INVESTIGATING INFORMATION LITERACY AT PUBLIC HEALTH INSTITUTES AT THE NATIONAL HEALTH LABORATORY SERVICES

Winkie Mbulaheni Siebane

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ABSTRACT

Information Literacy (IL) is the ability to perceive the requirement for information, search and find, assess to establish relevance, and to use information effectively. Information literacy is considered a crucial skill in the working environment since it provides a great advantage in competition, well-informed decision-making derived from evidence-based information rather than politics and improved organisational service and productivity. This research aims to explore the current level of IL of scientists working at the National Health Laboratory Service (NHLS) under two institutes: the National Institute for Communicable Disease (NICD) and the National Institute for Occupational Health (NIOH). With the objective of identifying scientists' opinions on the significance of IL, assessing the usage of information resources by scientists, discovering the information needs of scientists, and exploring the correlations between the demographic variables and scientists' perceived Information Literacy Self-Efficacy (ILSE). The research adopted a quantitative cross-sectional approach and employed a survey method. The Census technique was employed with 118 scientists who made up the whole population of the research. Therefore, the whole population was invited to participate in the survey and 68 questionnaires were properly filled and submitted successfully which achieved a 58% response rate. The data collected was coded and analysed using the SPSS software. The outcome indicated that the vast majority of scientists have received training in IL and they were self-assured and knowledgeable in their ability to perceive the requirement for information, search and find, assess, interpret, and use information effectively. The lowest information literacy skills were reported in locating and accessing the resources. The majority of scientists preferred websites or the internet as their source of information. The majority of scientists rated information literacy as a very important skill that is of importance within the workplace. The regression analysis demonstrated that qualification level is the greater predictor of Information Literacy Self-Efficacy (ILSE) amongst scientists, followed by the level of IL instruction received. The study suggests that a favourable atmosphere for exchanging professional knowledge be created, as well as an IL programme tailored to scientists to enhance evidence-based practice. The outcomes of this research are beneficial for policymakers at the NHLS. These findings are particularly significant for information officers working in academic institutions who are developing need-based IL programs for staff members.

DECLARATION

I declare that this report is my own, unaided work. It is submitted in partial fulfilment of the requirements of the degree of Master of Management (in the field of Public Policy) in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other university.

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Winkie Mbulaheni Siebane

30 November 2021

DEDICATION

This work I dedicate to my late father, James Tshinanne Siebane, my mother, Maria Tshinakaho Siebane, my two beautiful kids, Thalukanyo and Molalatladi for their support.

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I thank God for the mercy and blessings He has bestowed upon me. Without Jesus, I could not have done it without His help. My supervisor, Dr. Halfdan Lynge-Mangueira, gave essential direction and advice during this research endeavour, and I am grateful for his help. Thank you to everyone who took part in this work. Lastly, I thank my employer, NHLS, for the time and resources you made available to me throughout this research.

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LIST OF ABBREVIATIONS

ACRL ..... Association of College and Research Libraries

DHET .....Department of Higher Education and Training

EBP.....Evidence-Based Practice

IL ..... Information Literacy

ILSE.....Information Literacy Self-Efficacy

ILSES.....Information Literacy Self-Efficacy Scale

NHLS .....National Health Laboratory Services

NICD ..... National Institute for Communicable Disease

NIOH.....National Institute for Occupational Health

NLSA ..... National Library of South Africa

SCONUL.....Society of College, National and University Libraries

SPSS ..... Statistical Package for Social Science

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1. INTRODUCTION TO THE RESEARCH

The rapid growth of information in today's world has prompted modern societies to discover and develop new searching abilities while retrieving and utilising information from various sources (Zurkowski, 1979). These abilities are called information literacy (IL). Knowing specific tools is not the only requirement for information literacy (Tiemensma, 2012) but the process is comprised of the capability to perceive the requirement for information, search and find, assess to establish relevance, use information effectively (Cheuk, 1998). These abilities are essential for each citizen's success in lifelong study, employment, and daily interpersonal interactions (Durodolu, 2020; Oyinade & Aramide, 2017).

Information is extremely important because everyone depends on it (Salim et al., 2018). However, the enormous expansion of information available across different mediums has had an impact on practically every area of daily life (Naveed & Rafique, 2018). Accessing the correct information at the right time has become increasingly important as information flow has increased (Kilic, 2010). Due to the sophistication and expanding extent of the newly emerging information environment, the interactions with information have changed dramatically. Moreover, the rising availability of unevaluated information, which has raised questions about its accuracy, reliability, and validity has motivated the idea of IL.

The idea of IL emerged in response to the recognition that locating, choosing, and applying information had become increasingly more difficult (Behrens, 1994). A large amount of information does not automatically make a person better informed. A person must be an attentive and skilled user of that information and the sources to which one has access. Therefore, the necessity to equip people with the ability to navigate through an information-based society is a major driving force behind IL (Bruce, 1997). Moreover, policymakers have lately started to highlight the necessity for a basic philosophical change away from information for conformance and toward information for lifelong learning concepts (Mandinach, 2012).

There is a significant collection of writing on information literacy (Bruce, 2000; Lloyd, 2003) with most studies focusing on librarians, information workers, and the library setting (Demasson, Partridge & Bruce, 2019; Marcum 2002; Weiner, 2011; Sparks, et al., 2016; Tshuma & Chigada, 2018; Zinn, 2016). However, Cheuk (2017) and Lloyd (2003) are of the view that the idea of information literacy ought not to be limited to the library context since

doing so restrains our comprehension of what information literate means. Lloyd (2004) argues that educators should shift their focus to real-world information settings in order to have a better grasp of the dynamics and reflect on the issues that information users encounter in various environments outside of the educational framework.

Since information has become a valuable commodity, there has been a surge in demand for information literacy (Wessels, 2014). Whether for academic or private purposes, the growth of knowledge can be aided by IL. Accordingly, in the pursuit of knowledge, IL is a critical ability (Mugambi, 2017) because individuals who are information literate generate and utilise data to communicate knowledge, which encourages creativity (Henkel, 2015). Therefore, the population benefits from information literacy to the extent that it helps the general population, and it is supposedly in the best interest of the community for every person to be information literate (Haras & Brasley, 2021).

A person who has information literacy skills could be a more productive member of society (Henkel. 2015). Devers (2007) indicates that information has the power to transform one's life. Whereas Wagner (2008) has recognised information literacy as being essential for global survival. Moreover, IL is characterised as an instrument of independence and a promoter for equality, as well as an important capability for every one existing in the information age (International Federation of Library Associations and Institutions (IFLA), 2014).

Meanwhile, the value of IL in public institutions and institutional learning and development has been widely recognised. Given that the information revolution has greatly enhanced the capability to acquire and utilise information from a number of resources, including material published electronically, societies must have specific abilities (in addition to the aptitude to read and write) to properly use these resources. According to Yevelson-Shorsher (2018), information literacy abilities are particularly significant in academic settings. Academics should develop information abilities so that they can think clearly and effectively, resolve issues, make informed conclusions, obtain information, and transfer it effectively (Chan, 2012). Because access without skills is useless, learning information literacy skills is a fundamental requirement for all individuals, including academic professionals (Simisaye & Olanrewaju, 2020). However, the success of information literacy is entirely dependent on institutional commitment (IFLA, 2006). As a result, institutions must continually expand their competencies, abilities, and processes, as well as obtain relevant knowledge to survive and invent new prospects in their professions (Ruzzier, Antoncic & Konecnik, 2006).

Research and training are an important part of public institutions and institutional learning and development. Therefore, research outputs are continuing to rise as institutions become more focused on knowledge-based evidence (Jager & Nassimbeni, 2005). Students may have the technological expertise to operate various devices, but they may lack comprehension of how to successfully look, gather, and analyse information from most of the available resources accessible to them (Bloom & Deyrup, 2013) and they occasionally lack critical thinking abilities (Breivik, 2005). Lack of information literacy has led many public institutions and institutional learning and development in preparing scholars to develop information literacy skills so that they cannot depend on anyone when researching and the case is no different in public health institutions. According to the 2019 Department of Higher Education and Training (DHET) report on the assessment of universities' research output, health professions and related clinical sciences' discipline is the second in producing new knowledge in all 26 universities in South Africa. This report also stipulates that instead of being merely information users, students are also information creators (Jacobson & Craig, 2015).

Public health institutions generally depend strongly on knowledge-based evidence, sound scientific research, best practices, and well-established methods (Wadson & Phillips, 2018). The importance of research in the profession is undeniable, as a result, healthcare, and medical literature is growing at a rapid pace. Therefore, having professionals with adequate information literacy skills is essential to provide quality and efficient healthcare service (Mugambi, 2017). These skills assist them to make informed decisions grounded on scientific data rather than politics.

Although the significance of information literacy skills in public institutions and institutional learning and development is undisputed (Forster, 2013). However, very little research is available to support the possession of these skills amongst public health institutions professionals including scientists (Naveed & Rafique, 2018). Consequently, Naveed (2021) recommends more research to better comprehend the complexities and problems that scientists face while acquiring and applying medical and healthcare information. Therefore, this study investigates the information literacy of scientists working at public health institutes at the National Health Laboratory Services (NHLS) in South Africa (SA) to establish their information literacy capacity.

The need for information literacy in public health institutions emerges from the fact that there are new infections that devastate humankind (Mugambi, 2017), which require scientists to

investigate, control and discover treatments. Therefore, scientists are an important group of professionals throughout the world who provide an essential service by conducting research and applying scientific knowledge to improve the health of the people (Naveed & Rafique, 2018). Scientists play a significant role in delivering healthcare support. For scientists to deliver excellent and proficient healthcare services, they need to have information literacy abilities to assist them with incorporating the research outcomes into their daily practice.

Since 1994, South Africa's new administration has implemented a series of charters, rules, initiatives, and programmes aimed at improving public health system performance and service delivery. Furthermore, SA devotes more money to healthcare in comparison to any other African nation (Malakoane, e.t.c, 2020). With healthcare issues such as the Coronavirus, Ebola, HIV/AIDS, and tuberculosis in South Africa, it is important to maintain excellent healthcare support throughout all healthcare institutions.

It is of high importance to look at information literacy in the public health institutes at the NHLS in South Africa because healthcare services and activities require a great deal of information. Professionals in this setting depend strongly on knowledge to perform work at a superior level including knowledge generation, distribution, transfer, and using knowledge, which indicates that the employees' work is research-driven (Badimo & Buckley, 2014).

The institutes’ primary business involves scientists. Therefore, addressing aspects of information literacy skills in two NHLS institutes (National Institute for Communicable Disease (NICD) and National Institute for Occupational Health (NIOH)) is another way to employee skill development that will help scientists do their everyday tasks more successfully while also enhancing the quality of service delivery.

1.1. Research problem statement

Preliminary reviews of the existing body of literature demonstrate a substantial scarcity of published research of IL focussing on scientists in public health institutes. Scientists are an important group of professionals who provide an essential service by conducting research and applying scientific knowledge to improve the health of people. Scientists assist in the early detection of health problems and the right response to prevent illness development. Rather than focusing on individual health, public health scientists concentrate on the overall health of the population.

There are new infections that devastate humankind, for example, Coronavirus, Ebola, and HIV infection are rising, which requires investigations by scientists to set up procedures to control them and discover treatments. Scientists' research has a huge impact on human health and lifespan, and as a result, it significantly benefits the economy of the nation. Therefore, for scientists to deliver excellent and proficient healthcare services, they require information literacy skills to assist them with incorporating the research outcomes into their daily practice.

In South Africa, information literacy is a new notion that has been advocated by educators since the 1970s and 1980s. However, due to the political system at the time, the majority of the population was not eligible for these advantages. Furthermore, there is an absence of investigation that has studied information literacy skills of scientists in public health institutions in South Africa due to the fact that many South African information professionals did not write and publish their information literacy activities (Behrens, 1994; de Jager & Nassimbeni, 2007). Therefore, more studies are required to establish the IL abilities of scientists in the public health institutes in the South Africa context. Moreover, it is important to study the public healthcare institutes as it is the source of health information to the majority of South Africans who are underprivileged.

Thus, the existing study aims to determine whether scientists at public health institutes at the NHLS possess the required skills to move around the information environment comfortably. The outcomes of this research will be beneficial for policymakers at the NHLS and other information specialists in providing IL training programs based on the needs of the scientists and in the development of policies and programmes that promote socio-economic growth. Moreover, this study would greatly add to the present literature on IL in the workplace as well in the context of scientists' in public health institutes.

1.2. Research question

1. What are the IL skills levels among scientists working at public health institutes at the NHLS in South Africa?

2. What is the association between scientists' perceived information literacy abilities and their demographic characteristics (age, gender, years of experience, educational background, and IL training received)?

1.3. Research objectives

This study aims to explore the current level of IL of scientists working at the NHLS in South Africa. More specifically, the objectives are:

1. To identify scientists' opinions on the significance of IL at public health institutes at the NHLS.

2. To evaluate the usage of information resources by scientists at public health institutes at the NHLS.

3. To discover the information needs of scientists at public health institutes at the NHLS.

4. To determine scientists' perceived ILSE.

5. To explore the correlations between the demographic characteristics (age, gender, years of experience, educational background, and IL training received) and scientists' perceived ILSE, using regression analysis.

The study adopted a quantitative cross-sectional approach and employed a survey method. The Census technique was employed. The entire population of the research was made up of 118 scientists. Therefore, the whole population was requested to participate in the survey. All 68 questionnaires were properly filled and submitted successfully which achieved a 58% response rate. Using the SPSS program, the responses were coded and analysed. The regression analysis demonstrated that out of six independent variables, qualification level is the greater predictor of ILSE amongst scientists, followed by the level of IL instruction received. When the qualification level of the scientists increases, their information literacy also increases. The same applies to information literacy instruction received. This means that out of five hypotheses suggested, only two were accepted and four were rejected.

1.4 Description of NICD and NIOH

NHLS is an entity under the South African ministry of health that provides clinical support and it has two specialised public health institutes: NICD and NIOH (NHLS, 2020, about us section, para. 3). These two are the source of expertise of national public health service and they promote evidence-based decision-making with NIOH specialising in occupational health and the NICD focusing on communicable diseases serving SA, the Southern African Development Community (SADC) countries, and the African continent. These two public health institutes provide the capacity to effectively respond to disease threats. Through its broad outreach efforts and partnerships, NIOH is known worldwide for quality in research, service, and training to enhance workplace health care services throughout Southern Africa (NHLS, 2021, about us section, para. 2). The NICD aids in the development of policies and programmes to combat communicable illnesses. Both institutes have an impressive track record of accomplishments, having produced hundreds of research articles in prestigious national and international publications. The NICD has 7 centres (Centre for Emerging Zoonotic and Parasitic Diseases (CEZPD); Centre for Enteric Diseases (CED), Centre for Healthcare-Associated Infections, Antimicrobial Resistance and Mycoses (CHARM), Centre for HIV and STIs (CHIVSTI), Centre for Respiratory Diseases and Meningitis (CRDM), and Centre for Tuberculosis (CTB), Centre for Vaccines and Immunology (CVI)). The NIOH specialised in Analytical Services, Biobank, Epidemiology, Ergonomics, Immunology, and Microbiology, Occupational Hygiene, Occupational Medicine, Pathology, TB/HIV, and Toxicology. Many governments and nations are expanding their investments in information and resources in public health institutions. Many various types of work need some level of IL abilities. Due to the sophistication of the tasks and other unique demands, the health professions necessitate a diverse set of skills and expertise.

1.5. Relevance of the study

This study is important since there have been very few studies into IL in the work environment of scientists (Naveed & Rafique, 2018). According to the IL research, there are inconsistencies in how people understand information literacy in different circumstances (Cheuk, 2017). The main issue is that existing conceptions of what IL is and how it is perceived were formed as an educational subject, and as a result, the frameworks do not represent the reality of IL in the workforce. As a result, the applicability of frameworks of IL abilities and competencies created in the educational environment to other fields and situations is now being challenged. Therefore, more investigation is crucial to provide insight

into policy and practice. Furthermore, this research looks into the most commonly established IL frameworks that are relevant in the workplace.

Public sector organizations are under growing stress to save money, show value in delivering services, adopt scientific evidence-based policies, and be transparent in decision-making (Bannister & Connolly, 2011). The present public administration has an abundance of information resources, but how they are chosen and used is impacted by a number of things, such as perceptions, attitudes, time restrictions, and workplace structure (Tait, 2016). Scientists are a valuable group of individuals who do study and apply scientific knowledge. Moreover, medical experts, health officials, and scientists are the most credible sources of information about diseases outbreaks, including COVID 19 (Gehrau et.al, 2021). Therefore, it is critical to comprehend how scientists in public institutes gather, analyse, evaluate, and use the information on a regular basis. This study is an investigation into the NHLS scientists' IL skills. Understanding and upgrading the ability level of IL of scientists is vital. As a result, the study's findings can aid in better allocating scientists to relevant jobs inside the institutions.

Librarians are responsible for providing information literacy training and providing information resources to all NHLS staff members including scientists. Therefore, the findings of this research may assist the information service section in identifying specific information literacy gaps among scientists and as a result, reforming their in-service skills training and preventing wasteful expenditure, and saving funds. This study will also reveal the skills that scientists require, whether they already possess them or not, and will therefore motivate them to develop the skills necessary to produce excellent scientific work that meets worldwide standards, as a result raising both their status and their institution.

Furthermore, information systems and resources can be better developed to take into account scientists' information abilities and needs. Improving scientists' information literacy abilities could help institutions perform better in the long run.

1.6. Research overview

Chapter 1 offers a quick summary of the research, including the research problem, research questions, research objectives, description of the cases, and the relevance of the study. Six hypotheses and research questions are provided. **Chapter 2** examines the relevant literature, which includes conceptual studies of information literacy, IL in the public administration setting, Evidence-Based Practice (EBP), the significance of IL in the workplace, information usage of health professionals, information needs of health professionals, IL and, information literacy competency among healthcare professionals, as well as a theoretical framework. Six hypotheses are provided in line with the relevant literature about the relationship between information literacy and demographic characteristics. **Chapter 3** describes the research methodology, which highlights the research approach, research tools, and application, sampling, the plan for data analysis, limitations, ethics, reliability, and validity. **Chapter 4** outlines the outcomes of data collection and the procedures of the analyses. Tests of hypotheses and regression analysis are included in the subsections. **Chapter 5** offers a discussion of the study's results and the implications of the findings. **Chapter 6** concludes with a summary of the study, major findings of the study, and a conclusion.

LITERATURE REVIEW

2.1. Information literacy overview

Paul G. Zurkowski was the first to coin the phrase ‘information literacy’, when he was the head of American Information Industry Association (AIIA) after it was discovered that scholars and employees were failing to locate and access information from the available resources in order to accomplish their objectives (Jinadu & Kaur, 2014). Therefore, the American Library Association (ALA) concluded that “to be information literate, a person must be able to recognise when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (ALA 1989).

Since then, numerous slightly varying meanings of information literacy have been generated:

The Society of College, National and University Libraries (SCONUL) also define a person who is information literate as an individual who should know and recognise that information is required, discern ways of filling the gap, develop locating strategies, access, analyse and evaluate information, organise, utilise and transfer that information, generate and synthesize (SCONUL, 1999).

Oman (2001) describes information literacy as understanding and application of information technology (IT), resources, information processes, and information control; building and utilising individual and corporate knowledge bases; and becoming a liable corporate civilian - the smart use of information.

According to Julien (2001), IL is the capability to utilise information sources efficiently and effectively. Literacy refers to the fundamental abilities of reading and writing, but ‘information literacy’ encompasses a broader and more sophisticated abilities that comprise the skill to discover, use, assess, and convey various forms of information.

The general opinion appears to be that information literacy includes much more than the simple skill of finding things. According to Owusu-Ansah (2005), there is a greater degree of agreement than discord on the meaning of information literacy. However, in disagreement with Owusu-Ansah, Kilic (2010) believes that the there are several meanings of IL, and the

meaning of the term is not clear. Moreover, Jinadu and Kaur (2014) argue that of the available information literacy definitions none of them accommodate IL in the developing countries where people, culture, and the environment has a greater impact on the information process. Ossai (2010) indicate that a person could be an archive (oral) or database that can be utilised as a source of information. Furthermore, the indigenous people have access to information that they use to address problems and help the community (Jinadu & Kaur, 2014).

In agreement with Jinadu and Kaur (2014), the definition of information literacy should also accommodate developing countries where information can be provided through different means of indigenous sources and where information technology is not a necessity. For example, an animal, weather, ancestors etc. can be a source of information. People contribute to the development of their communities by using indigenous, verbal, and non-transferable talents that are not defined as a collection of abilities by many information literacy definitions. Furthermore, information technology plays a central part of information literacy in the majority of the available definitions.

It is very important to indicate that people or communities see information in a variety of ways and what they believe to be information and information sources differ as well. Therefore, IL can simply be described as the skill to explore the information world to find relevant information, through whatever channel or medium and effectively use the discovered information. These abilities enable an individual to complete a task or make an informed decision at any given point in time without assistance. This encourages the information seeker to speak with others who can offer relevant information.

In 2018, the Chartered Institute of Library and Information Professionals (CILIP) reviewed the meaning of information literacy that was first published in 2004. The former definition explains that IL is recognising when and for what reason you require information, able to know where the information is, and how to assess, utilise, and convey it ethically (CILIP, 2004). The definition was more focussed on library environment and education context ignoring workplace and life-long learning. However, all this was changed in 2018 when CILIP revised their definition and concluded on a definition that is applicable even in all workplace including healthcare. The new definition indicates that the aptitude to reason critically and make sound rulings regarding any information we come upon and utilise is known as

information literacy (CILIP, 2018). It gives us the ability to make and express informed opinions, as well as completely engage in society (CILIP, 2018).

IL has been described and classified as the abilities required for the management of information within the education context. However, Cheuk (2008), Jinadu and Kaur (2014) and Lloyd (2003) are of the view that the idea of IL ought not to be limited to the education context since doing so restrains the comprehension of the meaning of information literate. Sonya (2014) believes that IL is a life-long learning ability that is valuable at any stage of life. Therefore, the CILIP perspective has been approved and well accepted by academics as it has extended information literacy into the following stage of students' professional employment (Stebbing, 2019). In addition, transferring information literacy skills from education to employment will not be a problem.

This discussion will assist the researcher in identifying the relevant theoretical framework for the study. This section contributes to the overall argument of this research as it is critical to acquire comprehension of what IL is and how other authors perceive it. The whole study is grounded by the information literacy from several points of view.

2.2. IL in the context of public administration.

The most outstanding information that comes out of IL and public administration is that every day, public administration institutions generate and operate with massive amounts of information which require policy makers to be familiar with IL in order to operate in this data-driven world. An organisation is defined by a variety of resources. Knowledge, as being among the resources, it is critical to the success of an organisation (Ruzzier, Antoncic & Konecnik, 2006). Therefore, professionals who generate ideas, who develop and communicate information, are necessary for organisational knowledge to exist (Nonaka, 1994).

As we embrace the information age, policymakers in all nations are becoming deeply concerned about the importance of knowledge and skills in increasing efficiency, creativity, and social cohesion. Public sector organisations are under growing stress to save money, show value in delivering services, adopt scientific evidence-based policies and be transparent in decision-making (Bannister & Connolly, 2011). Improved organisational productivity and great service quality are dependent on people and information (Badimo &

Buckley, 2014). Poorly designed and managed information systems can contribute to a loss of organisational knowledge, which can result in bad decision-making, strategies, and policies (Stewart et al, 2000). In addition, a lack of IL abilities can result in significant costs for institutions (Al Daihani & Rehman, 2007). Retaining competence as well as predicting existing and future customers' demands, requires awareness of and ability to use knowledge to grow as people, colleagues, and within the institutions (Bruce & Somerville, 2012).

Information has long been considered as a competitive advantage and a cornerstone to organisational growth (Adobor et al, 2019; Alhamoudi, 2015). However, many organisations struggle to come up with effective implementation methods of information management (Alhamoudi, 2015). Even when an organisation has unique and important resources, it may not be able to develop or stay ahead of the competition unless it has the competence to successfully employ such resources (Omerzel & Gulev, 2011). Organisations should thus identify, develop, and use their knowledge resources in strengthening or maintaining their competitive advantages while also increasing their productivity (Ruzzier, Antoncic & Konecnik, 2006). Moreover, to succeed and develop, organisations must do things differently. They must seek for new key success factors and compete in new and interesting ways. Information literacy is not only a valuable skill in itself, but it is also required for the effective allocation and application of other resources.

Information literacy's role in public administration and the improvement of public policies has for quite some time been recognised (Ormsby & Williams, 2010). According to Turner (2015), the dissemination of information aids in the improvement of individual and public wellbeing. IL has the potential of making people become autonomous learners and problem solvers. They are called Lifelong Learners (LL) once they are capable to do this over their life course. In these times of great competitiveness, information is an increasingly more valuable commodity; organisations are becoming more information demanding, and they are recruiting 'minds' rather than 'hands' (Wong, 2005). When developing measures to help citizens become more information literate, policymakers at both the national levels must take the Digital Divide into account (Correia, 2202).

Policies at all levels of government, including international, national, and state have recently emphasised the relevance of information literacy as a public concern (Haras & Brasley, 2011). The Prague Declaration: Toward an Information Literate Society, produced in 2003 by a UNESCO-sponsored committee of international IL specialists, provides a policy

framework for supporting information literacy and lifelong learning. UNESCO has recommended that “Information Literacy and Lifelong Learning initiatives should be formulated in the context of a country’s Global Information Society national agendas for reforms and advancements in culture, science, technology, the fostering of innovation and creativity, and both economic and social development” (UNESCO, 2008, p. 28). In addition, the previous president of the United States of America, Barack Obama, announced that October is IL awareness Month in a decree issued in 2009 (Proclamation No. 8429). The declaration was issued to underline the need for all citizens to master the abilities required to properly navigate through the information era, in addition to reading and writing skills.

In South Africa, prior to 1994, the educational system was divided, with whites having better educational chances and resources. Apartheid's history reveals its severely discriminatory ideas, which included segregation of universities and technikons, as well as well-resourced white universities and black institutions maintained far away from wealth and well-funded centers (Mzangwa, 2019). As a result, the majority of South Africans had little or no proper education, which hampered their aptitude to read and write (Jiyane & Onyancha, 2010). However, South African government has been striving to eradicate information illiteracy since 1994 by providing education to all citizens to improve their literacy levels. As a results, this made South Africa the first nation in the African continent to perceive the significance of access to information in the Constitution (Durodolu and Mojapelo, 2020). Section 32(1) of the Constitution of 1996 insists that each resident has the fundamental right to knowledge. Moreover, to show its commitment, the government spent over 21% of the government's overall expenditure on education (Durodolu, 2020; Zinn, 2016).

According to Soleymani (2014), the most significant elements in educational achievement is information literacy. Therefore, information literacy was acknowledged as a critical component of the answer to problems with information access and management in South Africa (Underwood, Nassimbeni & De Jager, 2002). As a result, the Library and Information Services (LIS) Transformation Charter (National Library of South Africa (NLSA), stresses that the South African administration, as well as all of its development sponsors, must effectively assist the project to advance IL and guarantee the privilege of right to information as an essential civil right for all SA people (NSLA, 2014, p.5). To this purpose, various information literacy projects such as INFOLIT have been launched across the country to raise literacy levels, especially in the present digital age. These initiatives back up the claim by Turner (2015) that information literacy works in the public interest. Therefore, freedom to

information will only be in existence if public administration institutions take their responsibility seriously.

However, according to Mzangwa (2019) the majority of formerly disadvantaged black South Africans have not benefited from the higher educational institution policy changes that was aimed at transforming the higher education system when it comes to higher education access, equity, and participation, since 1994 when democracy came in SA.

The Department of Higher Education and Training (DHET) is accountable for implementing information literacy programmes for institution of higher education and other post-secondary education and training institutions (Durodolu & Mojapelo, 2020).

2.2.1. Rapid growth of information

The most important thing that comes out of IL literature for health professionals is that there is a rapid development of writing in healthcare literature since the health care professionals depend on strong knowledge-based evidence. The primary goal behind this larger investment in healthcare literature is to assist healthcare professionals to give quality and most ideal evidence-based practice. However, the fast growth of information has had a profound influence on every area of human existence, influencing all sectors, including public administration. As a result, the number of information suppliers such as academic institutions, media centres, libraries, the internet, research institutions, and healthcare centres has significantly expanded (Mugambi, 2017).

According to the 2019 DHET report on the evaluation of universities' research output, the number of research publications published by universities in South Africa has increased across all categories of publications. The overall number of publications has climbed from 7 230 units in 2005 to 21 019 units in 2019, representing a 7.92 percent compound annual growth rate (CAGR) with health professions and related clinical sciences discipline being number two in the production of new knowledge across all 26 South African institutions.

This is an indication that public institutions are indeed the source of the production of new knowledge that is based on scientific evidence. Nonetheless, many public institutions are knowledge-intensive, and inadequate information management techniques may result in high expenses, loss of institutional knowledge, lack of essential knowledge, and ineffective

decision-making (Adobor, Kudonoo & Daneshfar, 2019). The study by Payal, Ahmed, and Debnath (2019) discovered that information management strategy, tools, and procedures have a huge impact (positive or negative) on the performance of the institutions.

Moreover, PubMed and MEDLINE are the most commonly used resources on earth, and it has been named as one of the few sites used among health professionals to conduct literature searches (Williamson & Minter, 2019). According to Druss and Marcus (2005) in 2001, journal articles from the MEDLINE database increased by 46% and it has about 4,800 journals from over 70 countries (Pravikoff et al., 2005) not forgetting that MEDLINE is just one of the hundreds of databases holding healthcare literature.

2.2.2. Evidence-based decision making

Making decisions based on evidence is taken from the field of evidence-based medicine, which is defined as a decision-making strategy in which a practitioner consults with a client and uses the best evidence available to choose the best choice for the client (Lloyd & Talja, 2010). Many fields, including the healthcare system, business, public policy, education, and libraries, have incorporated evidence-based practice (EBP). Making decisions based on evidence is primarily based on the idea that professional practice should be informed by current, relevant, and trustworthy research. Therefore, information literacy has been considered as a cornerstone for, if not a requirement for, evidence-based decision-making (Lloyd & Talja, 2010). Supporters and proponents of evidence-based decision-making argue that using this method leads to best practice and resource utilisation. Evidence-based decision-making is sometimes used to justify a choice or a point of view.

Evidence-based research requires IL abilities for the health professionals to look, retrieve, assess and utilise the evidence-based research for decision making. Therefore, Pravikoff et al. (2005) argue that IL is not a choice but a healthcare professional requirement. A cross-sectional survey conducted by Andrews et al. (2005) revealed that 44% of health practitioners search literature from online sources, for instance, MEDLINE, while 40% have never done it due to lack of information searching skills.

In South Africa, health is a human right, and no one is disadvantaged because of their social class. However, the healthcare system in South Africa is divided into two parts: a major public healtcare and a smaller, but rapidly growing private healthcare (Vambe, 2012). The

majority of the South African population relies on public health institutions to obtain medical care, due to poverty and lack of money to access the private health sector (Manicom, 2011; Grobler & Stuart, 2007). Consequently, public health institutions are confronted with a lot of responsibility and burden to deliver services to 80% of the South African population (Amado, et. al, 2012; Vambe, 2014). Poor administration, lack of funding, and deteriorating infrastructures have also affected South African public healthcare institutions (Amado et. al, 2012).

Research broadly focusing on the enhancement of knowledge management techniques in South Africa's healthcare system by Badimo and Buckley (2014) has demonstrated that poor knowledge gathering, sharing, communication, and utilisation is an obstacle to effective public healthcare provision delivery in South Africa. Corona virus, HIV/AIDS and tuberculosis are healthcare issues that are currently afflicting South Africa and the rest of African continent. Therefore, it is critical to guarantee that all healthcare institutions provide high-quality care (Badimo & Buckley, 2014).

Therefore, information is a critical resource in the South African public health sector, where healthcare professionals collaborate to improve the public's health. Information requirements are constantly felt, and information is searched, retrieved, evaluated and utilised. Hence information literacy is at the heart of all elements of healthcare activity and is a necessary skill for healthcare professionals to effectively manage EBP. According to Janavi, Ansari and Pashaeypoor (2015), IL can be considered a framework for EBP. Forster (2013) indicate that lack of IL abilities makes it difficult to accomplish EBP.

EBP is comprised of the skills to measure and describe a problem, formulate a question, find and evaluate the relevant evidence (Ross, 2010). Majid et al. (2011) indicate that EBP demonstrates a shift among healthcare professionals away from traditional practices and toward the greatest research-based practices and it has been hailed as the greatest standard for providing sympathetic and best healthcare as well as encouraging excellence in the healthcare. Brown et al. (2009) also states that EBP is a necessary ability for nurses in the twenty-first century. However, the challenge faced by EBP is the requirement of improved information literacy which involves developing skills for discovering, analysing, and successfully applying relevant evidence (Ross, 2010).

There is a rapid development of literacy in healthcare literature since the health care professionals depend on strong knowledge-based evidence. Therefore, information literacy

is highlighted in the setting of EBP. In order to perform EBP, health care professionals should strive to incorporate the best available information into the health of the population. This means incorporating scientific information, clinical competence, and the interpretation of patients' needs and perspectives into decision-making (Craig & Stevens 2012).

A study by Pravikoff et al. (2005), investigating nurses' readiness for EBP in the United States (US) discovered that majority of nurses do not comprehend or see research as of important, and they have received inadequate or no teaching to assist them in locating evidence upon which to base their practice. Moreover, previous research has discovered that nurses were not ready for EBP (Farokhzadiana, Khajoueib & Ahmadianc, 2015; Ross, 2010) because they lack the necessary information literacy skills (Pravikoff, et, al.; 2005; Ross, 2010).

According to Cheeseman (2013), health care professionals with a strong command of information literacy have a better knowledge of research evidence and its use in clinical decisions. Furthermore, Janavi, Ansari and Pashaeypoor (2015) discovered that information literacy and EBP have a significant relationship.

Therefore, excellent evidence-based practice requires IL skills for the health professionals to have the ability to look, retrieve, assess and utilise the evidence-based research for decision making. In support with the argument by Pravikoff et al. (2005) information literacy is not a choice but a healthcare professional requirement that makes evidence-based practice possible and effective.

2.3. The significance of IL in the workplace.

The most important thing that comes out of IL in the workplace literature is that IL is gradually being recognised and adopted in different fields of workplace and it has been recommended as one of the necessary work skills. According to previous studies, the practise of IL in the working environment is dynamic and ever-changing (Forster, 2017; Whitworth, 2014) and it is not experienced the same in working environments (Lloyd & Williamson, 2008). Information literacy has been recorded as one of the five significant skills for occupational performance by the US Department of Labour Secretary's Commission on Achievement of Necessary Skills (Jinadu & Kaur, 2014).

Forster (2013) argues that lack of IL skills in the workplace may result in difficulty to accomplish tasks, whereas Klusek and Bornstein (2006) suggest that it may lead to reduce of competitive advantage in commercial settings, meanwhile, Bruce (1999) considers information as basic importance, hence, Cheuk (2017) considers IL as an essential skill comparable to communication skills, management skills, and Microsoft (MS) skills. More so, Karim and Hussein (2008) consider IL as an asset just like any other resource that has an impact, such as financial resources.

All these authors are in agreement with one another that information literacy is a crucial component that need to be valued within the workplace. However, the difference is how they consider it. This is because not everyone perceives information literacy the same way in all working environment. Therefore, it is advisable to consider the advice given by Cheuk (2017) that encourages workplace to be information literate by first addressing the way information is defined in the organisation, the kind of information that is needed, and ways of utilising it. By doing all these, the organisations will improve its productivity and avoid wasteful expenditure.

According to a study conducted by Badimo and Buckley (2014) into practices of management of knowledge in the SA healthcare sector, putting information management concepts into practice at the Gauteng Department of Health could improve the achievement of goals and objectives while also improving service delivery within the Gauteng health sector.

In their case study following a mixed-methods approach investigating workplace IL in educational settings in the Central University of Technology, Free State (South Africa), Molopyane and Fourie (2015) discovered that the vast majority of those who took part in the study expressed that a lack of IL abilities in the workforce can lead to missed opportunities and many people felt that job descriptions should incorporate information literacy as a requirement. This outcome is the same as the findings of Chaudhry and Al-Mahmud (2015) using a survey method while investigating IL at work discovered that a large majority of respondents stressed the significance of information literacy education and proposed that IL programs be made mandatory for all employees. Raish and Rimland (2016) while investigating employer perceptions of critical IL skills also discovered that participants find information literacy abilities valuable in the working environment.

Identifying the significance of IL in the working environment is important to understand how scientists at the public health institutes at the NHLS perceive information literacy. South Africa is a democratic country that values the feedback from society. Therefore, it is fair and very important to know how employees' perspective is about information literacy. The focus should be on how to best use information to fulfill the workplace's highest priority strategic goals and produce good business impact. This section provides the exploration of the first research objective (section 1.3) and its outcome is presented in section 4.4.

2.4. Information usage of health professionals.

One of the most critical stages in the process of IL is selecting the appropriate source of information. The information gathered through searching is put to use at a later stage. However, it is noted that individuals take an easy way out when looking for information as opposed to concentrating essentially on quality (Anderson et al., 2001).

2.4.1. Source of information

According to Case and Given (2016), documents are often referred to as 'sources' in many information-gathering studies, although they are actually 'channels'. According to Diane (2015), assessing information and the source is more significant in this internet age than any other time since anybody with essential computer abilities can publish misleading information on the internet and by by-pass quality assurance, for example, editors, libraries, journal review board, and so on. Moreover, there is an issue of wrong information from apparently credible sources. America Academy of Pediatrics (2013) in its exploration on Evidence-Based Practice detailed that 20% of the 60 clinical websites examined had deceiving information. The National Cancer Institute (2016) cautions healthcare professionals about the significance of critically assessing clinical information prior to utilizing it even when it is coming from a reliable source.

According to Ossai (2010), a person could be an archive (oral) or database that can be utilised as a source of information. As a result, it is significant to discover how scientists source and utilise information from a variety of perspectives. The insights gained from these findings can be used to improve the way of communication, leading to better utilisation of medical information resources by scientists.

Scientists at the public health institutes at NHLS have access to physical books, databases, websites, people/colleagues, media, and encyclopaedias which they can employ as their source of information. In this case, websites is referred to web pages produced by organisations. However, in the current pandemic of COVID19, media, specifically social media were frequently presumed of disseminating misinformation and misleading facts about health information, further adding to the public's fear and panic (Gehrau et.al, 2021). Cross-sectional research done by Alduraywish et al. (2020) surveyed 430 respondents using a self-administered questionnaire to gather data that was analysed using SPSS software. The outcomes revealed that the vast majority of those surveyed do not trust information acquired from social media. Fridman et.al, (2021) also discovered that mass media and social media are the least trusted sources of health information.

Several researchers have been studying the usage of information by healthcare professionals from back in the late 1950s until today (Herner, 1959; Menzel, 1966; Meyada, 1969; Osiobe, 1985; Tahira & Ameen, 2009). Herner (1959) discovered that majority of American medical scientists preferred communicating with people as their source of information but they consider bibliographic publications (such as medical databases) and scholarly articles for learning and gaining knowledge in their field. This outcome is similar to an outcome by Zawawi and Majid (2001) that scientists who are researching at the Institute for Medical Research in Malaysia mostly preferred journal articles as the source of information but they also consider communication with colleagues as a significant source for fulfilling the needs of information.

Another noteworthy study by Tahira and Ameen (2009) that examined different knowledge demands and information search attitudes of science and engineering lecturers at the University of Punjab in Lahore, discovered that majority of scientists (52%) preferred to use websites, 27% preferred to use the library, while 23% preferred to search on the databases.

Chaudhry and Al-Mahmud (2015), when investigating the information management attitude, the study discovered that websites ranked first on the list of information sources for gathering work-related data with the highest mean score of 4.32, and information was also commonly sought from databases (3.13 mean score). A cross-cultural perspective study by Wu (2012) investigating information literacy in the workplace also discovered that 70% of respondents thought the information obtained from the website was accurate.

2.4.2. Databases

The preceding section gave us an overview of the most often used sources or preferred by health professionals when searching for information. Therefore, these studies give us an understanding into how information is being sourced and utilised around the world and most specifically in the healthcare profession. Based on these previous studies' findings, the most utilised sources of information by scientists include websites, databases, people or colleagues. The frequent use of databases as the source of information may be due to the fact that databases are regarded as the best produced from the top professional journals and publications, and database developers rely on the accuracy and quality of the content (Masic & Milinovic, 2012). Therefore, discovering how databases are utilised in the public health institutes at the NHLS is of paramount.

The information service section (NHLS libraries) at both institutions (NICD and NIOH) annually subscribes to various medical databases including EBSCO-MEDLINE complete, Science direct, ASM journals, e.t.c. This vast investment is due to the need to support scientists in their quest for information during their research so that they can make proper decisions, complete tasks, and eventually increase productivity within the NHLS.

According to Williamson and Minter (2019) PubMed and MEDLINE are the most commonly used resources on earth and they have been named as one of the few sites used among health professionals to conduct literature searches. PubMed provides free and unlimited access to all users over the internet since June 1997 (NLM, 2021, Free Web-Based Access, para. 3). According to Druss and Marcus (2005) journal articles from the MEDLINE database increased by 46% and it has about 4,800 journals from over 70 countries in the year 2001 (Pravikoff et al., 2005) not forgetting that MEDLINE is just one of the hundreds of databases holding healthcare literature. The primary goal behind this larger investment in healthcare literature is to assist healthcare professionals to give quality and most ideal EBP.

A cross-sectional survey piloted by Andrews et al. (2005) revealed that 44% of health practitioners search literature from online sources, for instance, MEDLINE, while 40% have never done it due to a scarcity of information-gathering abilities. The outcome of the infrequently used databases is comparable to the research outcomes of Pravikoff et al. (2005), investigating the readiness of US nurses for EBP. It discovered that majority (76%) of respondents said they had never used the CINAHL database and only 24% have used it.

2.4.3. Access to information.

There are librarians at both institutions that assist scientists with their need for information. However, great amount of the resources including databases have been made freely available on the NHLS intranet for all scientists to access at any given time. Access to this information requires some basic skills to navigate through library information resources. Therefore, it is of importance to understand how scientists gather information they need.

Grefsheim and Rankin (2007) telephonically surveyed 500 scientists working at the United State (US) National Institutes of Health (NIH) when investigating their information-seeking behaviour. The majority of respondents (95%, 474/500) said that the most common way they got information for work was to look for it on their own. However, an interview with a semi-structured format and a focus group study by Alvarez et al. (2014), investigating Brazilian HIV/AIDS researchers discovered that four out of six researchers lack sufficient information literacy skills and they depend on librarians to get information. As a result, it was critical to determine whether scientists at the NHLS' public health institutes can discover and obtain essential information without assistance.

2.5. Information needs of health professionals.

According to Prakasan (2015) information needs are items of information that are necessary in giving lectures, patient treatment, public education, and so on. However, Mahajan (2009), defines information need as the degree to which an individual expects information to take care of an issue or solve a problem. Moreover, Case and Given (2016) indicate that a hypothetical situation that occurs when a person recognizes they are uncomfortable with their present level of knowledge is called information need. The term information need is frequently used to describe the motivation for people to seek out knowledge (Ikoja-Odongo & Mostert, 2006).

Identifying information needs is the first step that is expected in the process of IL in order to fulfil a task or make an informed decision and solve a problem. Any improper identification of information needs may affect the productivity and usefulness of information systems (Devadason & Lingam, 1997). Therefore, satisfying one information requirement may result in the emergence of a new inquiry or concern (Case & Given, 2016).

Cheuk (2017) is of the opinion that knowing the needs of information of employees and in what way they utilise information in their daily practice is a significant step in planning a powerful IL program. Therefore, Weiner (2011) supports Cheuk by indicating that the development of a specific and adequate IL program and policies should be implemented after studying and identifying the information needs of clients.

A study at the University College Hospital, Ibadan by Nwagwu and Oshiname (2009) discovered that 99.5% of health professionals require information on the outbreak of infections, 99% needed information on new cures, whereas 98.5% needed outcomes of scientific research. Tahira and Ameen (2009), when investigating the information requirements and researching attitudes of scientists at the University of the Punjab, Lahore, discovered that majority of respondents needed information to support them with their research assignments (m=3.25) and to update the information (m=3.25).

Mugambi (2017) evaluated the information literacy abilities of Kenyan practicing nurses. According to the findings, these respondents primarily need information on caring for a patient, followed by in-house seminars, professional presentations for meetings or conferences, and professional advancement.

The identification of information needs of scientists will assist the information service department to provide the relevant sources of information that are in alignment with their information needs. This section is in conjunction with the 2nd objective of this number and the outcome are presented in chapter 4 section 4.6.

2.6. Information literacy competency among scientists

According to Behrens (1994) the notion of IL emerged in response to the recognition that locating, choosing, and applying information had become increasingly more difficult. Scientists with insufficient information literacy abilities may waste too much time getting information due to difficulties they may experience when searching for data, particularly in electronic journals. According to Simisaye and Olanrewaju (2020) the fact that information is available does not imply that it is utilised due to the fact that the information user may not know of the available information, how to retrieve it or they are not aware of the importance of the available resources. NHLS libraries provides online databases for free to all public health institutions in the NHLS.

Most literature on information literacy in the healthcare emphasises that professionals in the healthcare should be information literate in order to actively perform or contribute in evidence-based practice. Health science is an ever-evolving field. The 21st century saw the introduction of powerful new medications and breakthroughs in controlling various diseases. These significant breakthroughs have been made possible by a variety of research initiatives, which have resulted in the increase of health resources. The application of information from other fields to the healthcare profession has expanded the amount of information that employees must work with in order to stay up-to-date with the developments in their occupation. Consequently, it is critical to investigate IL competency among scientists in the healthcare industry.

Sonya (2014) believes that IL is a life-long learning skill in the healthcare field if it can be introduced at an early stage of undergraduate students and be crucially implemented when they are in their final year and continues through the first years of their professional clinical work, with line managers encouraging healthcare professionals to attend any information literacy training.

Anwar (1981) investigating IL among scientists in Pakistan discovered that the vast majority of scientists were never exposed to IL at any time during their study or work. Moreover, Covell (1985) discovered that 70% of inquiries emerging during physicians' daily operations stayed unanswered in Los Angeles, California. These results are acceptable since IL was still emerging during the period of this study and was not yet well accepted in the work environment (Lloyd, 2003; Bruce, 1999).

However, similar challenges were still being reported 30 years later. A cross-sectional survey employed by Naveed and Rafique (2018) discovered that most scientists at the Pakistan Council of Scientific and Industrial Research (PCSIR) never attended IL training during their whole career, but they considered IL as significant. It is noted that the relationship between IL skills and academic qualification is positive as IL skills seemed to be growing as academic qualification improved. Among Naveed and Rafique's recommendations was for the development of IL training for the scientists. A user survey of the National Library for Health in Derbyshire, United Kingdom, discovered that 74% of employees at the National Health Service fail to locate what they need when searching for information (Ayre, 2006) and lack of information literacy skills was found to be a problem.

Exploring data that was collected in a study by Naveed and Rafique (2018), Naveed (2021) tested the connection between scientists' information literacy abilities and their demographic features. The study discovered that the highest mean score in the process of IL was in understanding, synthesising and utilising the information (m=4.24) and the lowest mean score was in initiating the search strategy (m=3.93).

In order to create an adequate information literacy program, within the public health institutes at the NHLS, the level of information literacy amongst scientists needs to be explored. Therefore, this will be explored under five levels of information literacy: Never received IL training, Basic information searching skills, Guided library tours, Advanced IL skills and Research level skills. An individual who has basic information searching skills can conduct basic search strategies. Library-guided tours enable one to know their information centre/library. A person with advanced information literacy abilities may save time while performing literature reviews, effectively obtain and organise information, use sources ethically, and manage their intellectual property. Research level skills are the capacity to find, identify, extract, organise, assess, and use or present material related to a certain subject. This section is the fundamental of this study as it is conjunction with the research objective number four (section 1.3), its outcomes are presented in chapter 4, section 4.7.

2.7. Information literacy assessment framework

According to Grant and Osanloo (2014), the assessment framework serves as the foundation for the entire research inquiry. The structure and vision for a study is indistinct in the absence of a framework.

Whereas there is general consensus on the meaning of IL, however, the IL literature demonstrates that there is no adequate consensus on the most proper assessment framework for measuring IL. There are a range of applications, theories, and standards that attempt to describe how people find and use information. This has prompted a scope of models and standards: the PLUS model (Herring, 1996); the Seven Faces of information literacy (Bruce, 1997); Society of College, National and University Libraries (SCONUL) seven pillars of information literacy (SCONUL, 1999), the Association of College and Research Libraries (ACRL) information literacy competency standards (ACRL, 2000), Craig’s model of the information literacy (Craig, 2009) and many others.

A closer inspection of these assessment frameworks reveals that they all emphasise the improvement of abilities and knowledge through a path that an individual pursues to progress from inexperienced to experienced consumers of information (Mugambi, 2016). Jinadu and Kaur (2014) are of the opinion that all these frameworks might reject to support inquiry in the work environment particularly in the countries that are developing where the information processing takes place and it is heavily impacted by individuals, society, and the surroundings. In certain developing nations, community initiatives contribute to community progress using native, verbal, and talents that cannot be transferred (Ossai 2010) that have not been defined as a collection of skills by the ACRL (Jinadu & Kaur, 2014).

Therefore, it is crucial to have frameworks of information literacy that acknowledge this uniqueness in societies like these, where indigenous people have access to information that they use to address issues and improve the community. As a result, environment, time and culture will influence the level of information literacy necessary for survival (Pullen, Gitsaki, & Baguley 2010). However, the existing frameworks appear to favour societies (people) where information systems are inexpensive, easily accessible, and a lifestyle (Jinadu & Kaur, 2014).

Moreover, Kilic (2010) established that it is unclear to what degree information literacy standards assist people in preparing for employment and to what degree these standards and models, which were primarily established for educational purposes, can be adapted to working industries. The majority of the available frameworks were established in an education setting, emphasising processes to learn how to utilise information instead of working environments where employees must successfully apply information to generate knowledge (Lloyd, 2007).

These frameworks depict a learner or an individual as someone who must acquire knowledge through a series of stages. While this is feasible at work but it is not usual (Jinadu & Kaur, 2014). The workforce is a challenging setting to demonstrate abilities that the organisation and other workers may acquire and benefit from to better the community. A remedial lesson may be available to a leaner, yet a worker may be disciplined for failing to complete an assignment on time. This emphasises the reality that professionals will not be asked to submit articles or solve specific problems to obtain points, instead, they will be

required to conduct complicated data analyses to complete a complicated operation that is valued by colleagues, customers, managerial staff, and community.

However, Cheuk 1998, believes that the priority is on effective educational delivery, with the expectation that a successful education system will assist an IL that will enhance job performance. Furthermore, those who know how to learn will subsequently enhance their goal-achieving techniques for the purpose of gaining a competitive edge in the job (Bruce, Hughes & Somerville, 2012).

Five assessment frameworks are explored here among the many available information literacy frameworks. In 1996, James Herring created the PLUS model with focussing on intellectual skills and self-assessment. This model was created for students in the United Kingdom (UK). PLUS is a combination of:

- **P**urpose of information
- **L**ocating information source
- **U**tilisation of collected information
- **S**elf-assessment of the process to see if the issue has been resolved (Herring, 1996)

This model promotes the use of online resources and rejecting the indigenous, oral and other factors that may be used as knowledge source. Moreover, this model was created for the scholars in the UK and did not deal with information literacy in working environment. PLUS model also support self-improvement and not improving people around.

Bruce created The Seven Faces of IL in 1997 (Bruce, 1997). This model was tested in Australian academics. The approach was utilised to investigate various ways in which professionals deal with IL at work. The reason behind the name ‘Seven Faces of IL is because there were seven distinct approaches to information literacy:

1. Using information technology;
2. Understanding of information sources;
3. Information process;
4. Information control;
5. Knowledge construction;
6. Knowledge extension; and
7. The Wisdom Conception (Bruce, 1997).

According to Bruce (1998), an information literate individual is capable of using information technology. She further indicates that information technology contributes to information awareness. Like the PLUS model, Bruce's first and second face of IL has totally rejected the developing countries where most of the knowledge is undocumented. A developing nation is a sovereign state that has a less developed economic base and a lower Human Development Index (HDI) in comparison to other countries. For example, South African information professionals did not write and publish their IL activities (de Jager & Nassimbeni, 2007) and that does not mean that information literacy do not exist in the country. Furthermore, developing countries have few information technology resources and internet connection is considered a luxury. In the last face (seven face) information literacy is used properly for the benefit of others (Bruce, 1998). In African countries, people also contribute to the development of their communities by using indigenous, verbal, and non-transferable talents.

The Seven Pillars of IL was developed by the committee of the Society of College, National and University Libraries (SCONUL, 1999). The committee was made up of representatives from all institutions and national libraries in the United Kingdom and Ireland. These skills were listed in the following order: 1. Identifying the need for knowledge; 2. Differentiating methods of bridging the gap; 3. Locating techniques; 4. Finding and retrieving; 5. Comparing and assessing; 6. Arranging, implementing, and sharing; and 7. Summarising and generating.

Information technology is seen as a basic ability in the SCONUL model of information literacy. According to SCONUL (1999) these skill levels are regarded as iterative, and by exercising these skills, information consumers develop from competent to expert. The goals of the SCONUL model were to encourage higher education to improve students' ability to use information effectively. This model does not accommodate the workplace nor developing countries. Having an industry-specific IL theoretical framework makes it very easy for professionals and academics to adapt and use it.

In 2000, the Association of College and Research Libraries (ACRL) established IL competence requirements for higher education that have been transcribed into German, Spanish and Finland (ACRL, 2000). In October 1999, the ACRL standards was supported by the American Association for Higher Education and in February 2004 by the Council of

Independent Colleges. Furthermore, the Council of Australian University Librarians (CAUL) has adapted them for use in Australia (Jager & Nassimbeni, 2005). Below are the five standards that have been approved by ACRL.

- **Standard one:** The kind and scope of the information required are determined by the information literate learner.
- **Standard two:** The information literate learner obtains essential information in a timely and effective manner.
- **Standard three:** The information literate learner critically assesses information credibility before incorporating the material.
- **Standard four:** Individually or as part of a group, the information literate learner utilises the information efficiently to achieve a certain goal.
- **Standard five:** The information literate learner knows various technical, ethical, and societal concerns regarding the utilisation of the material and acquires and utilises it lawfully (ACRL, 2000).

In 2003, during Library and Information Association of South Africa (LIASA) seminar, ACRL standards were discussed. Seventy participants, the majority from South African higher education institution libraries attended the conference. The goal of this activity was to get people actively involved with well-known and acknowledged standards in order to see if they may be useful in South Africa (Jager & Nassimbeni, 2005). The attendees reached a consensus in agreement that the ACRL Standards can be employed for SA as well, while others expressed that some phrasing needed to be simplified.

An antagonist of ACRL standards, Kuhlthau (2013) has argued for rethinking ACRL standards in order to change some concepts so that it can be suitable for the next decades. According to Kuhlthau (2013) the words “extracting information” that comes from the ACRL standards encourages students to simply copy and paste information from the internet without being a part of the dynamic interaction of information, theories, and concepts from other fields, as well as the best inventive ideas from the real world.

The existing information literacy models and standards propose themselves as a potential tool for assessing information literacy. However, it is significant to highlight that these models and standards were developed for higher education and does not accommodate IL outside the academic setting. IL in the working environment where learning is perceived through

employees' on-site actions and communicated through experiences (Lloyd, 2012) is different from the education context where learners recognise an information need, substantiate a suitable source, and ethically transmit the information. Working environment is a multifaceted cultural activity that is abstractly placed and produced by the interconnections and networks that allow people to interact, objects, texts, and physical experiences (Lloyd, 2007). Moreover, information at work can be required for many things, for example, to make informed decisions or develop a new policy or amend a policy unlike information at school where it is mostly needed for completion of a school task.

Therefore, it was critical to employ information literacy framework that was appropriate for the current study. Introducing these models into developing countries may not serve the purpose. It is important to put South Africa, as a developing country into consideration and employ a model that accommodate its values and ethics. Moreover, a framework that accommodate working environment would be suitable.

Craig (2009) developed an assessment framework to assist healthcare professionals in their quest for information to improve the health of the people (Craig, 2009). This framework was developed to support healthcare professionals in the National Health Service (NHS) in Scotland. Craig's assessment framework was created to help researchers conduct study that is relevant to real-world situations in the workplace. The framework consists of seven arrows that direct individuals where they are in the cycle of information literacy:

1. **Question** - defining the question that needs an answer. According to this model, knowing what you need is very important in order to find the relevant solution. Asking the relevant question will yield the relevant answer;

2. **Source** - identifying where the information is that can answer the question. Sources can be anyone you know who can provide with relevant answers, as well as textual and electronic information;

3. **Find** - identifying the keywords that can yield relevant information. The phrases should have been established at the beginning (Question) and be ready to utilise them to explore the sources chosen;

4. **Evaluate** - assessing the retrieved information. At this stage it is all about examining if useful information has been discovered by examine the results to determine if the question was answered;

5. **Combine** – The new and valuable discovered results or answers should be blended with what is already known to build up new knowledge;

6. **Share** – Finding a way of informing other people about the discovered information if it will be beneficial to them; and

7. **Apply** - making an informed choice based on the information or implementing new policies. At this stage one needs to ask themselves these questions: What will I do with the data? Will this help me better manage or treat my condition? Do I want to improve my working habits? Am I looking for someone to assist with the creation of a new policy document?

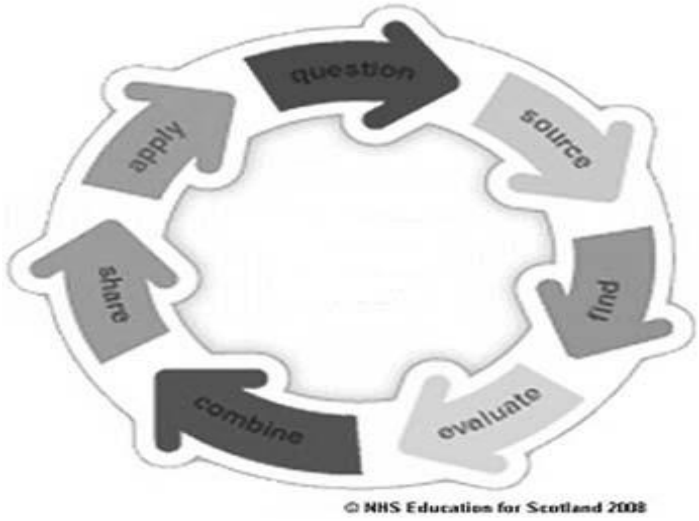

Figure 1: Craig's (2009) theoretical framework.

Craig's (2009) information activity is composed of activities such as questioning the information required, finding, evaluating, combining, sharing and applying the new information whereas information literacy is characterised by abilities to define information needed, capability to find, aptitude to assess, and employ the required information successfully. The most outstanding activity of Craig's assessment framework is activity number two (Source). This activity allows healthcare professionals to go outside of their work environment and interview people who may have relevant knowledge to their question. Unlike the other frameworks, Craig's framework doesn't limit healthcare professionals in

their quest for information. Even though this framework was developed for National Health Service (NHS) in Scotland, however, it also accommodates developing countries in Africa where research can be done outside the workplace because most of the information is not documented. This theory assists the researcher to comprehend how information is gathered and turned into knowledge in the workplace. This theory also encourages ‘Sharing’ in the workplace whereas SCONUL assessment framework encourages ‘Communicating’. Sharing is to offer a portion of one's possessions to someone else to use or consume whereas communicating means to convey or transfer information to another person. Craig’s assessment framework is the only framework that advocate for sharing out of all assessment framework demonstrated above. Sharing can be attributed to Ubuntu as an African philosophy.

Overall, the researcher concludes that information literacy is not always influenced by technology. Therefore, the researcher employed Craig’s assessment framework because it accommodates assessments in emerging nations like South Africa. This framework empowers the healthcare professionals to see how information is sourced and changed into knowledge inside the health sector. It doesn’t limit healthcare professionals into focussing on documented or published information only. Scientists require an extensive variety of health information to address clinical information requirements in order to complete job tasks of different complexity. The Craig model recognises that not all information is documented, and that information is also found in people. The Craig model will help scientists understand the key aspects of IL in the workplace. This framework is suitable for this study since it depends on a real-life environment where information activities happen.

2.8. Demographic correlates of IL

Statistical significance tests are used to determine the likelihood that a relationship identified in the data occurred only by chance: the probability that the variables in the population are truly unconnected (Allen, 2017). In other words, to come up with the correct result from a statistical examination it is crucial to understand the relationships between variables. The way the proper conclusions are obtained depends on the relationship between variables.

Therefore, exploring the association between the scientists’ ILSE and demographic variables is of importance. The outcome provides a clear vision of how information literacy

of scientists is connected with their demographic information. To accomplish this goal, a list of hypotheses need to be developed.

2.8.1. Hypothesis construction

Hypotheses relating to the second research question were developed after reviewing the existing literature and findings from previous studies. This section explains how past research has led to hypotheses about scientists' information literacy skills and how those hypotheses have been supported. Figure 2 demonstrates the development of the hypothesis, matching the independent variables with the dependent variable. Each arrow represents a hypothetical relationship between variables.

Figure 2. Matching variables in hypotheses construction.

Information literacy and gender

Prior to 1994, South Africans were living under an apartheid government. Apartheid entailed discriminating against women and minorities in employment and education, as well as restricting affordable housing, free healthcare, mobility, and economic possibilities. The system was also utilised to prevent women, particularly black women, from participating in different parts of society including education (Mabokela & Mawila, 2004). Moreover, some South African cultural practices have been forcing girls out of schools.

Much has been recommended after apartheid in terms of redressing past inequities (Bentley, 2004). Unfair discrimination on the basis of gender is prohibited under Section 9(3) of the 1994 constitution and women empowerment programs have been launched. Recently, L'Oréal in partnership with UNESCO have launched a program that aimed to support young women called "L'Oréal-UNESCO For Women in Science South African National

Programme". However, the former discrimination might have left a great impact in the lives of South African women.

Naveed (2021) exploring the connection among scientists' ILSE and demographic characteristics at Pakistan Council of Scientific and Industrial Research, Lahore made a list of findings: the scientists' information literacy self-efficacy was positively correlated with their age, gender, academic degree, work experience, and amount of research published. However, female scientists were shown to have a greater level of ILSE than men scientists. This outcome is similar to the finding of Taylor and Dalal (2017) while assessing gender disparities in IL abilities. They found that female respondents have high information literacy skills as compared to males.

Moreover, a cross-country study by Gebhardt et al. (2019) investigating the difference of gender in information literacy across fourteen (14) countries (Republic of Korea, Slovenia, Chile, Australia, Norway, Lithuania, Germany, Croatia, Russian Federation, Slovak Republic, Poland, Czech Republic, Thailand and Turkey, dependent on secondary data that was collected in 2013. The outcome of this study indicated that in twelve (12) out of fourteen (14) countries where appropriate data were obtained, female scholars outperformed male students significantly. In Thailand and Turkey, there were no sex disparities in information literacy performance.

However, a survey study by Liu and Sun (2012) investigating gender disparities in information literacy abilities at the institute of physics and electronic engineering in Taishan University discovered that gender disparities existed in information literacy. Even though both groups showed competence in information literacy, however, males had a substantially higher overall average score than females. Similar to the study of Liu and Sun (2012), Jeyshankar and Nachiappan (2021) discovered that the IL abilities of men professionals were somewhat greater than those of female professionals among research scholars of Alagappa University, Karaikudi, Tamil Nadu.

Moreover, according to report produced by Khuluvhe (2021) on Adult Illiteracy in South Africa, women (12.5 %) are more illiterate than men (11.6%). The Black or African population is the most affected with 14.0% of illiteracy. In his conclusion, Khuluvhe (2021) suggested that adult education programs should be increased to combat the illiteracy rate in South

Africa. Therefore, based on the literature above, the researcher can construct both arguments and hypothesised that:

H1: Women are more information literate that men.
H2: Men are more information literate than women.

Information literacy and age

Scientists' educational experience, confidence, and competence in the field evolved naturally as they grew older (Naveed & Rafique, 2018). However, one could argue that this can only occur under normal circumstances, where no other variables obstruct the process. As a result, the research cannot describe learning and age without also touching on or visiting the country's educational past. Prior to the advent of democracy, the Apartheid system had a significant impact on South African educational culture.

The majority of South Africans were denied the privilege of education during the apartheid period. Furthermore, those who were fortunate enough to get an education were limited to the Bantu school system, which was designed exclusively for black South Africans. Its most significant component mandated racially segregated educational institutions. The system resulted in inadequate funding and expenditures for black schools, a shortage of black school educators and their training, awful black school facilities and equipment, and a substandard education program.

After the year 1994, when democracy was established, education became free for everybody. This means that the majority of people began learning and receiving good education when they were already old. As a result of its past, SA is a nation with a history of societal divisions based on colour of the skin, gender, and place, all of which pose significant issues and contribute to social inequalities (Deacon et al., 2010). In common sense, and in agreement with Naveed and Rafique (2018), the older a person gets, the higher the information literacy or the more educated they become. However, based on the history of the country, this might not be the case. This was discussed in section 2.3.

Naveed and Rafique (2018) and Naveed (2021) exploring the connection between scientists' ILSE and demographic characteristics at Pakistan Council of Scientific and Industrial Research, discovered that scientists' information literacy self-efficacy was positively

correlated with their age. Moreover, Aharony and Gur (2017) examined the relationships between demographic characteristics and level of IL amongst scholars at Bar-Ilan University in Israel. It was discovered that older scholars have a greater degree of IL than younger students. Thus, based on the same logic, the researcher hypothesises that:

H3: Older scientists have stronger IL skills.

Information literacy and qualification level

As stated by the SCONUL (1999) and the ACRL (2000) participants who have finished a specific level of qualification are likely to have a higher IL abilities. To put it another way, people with more qualifications are anticipated to have higher levels of IL skills. Employing regression analysis when investigating information literacy skills in the working environment, Kilic (2010) discovered that there was a statistically substantial and positive link among ILSE and qualification level.

Applying similar method, Soleymani (2014) examined the correlation amongst IL and educational achievement of academics in Isfahan University of Medical Sciences. The study discovered that there is a strong positive association between IL and educational achievement of academics. Because there was a considerable positive association between IL and qualification achievement, the study concludes that information literacy-related abilities must be offered in order to improve their academic achievement. Many authors also discovered the same that is the better one's educational attainment, the greater one's IL self-efficacy (Aharony & Gur, 2017; Naveed, 2021; Naveed and Rafique, 2018; Nwosu, Obiamalu, & Udem, 2015). As a result, it is hypothesized that:

H4: More educated scientists have higher IL skills.

Information literacy and years of research

The years of research experience of scientists is also measuring the years of service/experience. Scientists at the NICD and NIOH are known to spend the majority of their time conducting research. Therefore, it is significant to explore IL and years of research experience, in order to discover if the two variables are correlated or not. The researcher had to discover if years of research of scientists influence or has an impact in their IL skills.

Exploring the connection between IL abilities and research experience, Kilic (2010) employed multiple regression inquiry to investigate the association concerning these two variables. The outcome revealed that there is no statistically significant association between IL skills and experience. However, Naveed (2021) discovered a positive association between IL skills and research experience amongst scientists. Simisaye and Olanrewaju (2020) also discovered a significant correlation between IL and years of experience. Moreover, Aharony and Gur (2017) and Franklin (2005) explored IL skills and experience amongst scholars. Their results revealed a positive relationship between IL level and the research experience. Therefore, it is hypothesized that:

H5: More experienced scientists have better IL skills.

Information literacy training and information literacy

IL training are executed in order to equip individuals with IL skills. These training can start from basic to research level skills. Many public institutions and institutional learning and development have the responsibility of preparing scholars to develop IL abilities and so that they can be independent researchers.

Public health institutes at the NHLS under information service section offer training to all NHLS staff members as part of employee skills development program. It has been realised how vital information literacy skills are within the NHLS, hence the investment to support NHLS staff members including the scientists. Moreover, there is also a huge amount physical and electronic information resources made available for all staff members within the NHLS, therefore, staff members are empowered with IL abilities to navigate through the resources so that they can utilise them during their research activities. It is very important to know how far scientists are in the level of IL training and what influence it has on their IL competency.

Naveed (2021) discovered no significant association between ILSE and IL teaching, and the Naveed assumed that the outcome was possibly due to a large percentage of respondents who never received IL training throughout their entire careers. However, Jessy et al. (2016) explored the effectiveness of information literacy training program at the pharmaceutical sciences at Manipal University in Manipal. A pre and post case study employing structured

questionnaires investigated 125 participants. The research discovered that the IL training received at the Health Sciences Library of Manipal University had a great influence on effective IL skills. This outcomes were comparable to those of Weightman et al. (2017) who has proven that information literacy training is useful in improving IL skills.

In South Africa, Lockhart (2015) studied the application of IL abilities following the attainment of a Certificate in Information Literacy (CIL) in Cape Peninsula University of Technology (CPUT), SA. This study confirmed that providing courses like CIL, increased students' IL abilities. As a result, the researcher hypothesized that:

H6: Scientists who have received IL training have higher level of IL skills.

Hypotheses for Information Literacy Skills:

Table 1 shows a list of six hypotheses proposed after reviewing prior investigations. All six hypotheses reflect the relationship of each of the six independent variables (gender, age, qualification, research experience, and information literacy training received) with the dependent variable (ILSE). These hypotheses helped the study investigate the link between information literacy abilities and the demographic features of scientists.

Variables	Hypotheses
Gender	H1: Women are more information literate that men. H2: Men are more information literate than women
Age	H3. Older scientists have stronger information literacy skills.
Qualification level	H4. More educated scientists have higher information literacy skills.
Research experience	H5. More experienced scientists have better information literacy skills.
IL instructions	H6. Scientists who have received IL training have higher level of information literacy skills.

Table 1. Hypotheses for information literacy skills

3. RESEARCH METHODOLOGY

This chapter identifies the overall methodology and techniques that were utilised in order to provide answers to the questions in the research. This chapter clarifies the research approach, research tools, and their application, sampling, the process of analysis, limitations, feasibility, and positionality, ethics and validity, reliability, and dependability of the study. The research approach aims to seek data that will assists in answering the study's research questions, which were stated in the first chapter.

3.1. Research Approach

Research strategy provides direction to the study by identifying the process or approach, which the study adopted. It permits the investigator to find responses to the research questions, which shapes the movement and arrangement of the research. Thus, a suitable research strategy depends on the goals of the study. According to Kumar (2019), research strategy is comprised of three research methods: quantitative, qualitative and mixed research strategy. All approaches have the same objective of producing or finding answers to the research questions but using different data collection instruments to get answers.

A quantitative study uses numbers and statistical techniques to process data and summarize conclusions in order to measure a phenomenon (Bryman, 2016). Qualitative study is carried out in a natural context and is more focussed on examining situations from the perspective of those involved, with the objective of comprehending why individuals react or behave in the manner that they do (Creswell & Creswell, 2018). A mixed method is a method that combines quantitative and qualitative methods.

According to Creswell and Poth (2016), quantitative research is useful in determining people's opinion, attitudes, and behaviour in relation to any given issue. Therefore, a quantitative cross-sectional approach was adopted to explore IL among scientists working at public health institutes at the NHLS in South Africa. Primary and secondary data were obtained for the study. The secondary data were gathered from published research to support the results of the primary data. Primary data was gathered using a quantitative research method because it is more specific, and it promotes the use of close-ended questions to strictly collect relevant data.

The study used a cross-sectional approach, with data collected at a particular moment in time (Bryman, 2019, p. 41) from the sample which is the two specialised public health institutes at the NHLS (NICD and NIOH). The cross-sectional design involves the gathering

of data from more than one case (Bryman, 2016) and it is more appropriate for this research because it is affordable and simple to study as compared to the before-and-after and longitudinal study designs that require data collected on more than one occasion (Kumar, 2019). A cross-sectional design is commonly referred to as a survey design and examines the relationships between variables (Bryman, 2016). Therefore, the cross-sectional design allowed the study to explore the association between scientists' ILSE and their demographic characteristics.

This research adopted a post-positivist position (logical empiricism) by measuring the level of IL, the perceptions about IL, the usage of information, and the information needs of scientists working at public health institutes at the NHLS based on the specific measurement instrument that is verifiable (Wagner et al., 2012). It assumes reality can be measured but only imperfectly, which differentiates it from pure positivism (Wagner et al., 2012).

Numerous empirical studies have investigated IL in the working environment. However, Anwar (1981) followed by Naveed & Rafique (2018), collected data using a quantitative method when investigating IL among working scientists in Pakistan. Therefore, a quantitative method benefited the study because the measures used can be tested for validity and reliability (Bryman, 2016).

3.2. Research tools and their application

Before data can be collected, the data collection instrument needs to be described. A research tool or instrument is anything that can be used to collect data needed in a research process, "for example observation forms, interview schedules, questionnaires and interview guides" (Kumar, 2019, p. 41).

This study draws on primary data. Therefore, the effective and convenient collection tool was the survey method using questionnaires to measure the level of IL among scientists at public health institutes at the NHLS in SA. According to Mills and Gay (2019), survey research is a widely used tool for determining the current situation, preferences, behaviours, concerns, and opinions of big groups and people. The literature reviewed by the researcher indicate that majority of researchers have used self-efficacy, rather than actual performance, to assess information literacy abilities (Naveed & Rafique, 2018; Richardson, 2019; Robertson & Felicilda-Reynaldo, 2015; Simisaye & Olanrewaju (2020). Self-efficacy is an individual's confidence in his/her capacity to carry out the behaviours required to achieve specified goals (Bandura, 1997). As a result, this study employed Kurbanoglu et al. (2006)

Information Literacy Self-Efficacy Scale (ILSES). This scale had 28 items allocated into seven sub-scales.

The ILSES was designed and developed to measure self-efficacy for IL, and it was recommended as very dependable, widely utilised, and having an adequate length to measure ILSES (Keshavarz et al., 2017; Mahmood, 2017; Naveed & Rafique, 2018). The usage of a 28-item measure is highly recommended for identifying people who have poor beliefs in their own efficacy, which might be a substantial barrier to them exploring their information literacy abilities.

Bandura (1997) defines self-efficacy as people's conviction in their own capacity to plan and carry out the steps necessary to achieve a goal. As a result, self-efficacy is utilised in this study to assess scientists' opinions of their IL skills.

Questionnaires (provided in the appendix) as a tool was beneficial for this research, as it ensures that participants involved and selected were in a good position to offer the researcher with the relevant data necessary required to inform analysis and influence the researcher's decisions at the end. Questionnaires are cheaper, quicker, and very convenient to the respondents (Bryman, 2016). Taking into account that scientists are frequently occupied, utilisation of fully-structured questionnaires was more suitable because it permitted the self-completion of the questions at one's convenient time and it guaranteed anonymity (Kumar, 2019). Scientists were surveyed using an online self-administered questionnaire. This method was very appropriate because the research respondents are geographically spread, which means Drop-off and Pick-up (DOPU) techniques were going to be very costly.

The questionnaire was separated into five (5) sections: Section 1: Demographic characteristics; Section 2: ILSES; Section 3: Perception about the significance of IL in the working environment; Section 4: The usage of information resources; Section 5: Information needs.

A cover letter (attached in the appendix) was provided together with the questionnaire link to provide a background and the purposes of the research. A return address for the survey was provided, as well as a deadline for its submission.

3.3. Sampling.

According to Bryman, (2016), a sampling is a number of participants extracted from the target population for the purpose of research study. A sample must represent the target population so that the outcome of the research can be generalised to the whole population.

The population of this quantitative cross-sectional research is the scientists currently employed at the NHLS institutes in SA. Therefore, this study adopted a census technique to gather data from 118 scientists working at the NICD and the NIOH. The most recent statistics on employed scientists were acquired from the human resources centres of both institutes. All the scientists were included to get a sample that is good enough for the analysis. A census technique is more practical in this study because it provided a reasonably good and satisfactory response rate that can permit the reflection of the whole population.

Population	Respondents			Response rate
	Female	Male	Total	
118	52	16	68	58%

Table 2: Scientists' population and response rate at the NICD and NIOH.

Naveed and Rafique (2018) also adopted the census method when investigating IL of scientists employed by the PCSIR which yield a good response rate of 86.4% and only 13.6% of scientists did not participate however it was not too extreme to influence the non-response bias.

3.3.1 Response rate

The response rate is the proportion of individuals that agree to participate in a survey. Data was collected using online and self-administered techniques.

The scientists volunteered to take part in the online survey and submitted the completed questionnaires. The challenge faced by the researcher was the slow response rate by the participants and it needed a lot of patience because scientists were very busy and others were on leave.

The data collection process took place in April and May of 2021. Therefore, in order to get a decent response rate, the researcher distributed the survey through the NICD and NIOH communication departments. In addition, the researcher sent personal emails to respondents encouraging them to participate in the study. Communication managers also sent reminders to all scientists at both institutions.

All 68 questionnaires were properly filled and submitted successfully which achieved 58% response rate. In many nations, the number of people who respond to social surveys is decreasing (Bryman, 2016). This suggests that people are becoming increasingly hesitant to take part in social survey research. Therefore, numerous researchers indicate that a 50% response rate is acceptable in social research survey (Babbie, 1973); Kidder, 1981; Mugenda & Mugenda, 2003). However, Fincham (2008) argues that researchers for survey research are expected to have a goal to achieve response rates of close to 60%. Nulty (2008) claim that, despite our best efforts, achieving response rates of greater than 70% will be difficult for social research survey. Therefore, the 58% response rate that have been achieved in this study is acceptable for data analysis.

A 50% correctly filled response rate can be used to determine study objectives (Mugenda & Mugenda 2003). A study by Mugambi (2017) on a questionnaire-based survey, having examined 347 registered nurses with 189 respondents, track down a normal response rate of 54%. Therefore, the rate of response of this research is demonstrating a reasonable and acceptable response (58%).

The remainder of the participants were either not accessible because of vacation or they did not respond because of individual reasons and administrative obligations. It's also important to note that this research was conducted during the lockdown, when the majority of people were working from home, making it impossible to find them, and some were suffering from pandemic-related fear. As a result, in these trying circumstances, one would not expect a high response rate.

3.3.2. Possible bias.

One of the most harmful setbacks is that self-completion questionnaires normally bring about lower response rates and participants neglect to bring them back (Kumar, 2019), and in the event that a response rate is low, it appears to be likely that the threat of bias in the results will be more prominent (Bryman, 2016). The respondents may also fail to keep to the deadline, a reminder was sent to all respondents. Addressing these issues also increased the response rate.

The growing availability of devices and internet connections has prompted the expansion of online survey administration. However, since online survey administration is a relatively new method of distributing the questionnaires, it may not be appreciated as compared to more traditional means.

This research managed to reach a 58% response rate which is a good response rate for an online survey. However, these response rate of 58% could contribute to a potential non-response bias. Only 42% of scientists did not participate.

3.4. Process of analysis

Data analysis is a way of breaking down data into smaller pieces, to make a clear considerate of data. According to Kumar (2019, p. 43) “the way you analyse the information you collected largely depends on the type of information (descriptive, quantitative, qualitative or attitudinal); and the way you want to communicate your findings to your readers”

This research aimed to measure the level of IL skills of scientists working at public health institutes at the NHLS and it is expected to produce quantitative statistics in conjunction with the objectives of the study. Therefore, SPSS software was utilised to code and analyse the gathered data. Scientists' ILSE; opinions about the significance of IL; utilisation of information resources and the information needs data were analysed with the descriptive statistics method. To show metrics of central tendency, descriptive statistics were used (mean, median, and mode).

The main purpose of investigating the relationship between variables is to find out if one variable can have an effect on another variable. Therefore, the correlations between IL and scientists’ demographic characteristics: age, gender, years of experience, IL training received, were explored using inferential statistics. Furthermore, the influence of scientists' demographic factors on their ILSE was investigated using regression analysis. Correlation analysis gives more insight that can be useful in developing IL interventions. The SPSS was also utilised to create tables for the demonstration of data produced from the objectives.

3.5. Limitations, feasibility, and positionality

As respondents can check all the questions before responding, which normally occurs, how they respond to a specific query might be influenced by their awareness into different queries (Kumar, 2019), therefore, participants were requested to be loyal when responding to questions as failure to do so would result in gathering false data which will have an impact on the results' validity.

While the authenticity of the replies is assumed, it should be mentioned that potential biases may be present. Because the research collects people's opinions and self-assessments of their ability levels, it's possible that participants exaggerated their abilities. This is human nature. The participants were encouraged to be truthful in their responses, however, the

likelihood of a social desirability bias is inevitable, which suggests that individuals have a desire to represent themselves better to an investigator, employer, or community (Fowler, 2013).

The quantitative research strategy includes an organized survey with close-ended questions. It prompts restricted results, and the outcomes can't generally speak to the genuine happening, in a generalised form. The respondents have restricted choices of reactions, in view of the determination made by the researcher. Nevertheless, this research will influence future research that aims to employ different method rather than a quantitative method to study IL amongst scientists.

Moreover, this study has surveyed a limited number of working scientists at public health institutes at the NHLS in South Africa, therefore, the outcomes cannot be summed up to reflect the whole population. A nationwide survey is needed to be strengthened in recognising the information literacy of scientists in public health institutions in South Africa. However, this study is a first step for setting a foundation that will influence future research that aims to create generalisable outcomes of IL of scientists in public health institutions in South Africa as no other studies have been piloted.

According to Savin-Baden and Major (2013), within specific research, positionality refers to the researcher's choice of position. It has an impact on every component and stage of the research, including how the research is being conducted, as well as the outputs and findings of the research (Holmes, 2020; Rowe, 2014). Therefore, the researcher's frank and transparent declaration and explanation of positionality should demonstrate how the researcher thinks they have or could have, affected their study (Holmes, 2020). Before presenting the results, and in the spirit of self-reflection, the researcher recognizes her position as a Black South African woman. The researcher is an employee at the NHLS organisation holding a Librarian position. The researcher is an advocate for information literacy within the NHLS. An insider position provides better access to the community being researched since the researcher is one of them (Sanghera & Thapar-Björkert, 2008).

The researcher believes that IL is a necessary ability for everyone to acquire to thrive in this data-driven society. It is also the researcher's job to carry out information literacy training in the NHLS. As a result, the researcher admits that her positionality may have had an impact on her study project. The participants may be less inclined to divulge their inadequate information literacy abilities than they are to an outsider with whom they can have no further interaction. As a result, participants may rate themselves higher than their real abilities.

Therefore, the introductory letter encouraged respondents to be honest when answering questions and they are assured anonymity. To guarantee trustworthiness, the researcher has verified that the data is properly assessed to avoid premature conclusions. It is critical to identify and handle risks, difficulties, and conflicts during the research study to perform an ethical and credible investigation that achieves the intended results (Fleming, 2018).

3.6. Ethics

The researcher sought permission from the Human Research Ethics Committee (Non-Medical) at the University of Witwatersrand because of ethical concerns. A permission letter was requested from the Executive Director of the NHLS immediately when the ethics clearance certificate is granted.

A cover letter was also provided together with the questionnaire link. In the cover letter, the researcher begins by presenting herself and the institution she is representing; outline the purposes of the investigation; highlight the research's importance, and provide guidelines. The contact number was provided so that they can contact the researcher if they have any inquiries.

Participants were guaranteed that their input is private and the anonymity is fundamental. The participants were also guaranteed that their involvement will not expose them to any sort of damage, physical, emotional, social, and mental harm. All participants were informed that they are participating on a volunteer basis and they have the right not to participate if they do not want to.

To address plagiarism, irrespective of the level of knowledge borrowed, all sources that were used in the study were cited in the text and referenced at the conclusion of the research report. The researcher also used the Turnitin system to detect any plagiarism.

3.7. Validity, reliability, dependability

To ensure validity, the researcher employed the census technique to ensure that every scientist in all the institutes is represented. Since the questionnaire collects opinions through self-evaluations, participants might detail their aptitudes higher than ordinary. Participants are anticipated to be truthful when responding to questions, however, the possibility for bias exists.

To guarantee the reliability of this study, the survey instrument was piloted prior to its use to establish how effectively the research instruments perform (Bryman, 2016). This was done to test the data collection instrument if it will yield relevant information and adjusted

appropriately. Piloting instruments is not just important for ensuring that survey questions work properly but it is also important for ensuring that the research instrument as a whole work properly (Bryman, 2016). Because there was no interviewer present to clear up some questions, the pilot study was important in the study because it is a self-completion questionnaire.

According to Taylor (2006), a pilot study should be conducted in a manner similar to the actual study, with the same research instruments and, if possible, the same target group. A significant portion of the research questionnaire was derived from Kurbanoglu et al., (2006) investigations. As a result, the survey was given to a pilot group of 15 scientists from both institutes (NICD & NIOH) before being opened to all scientists, and the survey questions was adjusted based on their response. The purpose of this adjustment was to make the instrument more usable and the questions more valid.

For dependability assurance, the researcher adopted the auditing approach (Bryman, 2016). All records of the study including questionnaires collected or returned, data analysis results from the SPSS software is stored in a manner that is accessible for an audit if the need arises.

4. PRESENTATION OF RESEARCH RESULTS

4.1. Introduction

This chapter presents the study's outcomes in accordance with the study's objectives and research questions. This research looks on the level of IL proficiency among scientists working at public health institutes at the NHLS (NICD & NIOH) in South Africa.

4.2. General information

The research study was executed by the researcher. Both institutions, the NICD and the NIOH showed support in the research. Before data analysis, the collected questionnaires from Google forms were imported to an excel spreadsheet to check the correctness and completeness of data bringing about no inadequate survey to manage. The data were imported to SPSS for data analysis.

This research explored the demographic variables of scientists (age, gender, years of experience, educational background, and information literacy training received), scientists' opinions on the significance of IL, the usage of information resources by scientists, information needs of scientists, scientists' perceived ILSE. The correlations between the demographic characteristics and scientists' perceived ILSE. To study these connections, six hypotheses were used. Correlation coefficients and t-tests statistical analyses were employed in this process. Furthermore, the influence of demographic variables was determined using regression analysis. The researcher was unable to compare the demographic characteristics of the sample except for the gender with the population as this information was not disclosed by the human resource centres of these institutes (NICD & NIOH). Therefore, the findings of descriptive analysis of variables are provided below, preceded by bivariate analysis and regression analysis.

4.3 Descriptive analysis of scientists' demographic and academic profile.

It is important to explore the demographic and academic profile of the respondents before examining their IL self-efficacy. Therefore, the tables below show descriptive information received from the sample. When it comes to gender equality, 76.5% of the sample (n=52) is female and 23.5% (n=16) is male (Table 3). Gender proportions in the NICD and NIOH populations are similar to and comparable with real proportions (See table 3).

	Frequency		Percent		Cumulative Percent	
	Population	Sample	Population	Sample	Population	Sample
Female	94	52	80	76.5	80.0	76.5
Male	24	16	20	23.5	20.0	23.5
Total	118	68	100	100	100	100

Table 3: Gender distribution (n-68)

For the sake of analysis, the age ranges were formed between 21 and 51 years and above with an average age of 39.7 and a minimum of 23 with a maximum of 62 (Table 4). Greater part of these respondents falls in the age sections of 21-30 (n=20, 29.4%) and 41-50 years (n=20, 29.4%), followed by those who are in age section of 31-40 years (n=18, 26.5). Only 10 (14.7%) of those surveyed were beyond the age of 51. The age proportions of participants showed that they were in the centre and dynamic age of their lives.

Age (years)	Frequency	Percent
21-30	20	29.4
31-40	18	26.5
41-50	20	29.4
51 and above	10	14.7

Table 4: Age group distribution (n=68)

Qualification level is measured in five groups. According to Table 5, 33 (48.5%) scientists have completed a master's degree, 16 (23.5%) scientists have earned a bachelor's degree, and another 16 (23.5%) scientists have earned a doctorate (Ph.D.). The number of scientists who obtained a diploma is 3 (4.4%). The findings also show that scientists have qualifications higher than a senior certificate. This could be due to the fact that both institutes (NICD and NIOH) need a diploma as a minimum entry qualification for scientists.

	Frequency	Percent	Cumulative Percent
Senior certificate	0	0	0
Diploma	3	4.4	4.4
Bachelor’s degree	16	23.5	27.9
Masters	33	48.5	76.5
Doctorate (Ph.D.)	16	23.5	100.0
Total	68	100.0	

Table 5: Qualification level (n=68)

The years of research experience of scientists is also measuring the years of service. The range of experience was from 1 to 16 years and above. Years of research experience were divided into five groups, each with a 5-year interval. Table 6 indicated that most respondents (n=21, 30.9%) had less than 5 years of research experience, followed by those who had work experience of 16 and above (17, 25%). 16 (23.5%) scientists had research experience of 11-15, while 14 (20.6%) had only 6-10 years of research experience.

	Frequency	Percent
1-5	21	30.9
6-10	14	20.6
11-15	16	23.5
16 and above	17	25.0
Total	68	100.0

Table 6: Years of research experience (n=68)

Respondents were also requested to indicate the number of research articles (publications) they have produced. According to the output in Table 7, 23 (33.8%) scientists had less than 5 publications, 18 (26.5%) scientists had more than 16 publications, and 12 (17.6%) scientists had up to 10 publications. Whereas only 15 (22.1%) scientists did not have publications. These findings suggest that the majority of scientists are publishing, which may be because both organizations are research institutes where personnel are encouraged to write scientific papers.

	Frequency	Percent
0	15	22.1
1-5	23	33.8
6-10	12	17.6
11 and above	18	26.5
Total	68	100.0

Table 7: Number of research publications (n=68)

Since competency in IL has been established in the healthcare literature as a necessity for the profession (Arguelles, 2012). Therefore, this component was intended to examine whether scientists have trained extensively in information literacy.

Table 8's output demonstrates that the majority of scientists (n=27, 39.7%) had obtained training in IL at the research phase. 23 (33.8%) scientists received basic information searching skills. There were very few scientists (n=10, 14.8%) who had no IL training.

	Frequency	Percent
Never received IL training	10	14.8
Basic information searching skills	23	33.8
Guided library tours	5	7.4
Advanced IL skills	3	4.4
Research level skills	27	39.7
Total	68	100.0

Table 8: IL training level (n=68)

These results could be attributed to the continual information literacy training provided by librarians at both institutes (NICD and NIOH) to all employees. Furthermore, the majority of South African public institutions and institutional learning and development are also preparing scholars to increase their information literacy skills and become independent researchers by offering IL training to all enrolled scholars. The skills learned can also be applied in the workplace. This could have influenced the outcomes as well. The majority of scientists are eager to enhance their level information literacy abilities. According to these findings, the vast majority of scientists at the NHLS have gained adequate information literacy skills throughout their careers over the past years.

4.4 Scientists' opinions on the significance of IL at public health institutes at the NHLS.

The respondents were requested to evaluate the significance of IL in the working environment on a Likert scale of 0 to 4, with 0 indicating strongly disagree, 1 indicating disagree, 2 indicating uncertainty, 3 indicating agree, and 4 indicating strongly agree.

Table 9 shows the outcomes of the investigation. The vast majority of these scientists (n=63, 92.6%) agree that missed opportunities can result from a lack of workplace IL, only a few scientists (n=3, 4.4%) were uncertain and only 2 (2.9%) scientists strongly disagree. The majority of scientists (n=64, 94.1%), agree that workplace IL is important for the organization (with only 54.4% who strongly agree and 39.7% who agree), and 27 (39.7%) scientists agree. There were only 4 (5.9%) scientists who strongly disagree. The majority of scientists

(n=46, 67.6%) agree that IL should be included in job descriptions, 17 (25.0%) scientists are not sure, whereas only 5 (7.3%) scientists disagree. 35 (51.5%) that workplace IL testing should be included in the hiring process. 24 (35.3%) scientists are uncertain, and 9 (13.2%) scientists disagree.

	Strongly disagree		**Disagree**		**Uncertain**		**Agree**		**Strongly agree**	
	N	**Row N %**	**N**	**Row N %**	**N**	**Row N %**	**N**	**Row N %**	**N**	**Row N %**
Lack of workplace IL can lead to missed opportunities.	2	2.9%	0	0.0%	3	4.4%	33	48.5%	30	44.1%
Workplace IL is important for org.	4	5.9%	0	0.0%	0	0.0%	27	39.7%	37	54.4%
Workplace IL should be included in job descriptions	3	4.4%	2	2.9%	17	25.0%	36	52.9%	10	14.7%
Inclusion of workplace IL testing in the recruitment process	2	2.9%	7	10.3%	24	35.3%	28	41.2%	7	10.3%

Table 9: Scientists' perception of IL in the workplace (n=68).

4.5 The usage of information resources by scientists at public health institutes at the NHLS.

4.5.1 Scientists' preferred source of information

According to research on nurse's information-seeking behavior, knowing of an information source does not guarantee that it will be used (Griffiths, 2003). However, Lialiou and Mantas (2016) suggest that scientists who want to stay current in their professions must be adaptable, utilise a variety of information resources, and be willing to try new diverse tactics when researching unknown and new research topics. As a result, it is critical to determine how scientist behave when seeking information. Therefore, the usage of information resources by scientists were explored by asking them what information source do they prefer, what is their preferred medical database and how do they usually access information they required.

The respondents checked more than one item in table 10, therefore, the total replies are greater than 68. Most scientists (n=56, 82.4%) have indicated that websites are their favorite source of information followed by databases (n=55, 80.9%). This could be due to the fact that both organizations (NICD and NIOH) have subscriptions to a variety of medical databases and also use open-source databases. Websites are easily accessible as long an individual has an active internet connection. Rather than majority of medical databases that need an individual to first purchase a subscription.

The highest percentage of scientists that preferred websites as their source of information could be because most scientists rely on reliable organisations that supply relevant information through their websites, for example, the World Health Organisation (WHO), the Centers for Disease Control and Prevention (CDC), including the NHLS, NICD and the NIOH. These websites are currently leading in providing information regarding the CORONA virus across the world.

Books were preferred by 35 (51.5%) scientists as a source of information. Both institutions feature physical libraries that are open during business hours to assist employees with their information needs. The majority of people still prefer physical libraries to electronic libraries because electronic access to knowledge is still difficult for certain individuals and requires equipment that many people do not have.

People (n=17, 25.0%) and encyclopaedias (n=17, 25.0%) are other sources of information for some scientists. There are very few scientists who consider media (newspaper (n=11, 16.2%), magazines (n=5, 7.4%), radio (n=4, 5.9%) and TV (n=3, 4.4%) as their source of information. This could be because health-related disinformation and falsehoods (fake news) on media pose a possible hazard to public health (Waszak, et al., 2018).

		Responses	
		N	Percent of Cases
A useful source of information	Websites	56	82.4%
	Radio	4	5.9%
	TV	3	4.4%
	Newspapers	11	16.2%
	Books	35	51.5%
	Databases	55	80.9%
	People	17	25.0%
	Magazines	5	7.4%
	Encyclopedias	17	25.0%

Table 10: Scientists' useful source of information (n=68).

4.5.2 Scientists' preferred databases

As demonstrated in Table 10, 55 (80.9%) scientists preferred databases as their source of information. As a result, it is critical to figure out how often scientists access various databases for medical and healthcare professionals. Table 11 shows that PubMed, with the highest mean score of 3.11, is the most commonly accessed database among scientists at the NICD and NIOH, followed by Science Direct with a mean score of 2.073. The least visited database is CINAHL (M=0.205) with 59 (86.8%) scientists who never used it, Cochrane (M=0.588) with 42 (63.2%) scientists who never used it and Up to date (M=0.838) with 44 (64.7%) scientists who never used it.

The frequent use of ASM journals, Science Direct, and MEDLINE databases can be attributed to the fact that the NHLS libraries subscribe to these databases.

	Never		Quarterly		Monthly		Weekly		Daily		Mean
Medical databases	F	%	F	%	F	%	F	%	F	%	
Science direct	10	14.7%	13	19.1%	15	22.1%	22	32.4%	8	11.8%	2.07
ASM journals	20	29.4%	16	23.5%	12	17.6%	18	26.5%	2	2.9%	1.50
MEDLINE	24	35.3%	17	25.0%	11	16.2%	12	17.6%	4	5.9%	1.33
PubMed	3	4.4%	9	13.2%	12	17.6%	27	39.7%	17	25.0%	3.11
Up to date	44	64.7%	5	7.4%	7	10.3%	10	14.7%	2	2.9%	.83
CINAHL	59	86.8%	5	7.4%	3	4.4%	1	1.5%	0	05	.20
Cochrane	42	61.8%	16	23.5%	7	10.3%	2	2.9%	1	1.5%	.58

Table 11: Frequently used databases (n=68).

4.5.3 Scientists' way of accessing information.

Scientists were asked to identify their prefered manner of accessing information between searching for information on their own and asking a librarian to do the searching on their behalf.

As seen in Table 12, a huge majority (n=62, 91.2%) of scientists indicated that they generally receive information for work by searching by themselves. And very few (n=6, 8.8%) indicated that they ask librarians to search on their behalf.

		Frequency	Percent
	Yes, I search myself.	62	91.2
	Not personally, but I do ask a librarian to search on my behalf.	6	8.8
	TOTAL	68	100.0

Table 12: How scientists receive information for work (n=68).

4.6 The information needs of scientists at public health institutes at the NHLS

Because the work environment for scientists is so complicated, it's essential to understand their healthcare information demands in order to identify research use and information literacy skills that are required. In this case, the section aimed to figure out for what professional purpose scientists seek information.

The respondents checked more than one item in table 13, therefore, the total replies are greater than 68. As displayed (Table 12), the majority (n=67, 98.5%) of scientists need information for a research project, 65 (95.6%) require information for training, while 48 (70.6%) need information for making an informed decision and only 44 (64.7%) require information for presentations.

		Responses	
		N	Percent of Cases
Need for information	In-service training	65	95.6%
	Presentation at a professional meeting	44	64.7%
	Making informed decision	48	70.6%
	Research project	67	98.5%

Table 13: Scientists' need for information (n=68)

4.7 Scientists' ILSE

ILSES, created by Kurbanoglu et al. (2006), was used to assess IL. This scale is comprised of 28 statements divided into seven sub-scales. The overall ILSES and its sub-scales, notably: "determining the need for information" (1 item), "starting the search" (3 items), "finding and retrieving information" (8 items), "gauging and understanding the information" (5 items), "analysing, summarising, and utilising the information" (2 items), "sharing information" (7 items), and "reviewing the processes" (2 items).

The participants were requested to measure their level of ILSE on five Likert scales (1= Fully Agree, 2 = Agree, 3 = Uncertain, 4 = Fully Disagree and 5 = Disagree). Calculation of mean and standard deviation of the participants' responses for scale and all subscales was done. The ILSES has been used in the medical field to assess IL self-efficacy (De Meulemeester, 2018; Özbıçakçı, Gezer, & Bilik, 2015; Richardson, 2019; Robertson & Felicilda-Reynaldo, 2015), whereas other researchers used these measurements to explore the participants' level of IL self-efficacy and several other researchers used it to evaluate respondents' degrees of information literacy self-efficacy (Aharony & Gur, 2017; Bakbak, 2019; Naveed & Rafique, 2018; Rafique, 2021). Table 14 shows the distribution of the respondents' mean, median, and standard deviation ILSES for each component of the IL abilities process.

	Mean	Mode	St. D
A. Defining an information need	4.132	5.00	1.049
B. Initiating the search strategy	4.259	5.00	0.917
C. Locating and accessing the resources	3.884	3.00	0.690
D. Assessing and comprehending information	3.958	4.00	0.711
E. Interpreting, synthesising, and using the information	4.014	4.00	0.814
F. Communicating information	4.109	5.00	0.786
G. Evaluating the product and process	3.941	4.00	0.830
ILSES	4.016	3.00	0.616
Scale: (1= Fully disagree, 2= Disagree, 3= Uncertain, 4= Agree, 5= Fully agree)			

Table 14: Scientists' IL self-efficacy (n=68)

These scientists rated themselves as 'fully agree/very true' on the overall ILSES, indicating that they were self - assured in IL. The information presented in Table 14 indicates that the highest mean score for ILSE was in initiating the search strategy (M=4.259) and the bottom mean score was in locating and accessing the resources (M=3.884). However, the overall scientists' ILSE mean score is M=4.016.

Nevertheless, the study's finding of quite high self-perceptions of information literacy abilities can be viewed as a potential weakness, which is described in the limitation section (3.5). This result, however, can be attributable to the fact that both organisations (NICD & NIOH) provide information literacy training to all interested employees.

4.8 Relationship testing

Using inferential statistics, the correlations between the total of the overall scales' mean scores as well as sub-scales and demographic characteristics for example age, sex, academic qualification, and research experience were investigated. This is done to measure the extent to which two variables are related. A lot of research that studied information literacy have successfully employed these tests in relationship testing (Kilic, 2010; Naveed, 2021; Naveed & Rafique, 2018; Punter et al., 2017; Taylor & Dalal, 2017)

Regression analysis was performed to see how strong the association amongst one dependent variable and the independent variables was. Regression analysis also help to forecast the significance of a dependent variable depending on a single or more independent

factors (Sakind, 2017). Regression analysis can be used to estimate how much variation in a single response is accounted for by a group of independent variables. Therefore, the strength of the association between scientists' demographic characteristics and ILSE was investigated in this case.

Regression analysis' primary purpose is to extract the link amongst each independent variable and the dependent variable. The researcher needs to determine if the scientists' ILSE are affected by their demographic factors (Gender, age, qualification, research experience and information literacy training level). This analysis has been done to check which one of these variables carries a significant impact on ILSE. As a result, this type of analysis is known as multiple regression analysis. Instead of using just one independent variable, multiple regression analysis predicts a result using two or more.

However, before conducting regression analysis, the researcher must be mindful of the possibility of collinearity between variables. Multicollinearity occurs when variables are excessively correlated (Ho, 2006). When you fit the model and analyse the findings, a high degree of correlation between variables can present complications. Therefore, the analysis will exclude variables that are found to be highly linked. Table 15 displays the associations amongst the variables and the Variance Inflation Factor (VIF) is displayed in Table 16.

		Gender	Participants Age	Highest qualification	Years of Research	Research published	IL level
Gender	Pearson Correlation	1	-.169	-.112	-.262*	-.150	.059
	Sig. (2-tailed)		.167	.362	.031	.224	.635
	N	68	68	68	68	68	68
Participants Age	Pearson Correlation	-.169	1	.433**	.799**	.664**	.267*
	Sig. (2-tailed)	.167		.000	.000	.000	.028
	N	68	68	68	68	68	68
Highest qualification	Pearson Correlation	-.112	.433**	1	.529**	.498**	.289*
	Sig. (2-tailed)	.362	.000		.000	.000	.017
	N	68	68	68	68	68	68
Years of Research	Pearson Correlation	-.262*	.799**	.529**	1	.649**	.319**
	Sig. (2-tailed)	.031	.000	.000		.000	.008
	N	68	68	68	68	68	68
IL training level	Pearson Correlation	.059	.267*	.289*	.319**	.255*	1
	Sig. (2-tailed)	.635	.028	.017	.008	.036	
	N	68	68	68	68	68	68

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 15: Correlations matrix

Model		Collinearity Statistics	
		Tolerance	VIF
1	Gender	.905	1.105
	Participants Age	.323	3.097
	Highest qualification	.663	1.507
	Years of Research	.290	3.444
	IL training level	.857	1.167

a. Dependent Variable: ILSES

Table 16: Coefficients[a]

There were moderate association rates among age, qualification, research experience and research publication according to the correlation matrix and VIF, therefore, the rates were not high enough to be excluded. The model looked at the influence of independent and control variables on the dependent variable ILSE (gender, age, qualification, research experience, and information literacy training received). Table 17, 18 and 19 shows the summary of the findings.

The following is the model's baseline equation for ILSES of respondents:

$$E(Y_{ILSES}) = B_0 + B_1X_{1(Gender)} + B_2X_{2(Age)} + B_3X_{3(Qualification)} + B_4X_{4(Years\ of\ Research)} + B_5X_{5(IL\ training\ level)}$$

The variables' values were entered as follows into the equation:

$$E(Y_{ILSES}) = 3.213 + (-0.021)\ X_{1(Gender)} + -0.003\ X_{2(Age)} + 0.334\ X_{3(Qualification)} + -0.042\ X_{4(Years\ of\ Research)} + 0.096\ X_{5(IL\ training\ level)}$$

The connection between the dependent variable (ILSES) and the independent factors (gender, age, qualification, research experience, and information literacy training received) was statistically significant, according to the overall F statistics (F = 4.435, p.001). The R^2 = .304 depicts that model 1 accounted for 30.4% of the variance in ILSE. In other words, 30.4% change in ILSE can be accounted by scientists' demographic factors. There is a significant impact of scientists' demographic factors on ILSE.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.551[a]	.304	.235	.53883	2.372

a. Predictors: (Constant), IL training level, Gender, Highest qualification, Participants Age, Years of Research

b. Dependent Variable: ILSES

Table 17: Model Summary[a]: ILSES vs. Independent Variables.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.727	6	1.288	4.435	.001[b]
	Residual	17.711	61	.290		
	Total	25.437	67			

a. Dependent Variable: ILSES

b. Predictors: (Constant), IL level, Gender, Highest qualification, Participants Age, Years of Research

Table 18: Anova: ILSES vs. Independent Variables.

This research proposed six hypotheses that reflect six independent variables (gender, age, qualification, research experience, and information literacy instruction received) and the dependent variable (ILSE). Table 19 summaries the findings of multiple regression analysis:

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.213	.367		8.753	.000
	Gender	-.021	.162	-.015	-.132	.895
	Participants Age	-.003	.011	-.059	-.312	.756
	Highest qualification	.334	.100	.437	3.333	.001
	Years of Research	-.042	.104	-.080	-.404	.687
	IL training level	.096	.041	.268	2.322	.024

a. Dependent Variable: ILSES

Table 19: Coefficients: ILSE vs. Independent Variables.

Hypothesis:

H_1: Women have more information literacy skills than men.

The first hypothesis suggests that women have greater information abilities than men. The hypothesis tests if women have a significant impact on ILSE than men. Therefore, the results indicate that women have higher information literacy skills as compared to men. Furthermore, this outcome doesn't show a positive association between women and IL abilities (b = -.021, p .895). The R^2 = .001 depicts that women explain 00.1% of the variance in ILSE. This means that the 00.1% change in ILSE can be accounted for by the women.

Therefore, the researcher rejects the null hypothesis that women have no information literacy skills than men (H_1).

H_2: Men have more information literacy skills than women.

The second hypothesis suggests that men have greater information abilities than women. The hypothesis tests if men have a significant impact on ILSE than women. However, the regression analysis always rejects men (independent variable) during the test. This could be due to the little number of males (16) who participated in the study as compared to females (52). Therefore, the outcome indicates that men are not more information literate than women. The outcome revealed no statistically significant correlation between men and ILSE as compared to women. These results direct a negative effect of men on ILSE. Therefore, the researcher cannot reject the null hypothesis that men have no information literacy skills than women (H_2).

H_3: Scientists who are older have stronger IL abilities.

The third hypothesis propose a positive relationship between age and IL abilities. The hypothesis tests if age have a significant impact on ILSE. Scientists' age does not predict their ILSE, ($p > 0.05$) which indicate that scientists' age cannot play a significant role in shaping ILSE (b = -.003, p .756). The outcome revealed no statistically significant correlation between age and ILSES. In other words, there is no statistical evidence that the correlation between scientists' ILSE and age exists. These results clearly direct a negative effect of scientists' age on ILSE. Therefore, the null hypothesis, that age has no effect on IL abilities, cannot be rejected by the researcher.

H_4: Scientists' qualification level and information literacy skills are positively correlated.

The fourth hypotheses implies that there is a favourable link between IL abilities and qualification level. Therefore, the hypothesis tests if qualification have a significant impact on ILSE. The results revealed a statistically significant and positive correlation between scientists' ILSE and qualification level ($p < 0.001$), which indicates that scientists' level of qualification can play a significant impact in shaping ILSE (b = .334, $p < .001$). There is a correlation between scientists' qualification levels and their IL abilities. These results clearly direct a positive effect of scientists' qualification on ILSE. Furthermore, the $R^2 = .237$, depicts that qualification level explains 23.7% of the variance in ILSE. This mean that 23.7% change in ILSE can be accounted by the qualification level. Therefore, the researcher rejected the null hypothesis that qualification level does not have effect on IL skills.

H_5: Scientists with more years of research have better information literacy skills.

The fifth hypotheses implies that information literacy skills and years of research are positively correlated. The hypothesis tests if years of research have a significant impact on ILSE. The outcome revealed no statistically significant association amongst ILSE and years of research ($p > 0.05$) which indicates that years of research cannot play a significance role in shaping ILSES ($b = -.042$, $p > .687$). In other words, there is no statistical evidence that the correlation between scientists' ILSES and age exists. These results clearly direct a negative effect of scientists' years of research on ILSE. As a result, the researcher cannot reject the null hypothesis that years of research has no influence on IL skills.

H_6: Scientists who have received information literacy training have higher level of information literacy.

The sixth hypotheses (H_6) assumed the positive relationship between IL training received and IL abilities. The hypothesis tests if IL instruction received have a significant impact on ILSE. The results revealed a statistically significant and positive correlation between scientists' ILSE and IL training received ($p < 0.05$), which indicates that information literacy instructions received by scientists play a significant impact in shaping ILSE ($b = .096$, $p < .024$). There is a positive association between information literacy training received by respondents and their IL abilities. These results clearly direct that information literacy training has a favourable influence on ILSE. The $R2 = .138$ depicts that both explain 13.8% of the variance in ILSE. This mean that 13.8% change in ILSE can be accounted by information literacy training level. Therefore, the researcher rejected the null hypothesis that information literacy training level has no effect on IL skills.

A breakdown of regression coefficients shows that two of the six independent variables (Qualification [Beta= 0.437] and IL training received [Beta=0.268]) contributed considerably to Model 1. Therefore, to determine statistical significance predictors, the stepwise method was applied. Stepwise examines the correlation matrix, selecting the independent variable having the highest Pearson correlation with the dependent variable for regression analysis. Returning to the correlation matrix, it searches for the next highest predictor for the dependent variable while accounting for variation. This is a step-by-step procedure that is repeated until no independent variable has a higher effect on the dependent variable, at which point the procedure is terminated. The highest predictors are demonstrated in Table 26.

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate	Durbin-Watson
1	.487[a]	.237	.226	.54211	
2	.327[b]	.138	.125	.57626	
3	.544[c]	.296	.274	.52496	2.307

a. Predictors: (Constant), Highest qualification

b. Predictors: (Constant), IL training level

c. Predictors: (Constant), Highest qualification, IL training level

d. Dependent Variable: ILSES

Table 20: Model Summary[b]: ILSE vs. Independent Variables.

These results demonstrate that out of six independent variables qualification level is the greater predictor of ILSE amongst scientists followed by the level of IL training received. Furthermore, the $R^2 = .237$, depicts that qualification level explains 23.7% of the variance in ILSES. The R2 = .138 depicts that information literacy training level explains 13.8% of the variance in ILSE. Both the qualification level and IL training level have a significant impact on ILSE. The R2 = .296 depicts that both explain 29.6% of the variance in ILSE. The remaining independent variables had little or no significant effect on scientists' ILSE.

5. DISCUSSION OF FINDINGS

This research explored the importance of IL, the use of information sources, information requirements, IL skills, and the link between IL abilities and the demographic factors of scientists. This study was completed using two research questions and six hypotheses. The hypotheses were tested using multiple regression analysis. Therefore, in the discussion section that follows, the findings are compared to those of previous studies.

5.1. The significance of IL

Scientists were requested to provide their judgement on the significance of IL at public health institutes at the NHLS. The majority of scientists rated information literacy as a very important skill that is of importance within the workplace and they agree that missed opportunities can be a result of a lack of workplace information literacy. Scientists are a group of professionals who deal with a great deal of information and research that need information literacy skills to handle and apply scientific knowledge to enhance the health of people. Moreover, advocacy for information literacy has been gaining momentum in the country with many programs launched to eradicate information illiteracy within public institutions (Durodolu & Mojapelo, 2020). During the apartheid era, the majority of South Africans were denied the opportunity to learn and access knowledge. Right to information was declared a basic right for all humans following the end of apartheid, thus knowing how to explore the information world is critical and having information literacy skills makes it easier to perform efficiently.

Therefore, this finding also supports the statement by several authors that information literacy has long been acknowledged as a critical skill in this ever-changing information world and a necessity in the workplace (Bruce, 1999; Cheuk, 2017; Forster, 2017; Karim & Hussein, 2008; Sparks, et al., 2016; Whitworth, 2014) and lack of IL skills in the workplace may result in difficulty to accomplish tasks (Forster, 2013), and it may lead to a dropping of competitive advantage (Klusek and Bornstein, 2006). The results were similar to those of Chaudhry and Al-Mahmud (2015), Molopyane and Fourie (2015), and Raish and Rimland (2016), who revealed that employees perceived IL as important and a lack of IL abilities in the workforce can lead to missed opportunities. This finding suggests that policymakers and information professionals should step up and prioritise information literacy within the NHLS.

5.2. The usage of information resources.

The usage of information resources by scientists at public health institutes at the NHLS was also explored. Under this section, the researcher investigated the preferred source of information, the preferred databases, and the way scientists access information.

5.2.1. Scientists' preferred source of information.

The study discovered a huge majority of scientists within the NHLS prefer websites (n=56, 82.4%) as their source of information. This was expected because most of the reliable organisations publishes their findings and articles or peer-reviewed papers or information that has been validated by experts on their websites.

The highest percentage of scientists that preferred websites as their source of information could be because most scientists rely on reliable organisations that supply relevant information through their websites, for example, the World Health Organisation (WHO), the Centres for Disease Control and Prevention (CDC), including the NHLS, NICD and the NIOH. These websites are currently leading in providing information regarding the CORONA virus in the world. Moreover, these resources are freely available on websites to all scientists as long as they have appropriate devices and proper internet connection. Nonetheless, this result was consistent with other authors' findings (Chaudhry & Al-Mahmud, 2015; Tahira & Ameen, 2009; Wu, 2012). Their studies discovered that websites ranked very high as the preferred source of information.

Databases (n=55, 80.9%) came second as the preferred source of information. This outcome was not anticipated as scientists rely mostly on scientific and evidence-based information and resources from the databases are regarded as the best produced from the top professional journals and publications (Masic & Milinovic, 2012). One would have expected databases to be the first preferred source of information as they provide peer-reviewed articles than websites. Few scientists preferred communicating with people (n=17, 25.0%) as their source of information. This might be because there are more experienced scientists who can provide knowledge to other peers. These scientists might have done the same research that their peers are required to do. This outcome is inconsistent with two studies of Herner (1959) and Zawawi and Majid (2001) who indicated that the majority of American scientists preferred communicating with people including their colleagues as their source of information but they also consider bibliographic publications (such as medical databases) to be useful in their quest for information.

We now live in a social media-dominated society. Social networking is expanding at an alarming rate. However, very few scientists preferred media (newspaper (n=11, 16.2%), magazines (n=5, 7.4%), radio (n=4, 5.9%) and TV (n=3, 4.4%) as their source of information. One plausible explanation for this outcome is that media and social media are the least trusted sources of health information because they are believed to circulate false information (Alduraywish et al, 2020; Fridman et.al, 2021; Gehrau et.al, 2021). The current spread of fake news all over the media might have led people into losing interest and trust in them. Furthermore, disinformation has been spreading like wildfire since Covid-19.

5.2.2. Scientists' preferred database.

Scientists were asked about their preferred or frequently visited databases. It was discovered that PubMed (M=3.11) was the most commonly accessed by scientists amongst seven databases. This result was not anticipated as the NHLS libraries did not subscribe to PubMed. Science direct (M=2.07) was number two, followed by ASM journals (M= 1.50) and MEDLINE (M= 1.33). Science direct, ASM journals and MEDLINE complete were expected to be the highest as the NHLS libraries subscribe to these databases. However, this might be due to that PubMed provides free and unlimited access to all users over the internet since June 1997 (NLM, 2021, Free Web-Based Access, para. 3). Williamson and Minter (2019) indicated that PubMed and MEDLINE are the most commonly used resources on earth, and they have been named as one of the few sites used among health professionals to conduct literature searches. This finding might have been influenced by the fact that the NHLS subscription journals do not always provide the search results they want, and PubMed is handier for them. These outcomes also revealed unsatisfying exploration of NHLS subscribed databases by scientists.

The study also discovered that scientists do go beyond in their quest for information, and they would use the most preferred databases that produce relevant results to their search regardless of whether their institution makes it available to them or not. Although scientists at the NHLS' public health institutes prefer PubMed, the NHLS libraries do not have a subscription. These findings suggest that scientists will pursue what is relevant, even if it means devoting resources to the task. PubMed is one of the most widely utilized resources on the planet, according to the prior literature. This outcome will also benefit NHLS libraries during the collection development process. To provide successful service, the NHLS

libraries must consider the preferred resources by their patrons. Addressing these issues will also improve service delivery and save funds.

5.2.3. Scientists' way of accessing information.

Scientists were asked which method of information access they personally prefer between searching for information on their own and asking a librarian to do the searching on their behalf.

The majority (n=62, 91.2%) indicated that they do search for information on their own and only a few scientists (n=6, 8.8%) indicated that they ask a librarian. These results were anticipated as librarians from both institutions offer information literacy training to all staff members including scientists. This means that scientists are independent, and they know how to navigate through the information world. These results are also supported by the overall ILSES which reveal that scientists were self-assured and knowledgeable in their ability to perceive the requirement for information, search and find, assess, interpret, and use information effectively. Which means they can search for information on their own. Moreover, the findings in Table 8 demonstrate that an enormous majority of scientists have gone to IL training.

However, those who did not search for information by themselves could be those who have personal assistance or scientists who do not yet have IL abilities. These findings are comparable to those of Grefsheim and Rankin (2007) who revealed that the majority of US NIH health workers access information for work on their own. However, they are opposite to the results of Alvarez et al., (2014) who revealed that four out of six Brazilian HIV/AIDS researchers lack sufficient information literacy skills, and they depend on librarians to get information.

5.4. Information needs of scientists

The information requirements of scientists were explored in order to figure out for what professional purpose scientists seek information. The results indicate that the majority (n=67, 98.5%) of scientists need information for a research project followed by scientists (n=65, 95.6%) who require information for training purposes. These findings might be attributed to the fact that research and training are two of the main organisational goals. The results of the research are shared with relevant health authorities in order to help them better understand diseases and plan and manage disease prevention and treatment. For example, the NICD and the NIOH is the centre for COVID19 research and training in South Africa and

Southern African region. The results are comparable to those of previous researchers who discovered that majority of scientists and healthcare professionals needed information on research projects (Nwagwu & Oshiname, 2009; Tahira & Ameen; 2009).

However, other scientists (n=48, 70.6%) indicated that they need information for making an informed decision. Therefore, this outcome can be attributed to the fact that scientists are a group of professionals who are grounded by informed evidence-based decision-making due to the sophistication of their work. Very few scientists (n=44, 64.7%) stated that they require information for presentations. This conclusion can also be attributed to the NHLS' encouragement of scientists to present their discoveries or results once they have completed their research or inquiry. This is done to keep the community informed about any study findings from the NHLS.

5.5. Scientists' level of information literacy skills.

The information literacy training received was explored to figure out the information literacy training levels of scientists at the NHLS. This study discovered that the majority of scientists have attended information literacy training with the highest receiving the research level training (39.7%) followed by the basic information searching skills (33.8%). These results indicate that majority of scientists received proper information literacy training. However, it was not indicated where these trainings were obtained, even though the NHLS libraries provide information literacy training to all the NHLS employees, there is a possibility that most of them had received training during their academic period.

5.6. Scientists' Information Literacy Self-Efficacy

The first research question explores the degree of IL skills among scientists working at public health institutes at the NHLS in South Africa. Therefore, the dependent variable measured in this research is IL abilities. As a result, scientists were requested to measure their level of ILSE on five Likert scales. The outcome indicated that scientists were self-assured and knowledgeable in their ability to perceive the requirement for information, search and find, assess, interpret, and use information effectively. These results, however, can be attributable to the fact that both organisations (NICD & NIOH) provide information literacy training to all interested employees. Furthermore, the vast majority of public universities offer IL classes to their students, allowing them to transfer those skills to their workplace. Therefore, the current information literacy education is capable of developing fundamental information literacy abilities.

However, scientists were found more competent in initiating the search strategy (M=4.259). This discovery could be attributed to the fact that scientists at the NICD and NIOH do scientific research to increase health/medicine knowledge, hence launching a search strategy is part of their routine. Moreover, these scientists are also taught how to initiate search strategies during information literacy training. This result is opposite to the outcome of Naveed's (2021) study, where scientists rated themselves the lowest when it comes to initiating search strategy.

The lowest mean score of ILSES as compared to other scores was in locating and accessing the resources (M=3.884). However, this is not necessary the low score but it is important to note that it is the lowest amongst the rest. A study by Ayre (2006) suggested that poor IL skills are the reason for failure to locate what is needed when searching for information. However, this could not be the case in this study as the respondents have shown greater competency in the overall information literacy skills. Therefore, the researcher suggests that this result could be due to a lack of resources within both institutions. Most scientific information is not for free and both institutions subscribe to few medical or health databases. As a result, scientists are left by themselves to locate and access information that the institutions could not provide. Scientists may be unable to discover information resources as a result of these factors, as not all scientists have the resources to discover and access the resources they want.

Health information is always changing, and scientists must remain on top of it to be productive at work. A high level of IL is meaningless if the necessary resources are not available to perform a task. As a result, collection developments and strengthening the IL abilities of scientists should be considered as vital at the institutions. Lack of essential information resources may result in poor performance and decision-making, which can obstruct service delivery and production.

5.7. Multiple Regression Results

The second study question concerned the link between scientists' perceived IL abilities and demographic factors. The regression statistical analysis revealed significant findings of the impact of scientists' demographic characteristics on their perceptions of IL. The results revealed that demographic factors had a significant impact on scientists' ILSES. Demographic characteristics were also the focus of a number of research undertaken in various studies (Kurbanoglu, 2003; Naveed, 2021; Naveed & Rafique, 2018; Punter et al., 2017; Taylor & Dalal, 2017).

Scientists' information literacy skills were shown to be significantly connected to two demographic factors. Qualification levels and IL training levels were discovered to be predictors of scientists' ILSES. Gender (male and female), age, and years of research, on the other hand, were found to be unrelated to ILSES. Table 27 summarises the outcomes of hypothesis.

Hypotheses	Outcomes
H1: Women are more information literate that men.	Supported
H2: Men are more information literate than women.	Rejected
H3. Older scientists have stronger information literacy skills.	Rejected
H4. More educated scientists have higher information literacy skills.	Supported
H5. More experienced scientists have better information literacy skills.	Rejected
H6. Scientists who have received IL training have higher level of information literacy skills.	Supported

Table 21: Hypotheses and outcomes

The regression analysis discovered that three of the six hypothesis were supported. Qualification and IL training received significantly contributed to the ILSES of scientists. As a scientist's qualification levels increase, so does their ILSES. 95.5% of scientists hold a bachelor's degree or higher. The same can be said for the IL training received. The ILSES increases as the IL instruction is increased. It was also discovered that women are more information literate than men.

Below is a detailed discussion of the regression analysis outcomes.

5.7.1. Information literacy self-efficacy and Gender (male and female)

Different from previous studies' expectations, the outcome revealed that female scientists had stronger information literacy self-efficacy than male scientists (H1). Therefore, the first hypothesis (H1) was supported, while the second hypothesis (Men are more information literate than women (H2)) was rejected. This outcome could have been influenced by the fact that only a few male respondents (16) participated in the study. These might have a significant impact on the study's outcome.

Moreover, these results were not in line with the outcomes of various studies (Jeyshankar & Nachiappan, 2021; Liu & Sun, 2012) where males had higher information literacy self-efficacy as compared to females. However, these study findings could have been influenced by the previous government system, which encouraged gender inequality. Although all

investigations were done in a scientific setting, the conclusions may differ due to variances in scientists' cultural, historical, and educational backgrounds.

This outcome was not expected, as the apartheid regime in South Africa and cultural beliefs had a significant detrimental impact on the lives of South African women, particularly black women. However, after 1994, the government launched various interventions that advocate for and support women, more especially in education. As a result, it is reasonable to believe that measures promoting women's empowerment and gender equality have had a substantial influence in reducing female illiteracy. These results were in line with the outcome of Gebhardt et al. (2019) and Taylor and Dalal (2017) Naveed (2021) who discovered that women seemed to be knowledgeable than men in terms of information literacy.

5.7.2. Information literacy self-efficacy and Age

Based on previous research on IL, this research anticipated a substantial correlation between scientists' IL abilities and their age (H3). However, the study outcome revealed that there is no statistical evidence that the ILSE of scientists correlates with their age. Therefore, the third hypothesis (H3) was rejected. This discovery was unexpected because it contradicted the findings of several earlier researchers. Studies of Aharony and Gur (2017) and Naveed (2021) discovered a positive relationship between age and ILSE, meaning that as respondents' age increased, so did their information literacy self-efficacy.

In agreement with Naveed and Rafique (2018), it is only normal for scientists' educational experience, confidence, and abilities in the profession to develop as they grew older. Meaning that the older the person gets the more educated or knowledgeable an individual becomes. However, South African history might have had a major impact on this outcome. This study outcome could have been influenced by the fact that life during the apartheid period was difficult for many South Africans, more especially the majority. During the apartheid period, the majority of South Africans were not given the right to free education which resulted in many people who cannot read and write. After apartheid, the government introduced adult education initiatives all over the nation with the aim of eradicating the illiterate. As a result, many South Africans started learning at their adult age and those trained old scientists had their education during the apartheid era. It is believed that the previous educational system did not treat all South Africans equally. However, information literacy was recognised as a critical component of the answer to problems with information access and management (Underwood, Nassimbeni & De Jager, 2002). It has been more

than twenty-seven (27) years since democracy came into effect in South Africa. One can argue that 27 years is too much for not seeing change. However, it is also understandable that change takes time. Therefore, this outcome is welcomed in this study with the hope that it will surely improve when time goes on.

5.7.3. Information literacy self-efficacy and Qualification level

In agreement with previous researches, qualification level has a significant and positive association with ILSE (H4). That is to say, the greater the qualification level, the greater the ILSE of scientists. Therefore, the fourth hypothesis (H4) was accepted. In 1999, the Society of College, National, and University Libraries (SCONUL) mentioned that people who have finished a specific degree of schooling are more likely to have a great level of IL abilities. This statement was also supported by Soleymani (2014), who revealed a strong positive association between IL and academic achievement of academics. Moreover, several authors also revealed that the higher one's educational attainment, the greater one's information literacy self-efficacy (Aharony & Gur, 2017; Kilic, 2010; Naveed, 2021; Naveed and Rafique, 2018; Nwosu, Obiamalu, & Udem, 2015). As a scientist's qualification levels increase, so does their ILSES. 95.5% of scientists hold a bachelor's degree or higher and only 4.5% had a diploma. All participants hold a diploma or higher. There was no scientist who holds a senior certificate.

5.7.4. Information literacy self-efficacy and years of research experience.

Inconsistent with previous studies' expectations, years of research has no effect on ILSES. The outcome revealed no statistically significant association amongst years of research experience and ILSES. Therefore, the fifth hypothesis (H5) was rejected. The years of research experience of scientists is also measuring the years of service/experience. This outcome was not anticipated as one would think that the more experience one becomes, the higher the information literacy skills. This discovery is fascinating since it can be interpreted in several ways. For instance, one would assume that scientists use information sources less frequently as they gain more experience; scientists may not need to improve their information literacy abilities as they gain more expertise. This could be because if individuals have gained expertise performing a normal action, they may not need to examine as many sources of information for something they already know.

Furthermore, co

These findings contradict the findings of numerous authors' studies (Aharony & Gur, 2017; Franklin, 2005; Naveed, 2021; Simisaye & Olanrewaju, 2020). However, these outcomes are similar to the results of Kilic (2010) who employed multiple regression analysis to test the association between dependent variables and independent variables. The results revealed no statistically significant correlation between information literacy skills and research experience.

5.7.5. Information literacy self-efficacy and IL training received.

In agreement with previous researches, information literacy training received has a significant and positive association with ILSE (H6). That is to say, the greater information literacy training received, the greater the ILSE of scientists. Therefore, the sixth hypothesis (H6) was accepted. These results were anticipated as the majority of scientists have developed their information literacy level through information literacy training and only a few scientists (n=10, 14.8%) never received information literacy training.

This outcome means that as information literacy training improved, scientists' ILSE also improved. This outcome can be explained by the fact that IL training is provided to scientists at the NICD and NIOH on a regular basis. These results are related to those of Jessy et al. (2016) who discovered that IL training received had a positive effect on the effectiveness of IL skills. Weightman et al. (2017) has also proven that information literacy training is useful in improving IL skills. Lockhart (2015) also discovered that courses like Certificate in Information Literacy (CIL), increase information literacy abilities. However, Naveed (2021) discovered that there is no significant association between IL self-efficacy and IL teaching, and this was possibly due to the fact that a great percentage of scientists never got IL training throughout their whole careers.

5.8. Implications of the findings

IL is seen as a crucial component in academic and employment contexts. The data-driven workplace environment and evidence-based decision-making, in particular, need that scientists have appropriate IL abilities for successful and efficient service delivery. In addition, a lack of IL abilities can result in significant costs for institutions (Al Daihani & Rehman, 2007). As a result, public health institutions should thrive to invest in their employees' IL abilities in order for them to be able to fulfill their responsibilities. The capacity of scientists to access essential information resources effectively is reliant on their abilities to do so, which is only feasible when they have appropriate IL skills. Therefore, this research will suggest several implications that will improve scientists' IL capacities.

The total information literacy mean score was pretty high, however, scientists had the least self-belief in locating and accessing resources. This finding suggests that public health institutions should invest more in collection development so that scientists can access relevant information resources. Investing just in information literacy abilities will have little impact if the appropriate information or resources are not also available. Moreover, collection development strategies should be developed so that relevant resources are acquired and made available to professionals of public health institutes through the appropriate mediums.

Qualification levels and IL training levels were discovered to be predictors of scientists' ILSE. However, qualification was the most important predictor of scientists' ILSE, followed by IL training. Several researchers made this discovery while doing their investigation. It appears that increased qualification level and IL training level are obvious predictors of the ILSE. These were also endorsed by the ACRL (ACRL, 2000). This conclusion suggests that as scientists' qualifications grow, so do their IL skills. This is also an indication that public health institutions should assist their personnel to improve their skills qualifications. Employees should also be encouraged to participate in IL training sessions. Moreover, a clear plan for IL development is necessary so that every employee understands what needs to happen and who is responsible for doing it.

The results indicated a negative association between experience and ILSE. This indicates that scientists' IL abilities did not grow as they gained experience. This finding may imply that scientists are unable to enhance their IL abilities throughout the course of their careers. Scientists may not feel compelled to enhance their IL abilities after working in one section for a while. To address this problem, new forms of training courses are required to strengthen the IL abilities of scientists despite their years of work. Scientists can acquire certifications in a variety of IL abilities through web-based learning modules that are available online.

According to descriptive studies, the most commonly utilised sources of information were websites/internet followed by databases. Internet access should be expanded in a way to attain these sources of information, and all sections should have access to these services. Any scientist should have access to relevant information resources on the internet. Scientists' confidence in acquiring IL abilities will grow as they get access to appropriate information resources.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of the study

This study makes some contributions. Its primary goal is to add to the field of information science by looking at IL abilities in a workplace setting. The study's major goal was to evaluate scientists' IL skills using Kurbanoglu et al. (2009)'s ILSES and to investigate the association between scientists' ILSE and their demographic characteristics. These scales were created and evaluated in an educational setting. Following an examination of the information literacy literature, the researcher formulated research questions and hypotheses.

The review of the literature demonstrated several information literacy definitions that researchers have adopted in various fields and environments. However, even when the definitions of information literacy are slightly different depending on the context, the value of IL is the same in all environments. The majority of researchers have emphasised that IL is needed in all spheres of life.

The Society of College, National and University Libraries (SCONUL) and the Association of College and Research Libraries (ACRL) have made significant contributions to the establishment of IL standards and models, with the Library and Information Association of South Africa (LIASA) adopting the ACRL standards for higher education. However, other researchers are of the view that these standards do not support IL in the working environment and they may also reject how information is acquired and utilised in developing countries. As a result, various researchers emphasised the importance of developing IL standards and models that talk about IL in the working environment and accommodate developing countries in Africa.

The study adopted a quantitative cross-sectional approach and employed a survey method. The Census technique was adopted. The questionnaire was given to a pilot group before being given to all scientists, and the survey questions were adjusted based on their response. All 68 questionnaires were properly filled and submitted successfully which achieved a 58% response rate. SPSS software was utilised to analyse the gathered data.

This study solely assessed scientists' self-evaluation of their information literacy abilities; nevertheless, this investigation may not show the true performance of respondents. As a result, any researcher must proceed with caution when interpreting these findings.

6.1.1 Major findings of the study

This section outlines the major outcomes related to the objectives of the study, the study's research questions, and hypotheses.

The **first objective** of the research was to identify scientists' opinions on the significance of IL at public health institutes at the NHLS. The major findings are listed below for the aforementioned objective:

The majority of scientists rated information literacy as a very important skill that is of importance within the workplace and they agree that missed opportunities can be an effect of poor of workplace IL.

The **second objective** was to evaluate the usage of information resources by scientists at public health institutes at the NHLS. The study discovered that the vast majority of scientists within the NHLS prefer websites (n=56, 82.4%) as their source of information. These might be due to the fact that those resources are freely available on websites to all scientists as long as they have appropriate devices and proper internet connection. Databases (n=55, 80.9%) came second as the favoured source of information. It was discovered that PubMed (M=3.11) was the most commonly accessed by scientists amongst seven databases. Science direct (M=2.07) was number two, followed by ASM journals (M= 1.50) and MEDLINE (M= 1.33).

Scientists were also asked to indicate the way they access information between searching for information on their own and asking a librarian to do the searching on their behalf. The majority (n=62, 91.2%) indicated that they do search for information on their own and only few scientists (n=6, 8.8%) indicated that they ask a librarian.

The **third objective** was to discover the needs of information by scientists at public health institutes at the NHLS. The outcomes demonstrate that the huge majority (n=67, 98.5%) of scientists need information for a research project followed by scientists (n=65, 95.6%) who require information for training purposes. These findings might be attributed to the point that research and training are two of the main organisational goals.

The **fourth objective** of the research was to determine scientists' perceived ILSE. The outcome indicated that scientists were self-assured and knowledgeable in their ability to perceive the requirement for information, search and find, assess, interpret, and use information effectively. These results, however, can be attributable to the fact that both organisations (NICD & NIOH) provide information literacy training to all interested employees.

The **fifth objective** was to discover the correlations between the demographic characteristics (age, gender, years of experience, educational background, and IL training

received) and scientists' perceived ILSE. The outcome revealed that three hypotheses out of six hypotheses were supported. Qualification and IL training levels had a positive influence on ILSE. The study also discovered that female scientists had stronger information literacy self-efficacy than male scientists.

6.2. Conclusion

The attention of this investigation was to look into the current level of IL abilities among scientists working at public health institutes at the NHLS in South Africa. This research provided insight into the scientists' IL abilities at the NICD and NIOH, as well as their prospective effective usage of information resources. Scientists at NHLS institutes recognised the idea of EBP, where they are required to establish their work on tangible evidence-based knowledge, and they have appropriate IL abilities in terms of initiating the search strategy, defining an information need, communicating information, and interpreting, synthesising, and using the information.

The research also revealed that scientists were self-assured and knowledgeable in their ability to perceive the requirement for information, search and find, assess, interpret and use information effectively. Therefore, this study concludes that scientists working at the NHLS public health institutes have appropriate information literacy abilities to explore the information landscape. Moreover, the value of IL must be recognised at all levels of life, including the workplace. Management must also recognise their responsibility in promoting scientists' information literacy abilities. The study suggests that a favorable atmosphere for exchanging professional knowledge be created, as well as an IL program tailored to scientists to enhance evidence-based practice.

The research suggests that relevant materials be made available and accessible to scientists, based on the study's findings of inadequate literacy skills in the issue of locating the needed resources. This proposal might be made during collection development by asking scientists about the most relevant resources they need to accomplish their task. Online health resources are excellent sources of high-quality, up-to-date scientific-based knowledge that scientists may use to promote EBP.

The research findings, which used a cross-sectional survey, provide insights on participants' IL abilities at one point in time. In the future, this research can be duplicated, and the outcomes of the research may be matched to these outcomes. This study also offers

significant explanations of scientists' information literacy self-efficacy concerning demographic characteristics, which can be used by future researchers. The outcomes of this research are beneficial for policymakers at the NHLS. These findings are particularly significant for information officers working in academic institutions who are developing need-based IL programs for staff members. More study can assist in better understanding the demands of scientists based on their subject areas and level of IL. Such studies might be carried out in many workplaces to help comprehend the required skills and future demands of professional contexts. However, these findings cannot be generalised because this study only examined a small number of scientists at public health institutes at the NHLS. More investigation is required to back up the conclusions of this research. A national survey of scientists' information literacy self-efficacy might be beneficial.

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5. APPENDICES

5.1 Consent form:

Research project: Investigating information literacy among scientists working at public health institutes at the National Health Laboratory Services (NHLS).

Researcher: Winkie Siebane

I, ……., agree to participate in this research project. I understand what my participation will involve. I agree to the following:

(Please circle the relevant options below).

I agree that my participation will remain anonymous. YES NO

I understand that I am participating freely and without being forced in a way to do so.

YES NO

I also understand that I can stop answering this questionnaire at any point should I not want to continue and that this decision will not in any way affect me negatively.

YES NO

I comprehend this is a research project whose design is not to profit me.

YES NO

I agree that the information I provide may be used anonymously after this project has ended, for academic purposes by other researchers, subject to their own ethics clearance being obtained.

YES NO

…… (Signature)

…… (Name of participant)

…… (Date)

5.2 Participant Information Sheet:

Dear Participant

My name is Winkie Siebane. I am studying for a Masters of Management (Governance (Public and Development Sector Monitoring and Evaluation)) in the School of Governance at the University of the Witwatersrand. I am conducting a study on "Investigating information literacy among scientists working at public health institutes at the National Health Laboratory Services (NHLS)" under the supervision of Dr. Halfdan Lynge-Mangueira.

I am inviting you to participate in this research study by completing the questionnaire. The following questionnaire will require approximately 15 minutes to complete. There is no remuneration for responding nor is there any known risk. To guarantee that all information will stay confidential, kindly do exclude your name. Your participation is voluntary. You can withdraw and discontinue participation without penalty. If you choose to participate in this project, please answer all questions as honestly as possible and return the completed questionnaires promptly to the following email address: 1385713@students.wits.ac.za. Submitting the completed questionnaire is taken to mean consent for participating in this research.

If you have any questions during or afterward about this research, feel free to contact me on the details listed below. This study will be written up as a research report which will be available online through the university library website. If you wish to receive a summary of this report, I will be happy to send it to you (optional). If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrec-medical.researchoffice@wits.ac.za.

Thank you for taking the time to assist me in my educational endeavors. If you require additional information or have questions, please contact me at the number listed below.

Yours Sincerely

Winkie Siebane

+2779 911 7208 / 1385713@students.wits.ac.za

Supervisor’s name:

Dr. Halfdan Lynge-Mangueira

0117173945 / halfdan.lynge-mangueira@wits.ac.za

Academic Affairs and Research
Modderfontein Road, Sandringham, 2031
Tel: +27 (0)11 386 6142
Fax: +27 (0)11 386 6296
Email: babatyl.kgokong@nhls.ac.za
Web: www.nhls.ac.za

18 March 2021

Applicant: Winkie Siebane
Institution: NICH
Department: Information Services
Email: winkies@nioh.ac.za
Tel: 011 712 6423
Cell: 079 911 7208

CC: Jone Mofokeng
Acting HR Executive

Re: Approval to conduct a study at the National Health Laboratory Service (NHLS)

Your application to undertake a research project "**Investigating information literacy among scientists working at public health institutes at the National Health Laboratory Services (NHLS)**", **Ref No: PR20169** has been reviewed. This letter serves to advise that the application to conduct the proposed research in the NHLS premises has been approved.

Please note that the approval is granted on your compliance with the NHLS conditions of service and that the study can only be undertaken provided that the following conditions have been met.

- Processes are discussed with the head of Human Resources (HR) and are agreed upon.
- Confidentiality is maintained at participant and institutional level and there is no disclosure of personal information or confidential information as described by the NHLS policy.
- A final report of the research study and any published paper resulting from this study are submitted and addresses to the NHLS Academic Affairs and Research office and the NHLS has been acknowledged appropriately.

Please note that this letter constitutes approval by the NHLS Academic Affairs and Research Office. Once all requirements have been met, please contact the site Business Manager and/or Laboratory Manager who will provide approval and communicate with the relevant people.

Yours sincerely,

Dr Babatyi Malope-Kgokong
National Manager: AAR

Prof Koleka Mlisana
Executive Manager: AARQA

5.3 Reaserch Instrument:

SECTION 1: DEMOGRAPHICS

It is important that we have a picture of the background of the respondents. For this reason, we have included in this questionnaire some questions that relate to your background.

1. Sex of Respondent. (*Tick the applicable)*

Male	1
Female	2

2. How old are you? (Tick the applicable)

21 - 30	1
31 - 40	2
41 - 50	3
51 and above	4

3. What is your highest level of education? *(Single response, tick the applicable)*

Senior certificate	1
Diploma	2
Bachelor degree	3
Masters	4
Doctorate (Ph.D.)	5

4. Years research experience. (Tick the applicable)

0 - 5	1
6 -10	2
11 - 15	3
16 and above	4

5. Number of research publications. (Tick the applicable)

0	1
1 - 5	2
6 - 10	3
11 and above	4

6. Levels of IL instructions received. (Tick the applicable)

Never received IL training	1
Library orientations	2
Basic information searching skills	3
Guided library tours	4
Advanced IL skills	5
Research level skills	6

SECTION 2: Information Literacy Self-Efficacy Scale (ILSES)

In any typical work setting, you and your colleagues will have to collect, store, analyse, and evaluate information. The next questions are a self-assessment of several aspects of these information processing activities at your workplace.

The questions that follow are statements that could apply to you as you go ahead and collect information for a work project. Can you please identify to what extent the following statements would apply to you? Scale: (**1= Fully Agree, 2 = Agree, 3 = Uncertain, 4 = Fully Disagree and 5 = Disagree).**

Questions		**Answers**				
		1	**2**	**3**	**4**	**5**
A. Defining the need for information.	7. I can define the information I need.	1	2	3	4	5
B. Initiating the search strategy.	8. I can identify a variety of potential sources of information.	1	2	3	4	5
	9. I can limit search strategies by subject, language, and date.	1	2	3	4	5
	10. I can initiate search strategies by using keywords and Boolean logic.	1	2	3	4	5
C. Locating and accessing the resources.	11. I can decide where and how to find the information I need.	1	2	3	4	5
	12. I can use different kinds of print sources (i.e. books, periodicals, encyclopedias, chronologies, etc.).	1	2	3	4	5
	13. I use electronic information sources.	1	2	3	4	5
	14. I can locate information sources in the library.	1	2	3	4	5
	15. I am able to use library catalogue.	1	2	3	4	5
	16. I am able to locate resources in the library using the library catalogue.	1	2	3	4	5
	17. I am able to use internet search tools (such as search engines, directories, etc.).	1	2	3	4	5
	18. I can use different kinds (types) of libraries.	1	2	3	4	5
	19. I use many resources at the same time to make a research.	1	2	3	4	5

D. Assessing and comprehending the information.	20. I can determine the authoritativeness, currentness and reliability of the information sources.	1	2	3	4	5
	21. I am able to select information most appropriate to the information need.	1	2	3	4	5
	22. I can identify points of agreement and disagreement among sources.	1	2	3	4	5
	23. I can evaluate www sources.	1	2	3	4	5
E. Interpreting, synthesizing, and using the information.	24. I can synthesize newly gathered information with previous information	1	2	3	4	5
	25. I can interpret the visual information (i.e. graphs, tables, diagrams).	1	2	3	4	5
F. Communicating the information.	26. I have the ability to write a research paper.	1	2	3	4	5
	27. I can determine the content and form the parts (i.e. introduction, conclusion) of a presentation (written, oral).	1	2	3	4	5
	28. I am able to prepare a bibliography.	1	2	3	4	5
	29. I can create bibliographic records and organize the bibliography.	1	2	3	4	5
	30. I can create bibliographic records for different kinds of materials (i.e. books, articles, thesis, papers, web pages).	1	2	3	4	5
	31. I can make citations and use quotations within the text.	1	2	3	4	5
	32. I can choose a format (i.e. written, oral, visual) appropriate to communicate with the audience (i.e. students, colleagues).	1	2	3	4	5
G. Evaluating the product and process.	33. I learn from my information problem solving experience and improve my information literacy skill.	1	2	3	4	5
	34. I can criticize the quality of my information seeking process and its products.	1	2	3	4	5

SECTION 3: NHLS scientists' perception about the importance of IL in the workplace.

Questions	Answers				
	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
35. Lack of workplace information literacy skills could result in missed opportunities.	1	2	3	4	5
36. Workplace information literacy skills is important for organisations.	1	2	3	4	5
37. Workplace information literacy should be included in the job descriptions.	1	2	3	4	5
38. Inclusion of workplace information literacy testing in the recruitment process.	1	2	3	4	5

SECTION 4: The usage of information resources by scientists at NHLS.

39. How often do you use the following online resources? (Tick the applicable)

	Never	Quarterly	Monthly	Weekly	Daily
a. Science direct	1	2	3	4	5
b. ASM journals	1	2	3	4	5
c. MEDLINE (via Ebscohost,)	1	2	3	4	5
d. Pubmed	1	2	3	4	5
e. UpToDate	1	2	3	4	5
f. CINAHL	1	2	3	4	5
g. Cochrane Database of Systematic Reviews	1	2	3	4	5
h. Via NHLS online catalog of holdings	1	2	3	4	5

SECTION 5: Information needs of scientists at public health institutes at the NHLS.

40. For what professional purpose(s) have you needed to find information? (Choose all that apply)

a. Research project (i.e. writing a journal article, book, book chapter).	1
b. In-service presentation.	2
c. Presentation at a professional meeting/seminar.	3
d. Make informed decision.	4
e. Please specify: ……..	5

41. What type of information resources do you find most useful for the type of information you need? (Choose all that apply)

Internet [1] Encyclopaedias [2] YouTube [3] People [4] Books [5] Databases [6] Newspapers [7]

Magazines [8] TV [9] Radio [10] others, please specify: ……..

42. Do you search online databases (e.g., MEDLINE, Science direct) for answers to your information needs? (Tick the applicable)

a. Yes, I search myself.	1
b. Not personally, but I do ask a librarian to search on my behalf.	2
c. Not personally, but I do ask someone else (e.g., an assistant, technician, or student) to search on my behalf.	3
d. No, I do not search online databases.	4

The questions are over. Thank you for your participation.

N.B. Please return the completed questionnaire to the following email address: 1385713@students.wits.ac.za.