploratorium.edu/ifi/resources/constructivistlearning.html. [Viewed 20 April 2014].

Hooper-Greenhill, E. (2010). Changing values in the art museum: rethinking

communication and learning. *International Journal of Heritage Studies*, 6:1, pp. 9-31.

Hooper-Greenhill, E. (2003). *Museum and the interpretation of visual culture*. London: Routledge.

Hooper-Greenhill, E. (ed) (1995). *Museums, media, message*. London: Routledge.

Hooper-Greenhill, E. (2000). Changing Values in the Art Museum: rethinking communication and learning. *International Journal of Heritage Studies*.12 Dec 2010**,** Vol. 6, No. 1, 2000, pp. 9–31.

Jensen E. (2001). *Arts with the brain in mind.* USA: Association for Supervision and Curriculum development.

Kafle, N.P. (2011). Hermeneutic phenomenological research method simplified. *Bodhi: An Interdisciplinary Journal, 5, 2011.*

Keene, S. (1998). *Digital collections: Museums and the information age*. Great Britain: MPG Books Ltd.

Komarova, M. (n.d). Audience Engagement: New Ideas from a Study on Art Museum Websites. [Online]. Available: https://museumhack.com/study-on-art-museum-websites/. [Viewed 18 November 2015].

Lankford, E.L. (2002). Aesthetic Experience in Constructivist Museums. *JSTOR Journal of Aesthetic Education*, Vol. 36, No. 2, Summer, 2002. pp.140-153.

Loman, J. (2006). *Future World Museum. Introduction in: Designing and diversity: challenge and transformation - Museums in Cape Town and Sydney*. United Kingdom Beacon Press, pp. 14–15.

Lyall, K. & Lyall, B. (1989). Computer assisted cataloguing: a pilot project at the Whipple museum. *MDA occasional paper* 13. United Kingdom: The Museum Document Association.

Machado, J. (2011). *A constructivist classroom is a 21st century classroom*. [Online].

Available: http://web.tech4learning.com/blog-0/bid/39184/A-Constructivist-Classroom-is-a-21st-Century-Classroom. [Viewed 10 June 2016].

Morrissey, K. & Worts, D. (2000). A place for the muses? Negotiating the role of technology in museums. *The virtual and the real: media in the museum.* Washington DC: American Association of Museums.

Mouton, J. (2001). How to succeed in your Master's and Doctoral studies*: A South African guide and resource book.* Pretoria: Van Schaik.

Mphidi, H. (n.d). *Digital divide and e-governance in South Africa. Research, innovate and partnerships.* RSA: Tshwane University of Technology.

Nations, D. (n.d). *What is Web 3.0? What Will Web 3.0 Be Like?* [Online]. Available: http://webtrends.about.com/od/web20/a/what-is-web-30.htm. [Viewed 10 June 2014].

Nightingale, J. (2005). Sight specific. *Museum practice magazine*, (Winter): pp. 42-44.

Othman, M.K. & Petrie, H. (et al.) (2011). Engaging visitors in Museums with technology: Scales for the measurement of visitor and multimedia guide experience. *Human-Computer Interaction – INTERACT 2011. Lecture Notes in Computer Science.* University of York: Heslington. Volume 6949, 2011, pp. 92-99.

Osborne, H. (1970). *The Oxford companion to art*. Clarendon: University of Michigan.

Pan, B. Croats, J.C. & Muller B. (2007). Developing Web-Based Tourist Information Tools Using Google Map. Information and Communication Technologies in Tourism. Springer, Vienna. [Online]. Available: https://link.springer.com/chapter/10.1007%2F978-3-211-69566-1_46?LI=true [Viewed 27 June 2017].

Plantema, S. (2016). South Africa takes positive steps to close the digital divide. [Online]. Available: http://thenerveafrica.com/6225/south-africa-takes-positive-steps-close-digital-divide. [Viewed 26 June 2017].

Poole, N. (2007). ICT for museums. [Online]. Available: http://www.ictfir museums.pdf. [Viewed 22 October 2013].

Powell, K. & Kalina, C. (2009). Cognitive and social constructivism: developing tools for an effective classroom. *Winter 2009*, Vol. 130 Issue 2, pp. 241-250.

Prew, M. (2011). *Challenges facing education in South Africa*. Retrieved on 12 December 2016, [Online]. Available: http://www.cepd.org.za. [Viewed 1 July 2017].

Rankin, E. & Hamilton, C. (1999). Revision; reaction; re-vision: The role of museums in (a) transforming South Africa. *Museum Anthropology*. Volume 22, Issue 3. December 1999, pp. 3–13.

Rey, F.B. & Casado-Neira, D. (2013). Relationship between public and management in museums through ICTs practices. *5th International conference on education and new learning technologies.* Barcelona – Spain. 1-3 July 2013. . [Online]. Available: https://www.academia.edu/10349655/Relationship_between_Public_and_Management_in_Museums_through_ICT_Practices. [Viewed 2 July 2017].

Reading, A. (2003). Digital interactivity in public memory institutions*: The uses of new technologies in Holocaust Museums*. London: Media culture society South Bank University.

Ribeiro-Neto. B. & Baeza-Yates, R. (1999). *Modern information retrieval*. New York: ACM Press.

Rivas, K. (2010). What is google-map museum tours are getting popular at first world countries. 100 Incredible & Educational Virtual Tours You Don't Want to Miss. Issue: Jan 5, 2010.

Ross, S. & Economou, M. (1998). The need for national strategies. *Information and Communications Technology in the Cultural Sector.* D-Lib Magazine. UK: Glasgow University.

Sandell, R. (2007). Community service. *Museum journal,* January: 24-27. [Online]. Available: http://www.museumsassociation.org. [Viewed 25 October 2013].

Seattle, G.F. (2013). *What is Tumbler?* [Online]. Available: http://www.economist.com/blogs/economist-explains/2013/05/economist-explains-what-tumblr-yahoo. [Viewed 11 June 2014].

Scupola, A. (2011). *Developing Technologies in E-Services, Self-Services, and Mobile Communication: New concepts. Roskilde University*. Denmark: Science Reference.

Shadbolt, N. (et al.) 2006. Semantic web revisited. *IEEE Intelligent Systems*. Volume: 21, Issue: 3, Jan.-Feb. 2006. pp. 96-101.

Simon, N. (2007). *Museum 2.0. Available* [Online]. Available: http://museumtwo.blogspot.com/2007/03/hierarchy-of-socialparticipation.html. [Viewed 11 June 2014].

Simon, N. (2008). Trust buster. *Museum*, Vol. 87, no. 5, (Sep / Oct): pp. 41-42

Simon, N. (2011). The participatory museum. California: Museum 20.

Simpson, J. A & Weiner, E.S.C. (1989). *The Oxford English dictionary*. Oxford: Clarendon Press.

Smuts, K. Mlungwana, N. & Witshire, N. (2016). SAHRIS: South Africa's integrated, web-based heritage management system. Journal of cultural heritage management and sustainable development, vol. 6, issue: 2, 2016. [Online]. Available:http://www.emeraldinsight.com/keyword/Digital+Inventory. [Viewed 30 June 2017].

Stock, O. & Zancanaro, M. (2011). A Visitor's Guide in an Active Museum: Presentations, Communications, and Reflection. *Comput. Cult. Herit*. 3, Article 11 (March 2011), Israel: University of Haifa, p 25.

Struwig, F. W & Stead, G.B. (2001). *Planning, designing and studying research*. Maskew Miller Longman (Pty).

Turner, J (ed). (1996). *The dictionary of art*. USA: RR Donnelley & Sons Company.

Thomas, S. & Mintz, A. (ed) (2000). *Mediated realities: media perspective. The virtual and the real: Media in the museum*. Washington: American Association of Museums.

Tosh, J. (2006). The pursuit of history. London: Longman.

Trant, J. (e*t al.)* (ed). 2000. Collaborative cultural resource creation: the example of the art museum image consortium. Museums and the web 2000, selected papers from an international conference. USA: Archives & Museum Informatics.

Voorbij, H. (2010). The use of web statistics in cultural heritage institutions. *Performance Measurement and Metrics*. Vol. 11. Issue: 3, pp.266–279.

Wheeler, J. (2011). *QR codes in museums.* [Online]. Available: http://www. themobilists.com/2011/08/30/qr-codes-in-museums/. [Viewed 20 October 2014].

Yin, R. (1994). *Case study research: Design and methods* (2nd ed). Thousand Oaks, CA: Sage Publishing.

Yoshiara, Y. (2008). Art museums and society after apartheid, Museum Management and Curatorship, 23:3, pp 281-293. [Online]. Available: http://www.tandfonline.com/doi/full/10.1080/09647770802234102?scroll=top&needAccess=true. [Viewed 2 July 2017].

Zembylas, M. & Vrasidas, C. (2005). Globalization, information and communication technologies, and the prospect of a 'global village': promises of inclusion or electronic colonization? *Journal of Curriculum Studies*. 2005, Vol. 37, No. 1. pp. 65-83.

Archival platform wins Western Cape cultural affairs award for archival advocacy. (n.d.). [Online]. Available: http://www.archivalplatform.org. [Viewed 1 July 2017).

Article discussion-Internet (n.d.). [Online]. Available: http://en.wikipedia. Org/wiki/Internet. [Viewed 20 October 2013].

Capture and Share the World's Moments. (n.d). [Online]. Available: http://instagram.com/#. [Viewed 18 June 2014).

Cultural development: A response to the challenges of the future? *A symposium organized within the framework of the 35th session of the General Conference of UNESCO in collaboration with Sciences Po and with the support of the Government of the Kingdom of Spain.* Paris, 10 October 2009. [Online]. Available: http://www.unesdoc.unesco.org/images/0018/001876/187629e.pdf. [Viewed 1 July 2017).

Digital technology for museums. 2013. [Online]. Available: http://www.aim-museums.co.uk/images/ cms/ focuspapers/ictformuseums.pdf. [Viewed October 2013].

Enabling the 21st learner, Ministry of Education. 2006. New Zealand commerce & Economics Teachers association Inc. [Online]. Available: http://www.nzceta.co.nz/pages/digital_technologies.htm. [Viewed 11 May 2014].

Heritage definition (n.d.). [Online]. Available: http://www.yourdictionary. Com/heritage. [Viewed 25 October 2013].

ICT in world institutions that house and care for artefacts and objects of historical importance (n.d.). [Online]. Available: http://web.worldbank.org/wbsite/external/topics/ extgender/extdigitaltechnologytoolkit/0,contentmdk:20273967~menupk:542826~pagepk:64168445~pipk:64168309~thesitepk:542820,00.html. [Viewed 8 November 2013].

Presence technology - allows members to see which contacts are online and chat. (n.d.). [Online]. Available: http://whatis.techtarget.com/definition/Facebook. [Viewed 11 June 2014].

So what is WhatsApp? (n.d). [Online]. Available: http://www.independent.co.uk/life-

style/gadgets-and-tech/what-is-whatsapp-meet-the-messaging-app-that-facebook-bought-for-19bn-9141405.html. [Viewed 18 June 2014].

The International Telecommunication Union – Report on the world summit on the information society stocktaking; 2008. [Online]. Available: www.itu.int/net/wsis/stocktaking/docs/2008/WSIS-Stocktaking2008-e.pdf. [Viewed 28 June 2017].

What are the institutions that house and care for artefacts and objects of historical importance? (n.d.). [Online]. Available: http://www.suffolk.gov.uk/leisureandculture/libraries/libraryservices/informationandadvice/countycouncilinformationcenteres.htm. [Viewed 3 November 2013].

What is 2D drawing and 3D? (n.d). [Online]. Available: http://www.advancedartusa.com/ap-studio-art/what-is-2d-drawing-and-3d. [Viewed October 2014].