DURBAN UNIVERSITY OF TECHNOLOGY
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The applicability of Accounting Information Systems for the Financial Accounting curriculum in the Fourth Industrial Revolution era: A case study at the Durban University of Technology (DUT).

By

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Submitted in fulfilment of the requirements for the degree of

Master of Accounting in Financial Accounting

in the

Department of Financial Accounting

Faculty of Accounting and Informatics

Durban University of Technology

December 2022

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DECLARATION

I, Welcome Siphiwe Cele , declare that this dissertation is my own work. This work has not been submitted in any form to any other university or institution of higher learning for another degree. All sources of information used or quoted have been properly acknowledged and listed in the references.

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DEDICATION

I dedicate this dissertation to my parents, my mother Mrs NM “Ma-Mfayela” Cele and my late father, Mr M Cele. You worked tirelessly to provide me and my siblings with opportunities that you did not have growing up. Your lessons on humility and respect will live with me for the rest of my life.

ACKNOWLEDGEMENTS

"But they who wait for the LORD shall renew their strength; they shall mount up with wings like eagles"
Isaiah 40:31

I would like to thank my supervisor, Dr Anrusha Bhana, for her excellent supervision and guidance throughout my study. I could not have completed this research without her constant and invaluable assistance. I am also grateful to Prof. Walter Malti, my co-supervisor, for all of his advice and assistance with my study.

I would like to thank my siblings, Nompumelelo, Mduduzi, Thulani and Sibusiso for their love and support.

I would also like to express my sincere thanks to the individuals and organisations listed below:

- Staff at the Vaal University of Technology, Department of Accountancy, especially those who took part in the pilot study, for their feedback and encouragement.
- Staff at the Durban University of Technology, Department of Financial Accounting, for their assistance with the pilot study and data collection.
- Dr Gill Hendry (statistician) and Mrs Ethel Ross (language editor) for their excellent support.
- MICT SETA, Mr Sboniso Mjaja, Ms Ugeshni Moodley and Dr Alveen Singh, for the research funding, as it supported the completion of my study.
- Mashuto Lebyane, Tshepo Nkgadima and Siphosenkosi Mbonani, for their encouragement and support throughout this study.
- My friends for their unwavering support.

This study would not have been possible without the participation of the Durban University of Technology, Department of Financial Accounting students, who took time out of their busy schedules to complete the research questionnaire.

ABSTRACT

Accounting technologies must be prioritised by South African higher education institutions (SAHEIs) to best prepare accounting students for the job market. This study explores students' perceptions of the applicability of accounting information systems (accounting software packages) in the teaching and learning of financial accounting in the era of the Fourth Industrial Revolution (4IR), at the Durban University of Technology. The research objectives focused on the students' awareness, knowledge, usage and perceptions of accounting software packages. Additionally, the research objectives examined the students' knowledge of the 4IR. The research used the Technology Acceptance Model (TAM) as the theoretical framework for the study. This was a census study that used a quantitative approach. A survey with closed-ended questions was used. A pilot study was carried out before the research questionnaire was distributed. The questionnaire was the primary data collection tool and it was distributed to Financial Accounting 3 students enrolled for the Diploma in Accounting at the Durban University of Technology (DUT), Ritson Campus, in Durban, KwaZulu-Natal. The study found that a significant proportion of the students had never heard of the accounting software packages or had heard of them but knew nothing or only a little about them. According to the data analysis, the average use of accounting software packages for learning financial accounting is significantly low. The findings showed that students are not competent in using accounting software packages. Data collected also revealed that students have positive perceptions of accounting software packages and a significant number of students perceived accounting software packages as important to their financial accounting learning. The study found that a significant number of students understand what the 4IR is. The financial accounting curriculum has long been criticised for not keeping up with industry standards. Several recommendations have been made to improve students' awareness, knowledge and use of accounting software packages, as well as their understanding of the 4IR. Furthermore, the research contributes to the existing body of knowledge on the use of technology in financial accounting teaching and learning, as well as the impact of the 4IR on accounting.

KEY CONCEPTS

i. Fourth Industrial Revolution (4IR)
ii. Accounting Information Systems (AIS): Accounting Software Packages (ASP)
iii. Educational Technology
iv. Financial Accounting Curriculum
v. Higher Education (HE)
vi. Technology Acceptance Model (TAM)

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CHAPTER ONE: BACKGROUND AND OVERVIEW OF THE STUDY

1.1 Introduction

This chapter gives a broad overview of the research. The background to the study is provided at the start of the chapter, followed by the definitions of core concepts and terminology.

The twenty-first century presents a number of challenges that will necessitate creative solutions. Technology has had an impact on almost every profession. Mhlanga and Moloi (2020) revealed that the Fourth Industrial Revolution is influencing how people connect with technology. Rhodes (2012) stated that the failure of accounting education to accommodate industry expectations has resulted in a shortfall in the knowledge and skills required from accounting graduates. (Habash 2021) explained that modern technology education must be introduced at university level in order for students to become familiar with technology before entering the labour market.

Education is influenced by technological developments , making it crucial for learning to keep up with current technologies. This chapter will provide a brief overview of accounting information systems in the form of accounting software packages. Technology and accounting have merged, rendering traditional methods of teaching and learning accounting redundant. However, the accounting curriculum is still based on manual accounting (Lautenbach 2015). This chapter will introduce the scope of the study; the rationale for the study; the significance of the study; the research problem; the objectives of the study and the research questions. Furthermore, the research methodology will be briefly provided. The overview of the structure of this dissertation will be presented.

1.2 Background to the study

The effects of technology are experienced by all professions across the world (Türegün 2019). The teaching and learning of accounting require innovative methodologies to provide students with conceptual and practical skills to interpret and analyse accounting information (Gaviria, Arango and Valencia 2015). Pedagogical concerns that Diploma in Accounting students are not disadvantaged require that South African higher education institutions prioritise accounting technologies. Technology and accounting have merged in recent years, making manual accounting systems irrelevant. However, the accounting curriculum is still based on manual accounting, with little integration of accounting and educational technologies (Lautenbach 2015)

Bozalek and Ng’ambi (2015) stated that there has been a distinct shift in higher education in South Africa from a situation in which institutions were directly responsible for the provision of education and infrastructure, to a situation in which institutions are directly responsible for both

the provision of education and infrastructure, and a relatively low technology, or poor, ICT infrastructure. The proliferation of cloud-hosted ICT infrastructures has resulted in an abundance of educational opportunities. Furthermore, a greater emphasis is placed on low-cost, mobile, adaptable, and widespread technology solutions, developed and frequently provided by academics and students. Individual students and academics now have a significant amount of control over their learning and teaching.

1.3 Definition of core concepts and terminology

1.3.1 Fourth Industrial Revolution (4IR)

The 4IR builds on the preceding digital revolution, but it is substantially different in terms of speed, scale, and possible disruption to existing growing business models built on a "sharing/on-demand" economy (Karsten, van der Merwe and Steenekamp 2020).

1.3.2 Accounting Information Systems (AIS): Accounting Software Packages (ASP)

There are many different ways to define the term 'accounting information system' (AIS) (Neogy 2014). For many, the phrase refers to a computer-based system, although it also refers to non-computerised systems (Romney and Steinbart 2017). An accounting information system (AIS) is a data and innovation framework device. In general, businesses use three types of information systems: data-based systems, computer-based systems, and manual systems (Dandago and Rufai 2014).

The accounting software packages that are computer-based systems are the focus of this study. Lim (2013) defined an accounting software package as a programme that records and processes accounting transactions within functional modules such as payroll, accounts payable, and accounts receivable.

1.3.3 Educational Technology

Educational technology is the research and ethical practice of creating, integrating, and controlling appropriate technological methods and resources to assist students to learn and function effectively (Romiszowski 2008). Arun (2014) examined the definition of educational technology and made the argument that technology encompasses much more than computers. Technology also relates to processes and it is best understood from a systems perspective.

1.3.4 Financial Accounting

Financial accounting can be defined as the orderly identification, systematic recording and reporting, by means of the preparation and presentation, of the monetary values in the financial transactions of an individual or a business entity (Alexander and Nobes 2010).

1.3.5 Curriculum

'Curriculum' is a difficult concept to define because it means different things to different people. Definitions of 'curriculum' range from narrow to broad, all-encompassing, interpretations that cover virtually every aspect of education (Jansen van Rensburg 2014). Barnett (2009) stated that a curriculum in higher education can be defined as a pedagogical vehicle for affecting changes in people through specific types of encounters with knowledge.

1.4 Scope of the study

DUT is one of the 26 public universities in South Africa. Founded over 100 years ago, the institution has a rich history that saw it grow from being a college into being a university with campuses in Durban and the Midlands. On 1 April 2002, ML Sultan Technikon and Technikon Natal merged to form the Durban Institute of Technology (DIT) and in March 2006, DIT was formally changed to the Durban University of Technology (Durban University of Technology 2008).

DUT has six faculties: Accounting and Informatics; Applied Sciences; Arts and Design; Engineering and the Built Environment; Health Sciences; and Management Sciences. This study focuses on the Faculty of Accounting and Informatics. The Faculty of Accounting and Informatics offers different programmes. Qualifications offered by the faculty range from Diplomas to PhD Degrees (Durban University of Technology 2022a). The sample population of this study were students registered for the Diploma in Accounting offered by the Financial Accounting Department in the Faculty of Accounting and Informatics.

The Financial Accounting Department equips students with the relevant training that will enable graduates to meet the needs of commerce and industry. The Financial Accounting Department is also responsible for teaching accounting-related subjects to all departments at DUT that have accounting as a requirement for their qualifications (Durban University of Technology 2020). Students enrolled for Financial Accounting 3, as a requirement for their Diploma in Accounting, were chosen for this study. As a result of their familiarity and experience with the curriculum and programme as exit level students, the responses of this cohort of students as a group of respondents were deemed especially significant.

DUT offers Financial Accounting to a number of diploma programmes. Four departments within the Faculty of Accounting and Informatics offer financial accounting as a major subject in their undergraduate qualifications, namely the Auditing and Taxation Department; the Financial Accounting Department; the Management Accounting Department; and Finance and Information Management (Midlands) (Durban University of Technology 2022a). Financial Accounting 3 is a required third-year course for students pursuing the Diploma in Accounting, offered by the Department of Financial Accounting.

1.5 Research problem

The Durban University of Technology's 2030 vision envisages a university with adaptable graduates who have the skills to initiate and respond to global changes (Durban University of Technology 2019). The skills shortage is a global challenge that affects the South African economy, particularly the labour market, resulting in higher unemployment (Petersen 2020). The National Planning Commission 2030 developed a framework that seeks to eliminate poverty and reduce inequality. The commission prioritised a number of objectives, including boosting employment; improving educational standards; developing skills; and promoting creativity (National Planning Commission 2011). Universities are responsible for preparing students for the labour market and ensuring that they have the necessary technological skills expected by employers.

Changes in technology over the years have rapidly altered how accounting functions are performed, affecting all businesses, from small to large, making the accounting system more accurate and flexible. As a result, paper-based accounting has become irrelevant in the present day (Jaydas 2017). Ahmed (2003) maintained that accounting education needs to keep up with the ever-changing environment, leading to a rethink of the competencies that undergraduates must possess. This suggests that the accounting curriculum should be designed in such a manner that it provides students with skills and knowledge expected by the job market. Al-Htaybat, von Alberti-Alhtaybat and Alhatabat (2018) claimed that it is critical to align accounting education with the new technologies to ensure that accounting graduates acquire globally work-relevant skills and knowledge. The gap between technology and accounting education was identified in the early 2000s, but little has been done to update the accounting curriculum (Penprase 2018).

The purpose of this study is to explore students' perceptions of the applicability of accounting information systems (accounting software packages) in the teaching and learning of financial accounting in the era of the Fourth Industrial Revolution. The government recognises the relevance and significance of technology in education, as well as the role of education in job creation. The university has stated its commitment to developing graduates with the abilities

required to effect global change through new ideas. Elaine Gioiosa and Kinkela (2019) recognised that students are interested parties in higher education, so their perceptions are extremely important. Despite the many reasons for, and benefits of, incorporating the use of accounting technology in the current curriculum, universities have failed to implement measures that will ensure that accounting graduates are equipped with relevant accounting technology skills (Seethamraju 2010).

The research objectives are derived from three knowledge gaps identified in this study. Firstly, the study discovered little available literature on using technology in teaching financial accounting from a South African perspective. Secondly, there is a need to investigate how advanced technology influences accounting teaching and learning for undergraduate students. Finally, it is critical to understand how DUT aligns the accounting education curriculum in order to help students understand the impact of accounting technology and the Fourth Industrial Revolution in the accounting sector.

The study contributes to the growing body of research on how accounting technology can improve financial accounting education. The study provides a unique perspective on the applicability of accounting software systems in the form of accounting software packages in a South African context, as most related studies have not been conducted in South Africa. In addition, the study illustrates the importance of including more detailed 4IR topics in the financial accounting curriculum.

1.6 Rationale for the study

Graham, Williams and Chisoro (2019) asserted that a lack of relevant experience is a challenge for graduates. Petersen (2020) stated that the shortage of skills in graduates is an international challenge. Accounting professionals insist that the only way to best prepare young graduates for the accounting workplace is to ensure that they have the necessary skills to use technological tools effectively and efficiently (Joshi and Chugh 2009). It is estimated that 65% of children starting primary school now will occupy jobs that do not currently exist (Mhlanga and Moloi 2020). The 4IR is a wave of change impacting the accounting field and reshaping the accounting profession. Redundant and repetitive tasks that were the day-to-day tasks of accountants are now being replaced by artificial intelligence and automation (Rîndașu 2017).

The Durban University of Technology developed a university strategy called Envision 2030 which highlighted four perspectives: stewardship; systems and processes; sustainability; and society, aimed at moving the university into a desirable strategic destination. Envision 2030 will contribute to ensuring that the university can develop graduates that are innovative and equipped with the skills to respond to change (Durban University of Technology 2019). DUT has

expressed its commitment to producing graduates who are equipped with the skills necessary to bring about change in the world through innovative ideas. Penprase (2018) reported that the accounting curriculum is still based on manual accounting, with little integration of accounting technology. Below is Figure 1.1, giving the abridged subject content for Financial Accounting and Business Information Systems programmes, taken from the Department of Financial Accounting's 2022 Handbook.

Figure 1.1: Abridged subject content

Source: Adapted from the Durban University of Technology (2022b)

Figure 1.1 indicated that the Financial Accounting syllabus does not cover topics related to the 4IR, with no topics related to using technology for financial accounting purposes. The syllabus for Business Information Systems, on the other hand, includes 4IR-related topics.

The study sought to determine whether students are aware and knowledgeable about accounting software packages. The use of accounting technology, such as accounting software packages, is critical in preparing any future accounting professional. The findings of this study will indicate whether the financial accounting curriculum is in line with the university's strategy of producing graduates with the necessary skills to respond to technological changes.

Organisations are increasingly interested in hiring graduates who have knowledge of, and skills in, accounting information systems (AIS) (Poston and Grabski 2000). Figure 1.2, below, shows abridged online job advertisements by CareerJunction for positions that require a Diploma in Accounting, or similar qualifications. It is important to understand what employers expect from graduates.

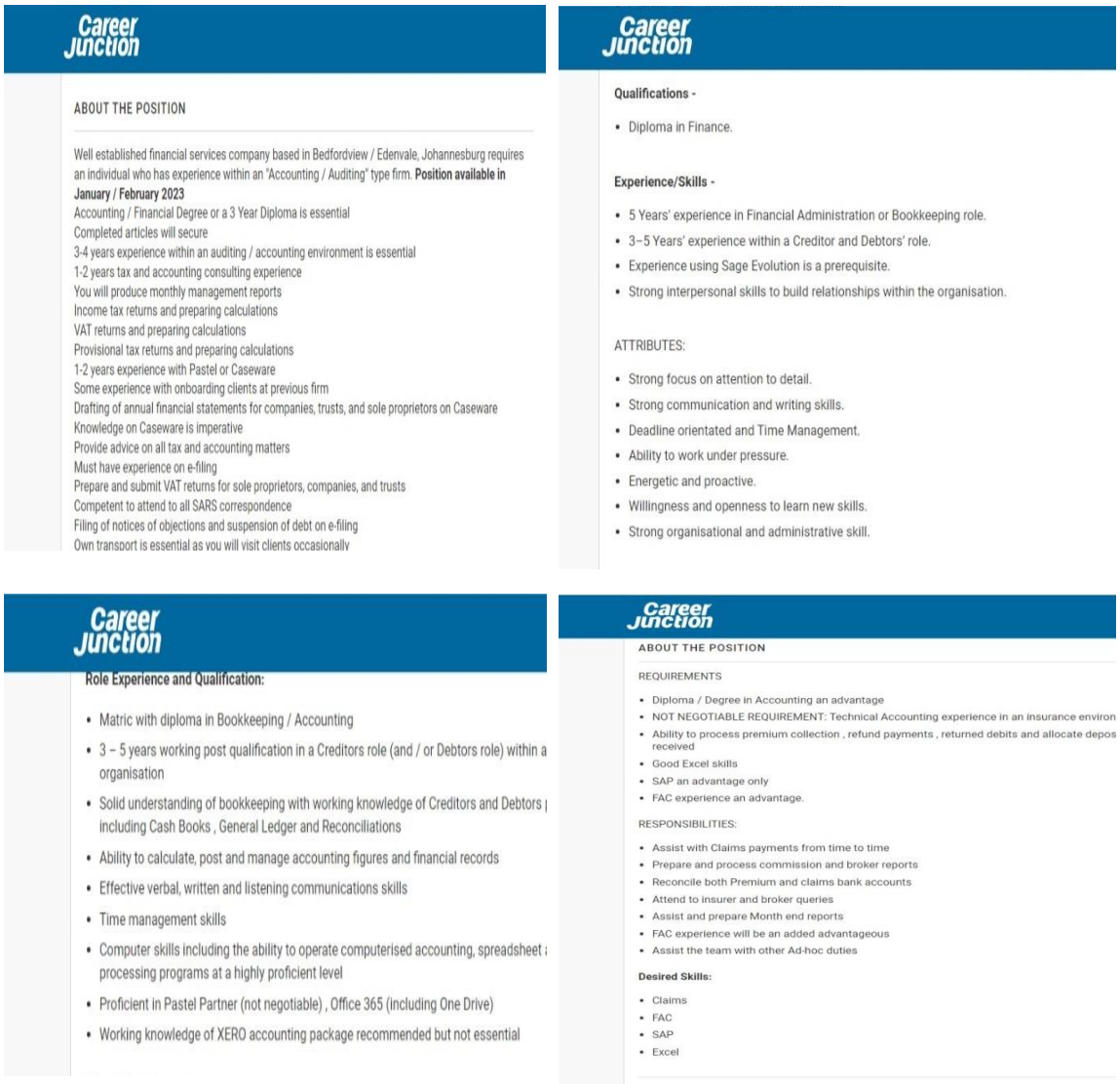

Figure 1.2 CareerJunction's abridged accounting online ads

Source: CareerJunction (2022)

According to the advertisements in Figure 1.2, candidates seeking employment in the accounting field must be familiar with accounting software packages such as Pastel, Sage, and SAP. Figure 1.2 demonstrated the importance of this research study by illustrating that employers expect Diploma in Accounting graduates to be proficient in using accounting software packages.

1.7 Research aim

The aim of this study was to examine the applicability of accounting information systems (accounting software packages) in the teaching and learning of financial accounting at DUT in the Fourth Industrial Revolution era. This was achieved using a case study.

1.8 Research objectives

The objectives of the study:

- to identify awareness, knowledge and usage of accounting software packages in the teaching and learning of financial accounting;
- to explore students' perceptions of accounting software packages and their use in learning financial accounting;
- to determine ways in which accounting software packages can benefit the learning of financial accounting; and
- to explore students' knowledge of the Fourth Industrial Revolution.

1.9 Research questions

The study's objectives have resulted in the following research questions, which will define the scope of the study:

- Which accounting software packages are students aware of, knowledgeable about, using, and competent in?
- What are the students' perceptions of the use of accounting software packages in the process of learning financial accounting?
- In what way can accounting software packages benefit the learning of financial accounting?
- What do students know about the Fourth Industrial Revolution?

1.10 Significance of the study

A lack of digital talent impedes any organisation's desire to grow and innovate. As a result, an organisation must hire employees who are knowledgeable about new technologies (Kolding *et al.* 2018). Education is influenced by technological developments more than anything else, making it crucial for learning to keep up with current and trending technologies (Zarei, Farzaneh and Bazyar 2014). The lack of relevant technological skills and experience may indicate a skills mismatch between what universities provide and what is required in the workplace. Furthermore, it is impossible to disregard the impact of the 4IR. Shrivastava and Shrivastava (2014) stated that universities assist in the creation of new knowledge. Therefore, universities need to create curricula that focus on emerging technologies (Penprase 2018). The financial accounting curriculum must be aligned with technology to give accounting graduates job market-expected technological skills.

This research study is intended to identify students' awareness, knowledge and competency in using accounting software packages, as that will ascertain how the university is applying relevant technological skills in the curriculum to prepare students for the workplace. The research study also intended to explore the students' perceptions about the usefulness and benefits of applying accounting software packages in the financial accounting curriculum. It is hoped that this study will promote and improve the application of relevant technological tools when designing financial accounting curriculum changes. Furthermore, the research study is intended to explore students' knowledge of the 4IR. It is hoped that the study will promote a greater consideration of the Fourth Industrial Revolution (4IR) in the financial accounting curriculum. The findings should contribute to an increased interest and research into how accounting technology affects accounting learning in the era of the 4IR.

1.11 Research methodology

1.11.1 Research design

Martin and Bridgmon (2012) stated that the blueprint for finding answers to research questions is provided by research designs. Bryman (2012) indicated that a research design establishes a framework for gathering and analysing data.

A census approach was considered more appropriate for this study, which utilised a quantitative approach. A self-administered survey with closed-ended questions was used. The questionnaire yielded information about students' perceptions of the use of accounting software packages, and the perceived benefits of using accounting software packages, as well as the students'

knowledge of the 4IR. A questionnaire was developed in order to meet research objectives and provide insight into the research questions.

1.11.2 Target population

A population is a group of people or objects that are the subject of a study (Chawla and Sondhi (2011). The population for this study was students enrolled for the Diploma in Accounting studying Financial Accounting 3 in the Department of Financial Accounting at DUT, Ritson campus. The university did not offer a postgraduate diploma in accounting when data administration and collection began. Thus, the study was limited to students pursuing the Diploma in Accounting.

According to the Department of Financial Accounting's class list for 2022, 257 students were enrolled in Financial Accounting 3 as part of the Diploma in Accounting at the Ritson Campus. The study is a census study. As a result, no probability or non-probability sampling was required. According to Chawla and Sondhi (2011), a census is applicable when gathering data from a small population.

1.11.3 Data collection instrument

Data collection instruments are probing strategies used by a researcher as tools for collecting data. Data collection instruments include questionnaires, interviews, observations and reading (Munir *et al.* 2017). The study made use of a five-point Likert scale survey questionnaire.

1.11.4 Ethical considerations

A gatekeeper's permission letter (Appendix D) from the Institutional Research and Innovation Committee (IRIC) was given to the Department of Financial Accounting's head of department before the questionnaire was administered. Student participation was entirely voluntary and their confidentiality was protected. As a result, ethical considerations were considered and the appropriate ethical clearance (Appendix C) from the university's Faculty Research Ethics Committee (FREC) was acquired.

1.12 An overview of the chapters in the study

1.12.1 Chapter One: Introduction

The background is discussed in this chapter to place the research study in context. The research problem being studied; the aims and objectives; the questions; and the overall methodology of the study are introduced.

1.12.2 Chapter Two: Literature review

This chapter presents the literature review on the use of accounting software packages in the financial accounting curriculum. In addition, this chapter examines the impact of the 4IR on accounting technology. The literature review includes both seminal and recent works.

1.12.3 Chapter Three: Research design

The research methodology for the study is covered in this chapter, in particular the design of the study, collecting data instrument, and data analysis method.

1.12.4 Chapter Four: Data analysis, results and interpretation

The data analysis, which used version 25 of SPSS is discussed, as well as how the data connects to the study's research objectives.

1.12.5 Chapter Five: Conclusion and recommendations

This chapter discusses the data analysis and how it pertains to the study’s research objectives.

1.13 Chapter summary

This chapter highlighted the importance of accounting technology, especially the use of accounting software packages in the financial accounting curriculum in the era of the fourth industrial revolution. In order to introduce the research topic, this chapter provided the study's background. The scope of the study, research study problem, rationale, research aim, and research objectives were all presented in a coherent form. The significance of the study, research approach, and structure were all clarified in detail.

The next chapter will present a critical review of the literature which supports the study. Accounting software packages, educational technology, financial accounting curriculum and the impact of the 4IR on accounting technology are discussed.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The previous chapter established the relevance of the current research study by highlighting the background, research objectives, scope and significance of the study. The literature review reflects definitions employed in previous works. This chapter evaluates the critical literature that supports the study. Mouton (2001) suggested that a researcher must be concerned with collecting the most current, reliable and pertinent knowledge contributed by other scholars. Equally importantly, Rowe (2014) maintained that a good literature review must point out critical gaps in the knowledge.

This chapter reviews the literature pertaining to the applicability of technology in the financial accounting curriculum. Existing research on the impact of the 4IR on the teaching and learning of financial accounting in explored in both the international and South African contexts. This literature review also highlights past theories that have by employed by previous researchers.

2.2 Key Concepts

2.2.1 Fourth Industrial Revolution

Nel and Kayembe (2019) stated that the Industrial Revolution was a major development, change, or transition in the evolution of human civilization, encompassing everything from the use of machineries, telecommunication services and electricity, to new innovations in technology. Karsten, van der Merwe and Steenekamp (2020) noted that the 4IR builds on the preceding digital revolution, but it is substantially different in terms of speed, scale, and possible disruption to existing, growing organisational models built on a “sharing/on-demand” economy.

The First Industrial Revolution altered people's lives and economies by reshaping a farming and handicraft economy into one influenced by trade and machine production. During the Second Industrial Revolution, oil and electricity facilitated mass production. During the Third Industrial Revolution, technology was used to computerize production (Xu, David and Kim 2018).

The 4IR is one of the most widely debated topics among academics, researchers, practitioners, and policymakers worldwide. According to one study, the 4IR’s nine technological pillars are systems amalgamation; big data and analytics; simulation and virtualisation; the Internet of Things; the cloud; cybersecurity; autonomous robots; augmented reality; and additive manufacturing (Coetzee et al. 2021).

New, flexible curricula and teaching approaches are required to meet students' current and future demands. The existing structure needs a creative reimagining of the curriculum (Menon and Castrillón 2019). Employers are looking for graduates who are ready to help steer their organisations to success in today's globally competitive workplace. Higher education institutions (HEIs) are responsible for producing graduates with the necessary knowledge, skills and attitudes, as well as graduates who are instantly employable (Arek-Bawa and Reddy 2020).

2.2.2 Financial accounting

Financial accounting can be defined as the orderly identification, systematic recording and reporting, by means of the preparation and presentation, of the monetary values in the financial transactions of an individual or a business entity, in order to allow users to make decisions on the basis of information collected in the current financial statements and financial reports. Financial accounting is an expert approach which enables the people or entities interested in the operations of an entity to access financial information about the entity and its activities (University of South Africa 2016). Financial accounting is the branch of accounting that is designed for users outside of the business (Alexander and Nobes 2010).

At its most fundamental level, financial accounting's primary objective is to provide owners and funders with consistent and comparable information about the organisation's value creation (Nilsson and Stockenstrand 2015). Financial Accounting emerged as a profession, largely as a consequence of the necessity to stay abreast of financial activities in order to provide evidence to the relevant parties. Financial accounting methods have previously been flexible to accommodate variations.

2.2.3. Accounting information systems: accounting software packages

Badua and Watkins (2011) pointed out that accounting systems date back to 8,000 B.C., if the definition is broadened to include traditional manual accounting systems. Accounting systems, on the other hand, date back to the 1920s if accounting systems are defined strictly as the use of traditional accounting processes in conjunction with computers and telecommunications. For many, the phrase refers to a computer-based system (Romney and Steinbart 2017). However, today's accounting information systems (AIS) are concerned with both financial and non-financial data and information (Dandago and Rufai 2014).

Accounting professionals perform daily tasks by utilising broad computer applications. In most organisations, computerised accounting software has completely replaced manual accounting systems (Boulianne 2014). Accounting information systems research has a long history

because of their importance in practice and education. Organisations are increasingly interested in hiring students who have knowledge and skills in AIS (Poston and Grabski 2000).

Hall (2015) explained that an accounting information system (AIS) is made up of the data and methods used to activate; recognise; evaluate; categorise; document; and report the assets and liabilities associated with the organisation's transactions. The quality of information in the accounting information system (AIS) influences the reliability of financial statements. Lacy *et al.* (2019) indicated that the modification of accounting from paper processes, coupled with stringent guidelines set by governing bodies, has made accounting systems more complex.

A good accounting information system, as illustrated in Table 2.1, will include the following features:

Table 2.1: Effective accounting system

Recognize and keep track of financial transactions
Give accurate, up-to-date information about transactions.
Precisely determine the financial value of transactions.
Record transactions in the sequence in which they occurred.

Source:(Hall 2015)

In the field of information and technology systems, an accounting information system (AIS) is a tool. There are numerous system designs influencing how data is collected and disclosed that must be considered. The size of the organisation; the volume of transaction data; the nature of its operations; and its organisational structure and form may also have an impact on the system design. In general, organisations employ three types of information systems: manual systems, computer-based transaction systems, and database systems (Lim 2013). An information system is a network of interconnected subsystems that work together to gather; process; store; integrate; and disseminate data for decision making, strategic planning, and control (Dandago and Rufai 2014). Table 2.2 illustrates types of accounting information systems.

Table 2.2: Types of Accounting information Systems

Manual System: It makes use of paper-based journals and ledgers.
Computer-Based Transaction System The user is simply filing in a computer screen that looks and functions as a source document.
Database Systems This system collects both financial and non-financial data and stores it in the data warehouse.

Source: Adapted Lim (2013)

2.2.3.1 Computer-based transaction system

The broad term 'computer-assisted accounting' refers to either accounting performed with a computer's assistance or the use of a computer to digitise the accountant's activities (Frimpong, Yawson and Akomeah 2018).

A study found a positive and significant correlation between students' performance and how well the General Ledger Package helped them comprehend accounting concepts. The General Ledger Package has been used to introduce students to recording procedures in place of the more traditional 'paper and pen' methods (McDowall and Jackling 2006).

A study that provided an overview of computerised accounting in Ghana, and investigated the challenges and benefits associated with its use, concluded that, despite the numerous benefits of computerised accounting, there are some drawbacks. Some organisations are struggling to make the switch from manual to computerised accounting because of a fear of computers; computer malware attacks; a reluctance to change; and high costs, among other reasons (Frimpong, Yawson and Akomeah 2018).

2.2.3.2 Accounting software

'Accounting software' refers to a collection of programs or procedures associated with a system. Electronic information interchange; accounting software; audit software; word processing software; and graphics software are all ubiquitous in the world of organisations (Lim 2013).

Accountants must be proficient in using software tools in order to execute accounting duties more effectively and efficiently (Ghasemi et al. 2011).

'Accounting software' includes programs that record and process accounting transactions within functional modules, such as payroll; accounts receivable; accounts payable; and trial balance. It is a part of the accounting information system (AIS) . Basic accounting software is now available online. Commercial accounting information system software is classified into three types: turnkey systems, backbone systems, and vendor supported systems (Lim 2013). Table 2.3 illustrates the three types of accounting software.

Table 2.3 Types of accounting software

Turnkey Systems: Completed and tested systems These are ready to be integrated into the organization's process.
Backbone Systems: Consist of basic system structures on which to build. The core principle is pre-programmed in this approach, and the vendor will design the user interface to satisfy the client's specific requirements.
Database Systems These are referred to as customised systems. The system is created, applied, and managed by the software vendor for its client.

Source: adapted (Lim 2013)

The inaugural Account Production and Accounting Software Guide for Practitioners prepared by the South African Institute of Chartered Accountants (SAICA) provided a detailed guide to help accounting practitioners choose suitable software for accounts production and accounting purposes. The guide generally assists accounting practitioners in selecting software products that will best suit their needs as practitioners and satisfy their clients' needs. The South African Institute of Chartered Accountants (SAICA) considered several factors in reviewing the software products, including the cost of the products; features of the products; installation challenges; software update capabilities; training required to use the products; timesaving and increased productivity capabilities; compliance issues; risks and security considerations. The SAICA guide reviewed several different software products, such as Microsoft Dynamics 365; Palladium Accounting Software; QuickBooks Online Accountant (QBOA); Sage Business Cloud

Accounting; SAP Business One; Xero; New GX Advisory, and PayFast (South African Institute of Chartered Accountants (SAICA) 2018).

The South African Institute of Professional Accountants (SAIPA) provided a list of accounting products and services to assist its members in meeting current and future technological challenges. This included, but is not limited to, Draftworx; Sage; CaseWare; Receipt Bank and Xero products (South African Institute of Professionl Accountants (SAIPA) 2020).

2.2.3.3 Benefits of using accounting software packages

The benefits of using accounting software packages are numerous and significant. Essentially, accounting software packages aid businesses in a variety of processes (Dimitriou 2015). (Habash 2021) concluded that, when compared to computerised accounting systems, manual accounting systems take longer to process information. Furthermore, manual systems require more personnel. Table 2.4 illustrates the advantages and disadvantages of information systems.

Table 2.4 Advantages and disadvantages of new technologies (information systems)

	Advantages	Disadvantages
Financial	Decreases the initial investment in capital Consistent subscription costs Reduced costs overall	Long-term costs may be higher for ongoing subscription fees
Performance	Enhanced productivity Enhanced client relations Vendor managed upgrades without service interruption Greater availability Quicker rollout	Problems with service level agreements Performance risks Complicated to audit
Security	Optimised recovery from disasters Prevents the need for backups.	Access management Data protection System management made more demanding Cyberattacks on the network are plausible
Strategic	Flexible system Allows small and medium-sized. businesses to concentrate on their core competencies. Adaptation to additional cloud services	Risk of service disruption due to vendor failure Compliance hazard Control issues
Technical	Eliminates requirement for internal IT Utilization of cutting-edge technology Support is available. Enhanced system availability	Reliance on a swift, trustworthy internet connection Heightened danger of network congestion and server stress

Source: Dimitriou (2015)

The benefits of using accounting software packages are numerous and significant. Essentially, accounting software packages aid businesses in a variety of processes (Dimitriou 2015). There are over 150 well-known software products around the world (Marushchak *et al.* (2021). Al-Delawi and Ramo (2020)stated that accounting information systems are in high demand due to their significant impact on organisational performance. Epstein (2021) noted that accounting software is a simplistic application that enables an organisation to better manage its cash flow for auditing purposes. It is the primary tool for determining an organisation's fiscal viability and meeting legal compliance obligations using tools like general ledgers, account payables and receivables, sales order, inventory control and invoicing.

Mundida (2020) stated that current accounting software makes transaction processing much faster, easier, and more accurate than manual accounting processing. They do, however, have

some limitations: They cannot, for example, make decisions or exercise judgement. Coci (2020) also pointed out that computers are simply not capable of what-if scenario thinking; adaptive thinking; complex problem-solving; creative thinking; or imagination. As a result they lack emotional intelligence; compassion; diversity; intellectual ability; inquisitiveness; entrepreneurial spirit; and storytelling ability. Ganyam and Ivungu (2019) noted that an accounting information system is an essential resource in the arsenal of leaders seeking to maintain a competitive edge in the midst of rapid technological advancement, improved knowledge, and challenging demands from clients and owners of organisations.

2.2.4 Educational technology

Nowadays, the use of technology in education is increasingly becoming extremely important (Stošić 2015). Technology-based teaching is a substitute for the traditional teacher-centred approach to teaching. Traditional teaching is deemed irrelevant in a world that is technologically advanced, as students live in the information age era (Erasmus and Fourie 2018). The lack of international standardisation in defining the term ‘educational technology’ creates difficulties in developing a universal definition and characteristics (Bryant and Hunton 2000).

Jack and Higgins (2019) explained that it is unlikely that consensus on terms and concepts, or a centralized definition of educational technology, will be reached. A brief analysis of the literature on technology in the early years identifies the different terms used to refer to educational technology. Shakirova and Valeeva (2016) concluded that all definitions of educational technology allude to a collection of educational processes; goals; strategies; processes; resources; means; conditions; and forms, as well as a mechanism of teacher and student interaction that ensures the educational process’s success. Table 2.5 presents educational technology terminology.

Table 2.5 Educational technology terminology

Modern technology
Mobile applications
Technological learning
Virtual brands
Online resources
Electronic media
Information systems
Computer technology
Network technology
Internet resources
Digital competency
Distributed learning

Source: Adapted Jack and Higgins (2019)

The integration of internet, computer and digital applications has made learning with technology a more effective educational practice. Information and communications technology (ICT) resources and applications are used to provide flexible learning that focuses on information access, and interaction between teachers and students. The role of ICT in social transformation is acknowledged in the South African higher education sector. Emailing; weblogs; virtual libraries and the development of creative software packages for the management of information tasks in teaching are all examples of information and communication technology practices. HE in South Africa uses technology systems such as Zoom, Microsoft Teams and Skype to create interpersonal interaction through web seminars (webinars), conference calls and videos (Patrick, Abiolu and Abiolu 2021). Nonetheless, it is important to keep in mind that the education system is not exempt from the impact of IR 4.0 technologies. The technologies of the 4IR are

expected to have a significant impact on learning opportunities, educational policies and instruction procedures (Elayyan 2021).

Amiel and Reeves (2008), as cited by Lautenbach (2015), argued that educational technologies do not ensure significant improvements in educational outcomes. Learning technologies should be utilised to improve a process rather than as a goal in and of themselves; and if this is recognised as a process, the goal of technology in education will become evident. Technology in education should not be viewed as the activity's purpose or object, but rather as a mechanism to assist in the teaching and learning process. Nori et al. (2016) concluded that educational technology allows instructors to vary their delivery methods and avoid rigour, which is generally considered an excellent technique for teaching financial accounting.

2.2.5 Financial accounting curriculum

The financial accounting curriculum specifies the instruction materials, the method of instruction, and the method of evaluation for curriculum implementation. The Financial Accounting curriculum is regarded as a document that includes a detailed list of topics; objectives; content; teaching and learning materials, and an evaluation guide that students are expected to cover (Akamigbo and Eneja 2020).

Accounting is generally concerned with evaluating and imparting the financial information gathered from accounting systems, as well as the reporting of financial results to owners, employees and their representatives, and all other stakeholders, including lenders and the government (Besusparienė, Vitunskaitė and Butėnas 2018). Accounting can be defined simply as the language of the organisation (Mostyn 2012). Accounting is a global language that is deemed to be logical, reliable and impartial, and capable of simplifying complicated information (Helliar 2013). The basic aim of accounting is to supply information to external and internal users to allow them to make informed decisions (Agyekum and Singh 2018). Besusparienė, Vitunskaitė and Butėnas (2018) claimed that about 50% of the information used in making effective organisational decisions is based on utilising financial accounting information.

An accounting professional who has graduated from any of the South African higher education institutions (SAHEIs) must be able to read and analyse financial statements. The first learning goal is for students to execute the traditional function of creating financial statements while simultaneously learning how to read and interpret them (McWilliams and Peters 2012). Peens (2021) indicated that the South African Institute of Chartered Accountants (SAICA) pointed out that the future of the accounting industry does not appear to depend too much upon the calculations carried out by accountants. Instead, it is dependent on accounting professionals' abilities to understand financial performance and financial position developments in the industry,

and which calculations and publications provide users with financial information. Lubbe (2017) explained that accountants in the ‘world of work’ can no longer rely solely on abilities learned in higher education; also indicating the importance of sound practical skills, as employers need a wide range of useful skills.

Ahmed (2003) stated that accounting education needs to keep up with the ever-changing environment, requiring a rethink of the competencies that undergraduates must possess. Therefore, the financial accounting curriculum should be designed in such a manner that it provides students with the skills and knowledge expected by the job market. Rhodes (2012) explained that the failure of accounting education to accommodate industry expectations has resulted in a gap in the knowledge and skills required from accounting graduates. Technology advancements have a greater impact on education than anything else, so it is critical for teaching and learning to stay up-to-date with the latest accounting technologies (Zarei, Farzaneh and Bazyar 2014).

2.2.6 Higher education (HE) in South Africa

South Africa has 26 public higher education institutions spread across the country's nine provinces (Universities South Africa 2021). Universities are established all around the world to undertake three core functions: teaching, research and community service. The university's main goal is to provide quality teaching and learning, to expose students to how knowledge is created through research, and to contribute to societal development through community service (Olaniran and Maphalala 2020).

Institutions of higher learning exist at the intersection of the state, the market, and society, each with a distinct set of demands and rationales (Shrivastava and Shrivastava 2014). South African university students come from unequal and unfair backgrounds in regards to their education, race, class, and economic and other resources (Chetty, Pather and Condy 2015). Student hardship in South Africa indicates how the expansion of higher education is putting a lot of pressure on state budgets, higher education institutions and individual families, particularly those who are entering higher education for the first time (Allais 2017).

Jaffer, Ng'ambi and Czerniewicz (2007) pointed out that higher education institutions face challenges that include, not just growing throughput in terms of numbers and diversity of student population, but also providing a quality educational service. Samkin and Stainbank (2016) stated that universities are in the midst of a technological revolution that will reduce demand for certain specialists. The number of occupations requiring a mid-level degree is anticipated to decline as a result of globalisation and automation. Furthermore, advances in machine intelligence and automation are expected to have an impact on historically unaffected economic

sectors. This technological revolution may result in a rise in the demand for retraining and continuing education among employees of all ages.

2.3 Teaching and learning environment at South African higher education institutions (SAHEI)

2.3.1 Learning environments in higher education

Warger and Dobbin (2009) explained that a learning environment is made up of a variety of factors that influence learning. The concept of a learning environment implies a situation in which intentions and design cannot account for everything that occurs; some elements escape control or are at the very least unintended. Hezemans and Ritzen (2002) pointed out that the student, the instructor and the field are all involved in the creation and implementation of learning environments.

The best learning environment is one that is accessible; dynamic; productive; interactive and empowering. A learning environment must also cater for the demands of today's students by giving practical work experience, instant feedback and learning equipment that is adaptable (Khlaisang and Songkram 2019). Aheto and Cronje (2018) argued that learning environments in higher education are a disputed issue because they have such a large impact on students' learning connections and behaviour in a complex technological environment.

Higher education attracts a diverse range of students, from recent matriculants beginning undergraduate programmes to working people with substantial work experience. In higher education learning environments, students expect engaging and relevant learning experiences (Jacobsen, Brown and Lambert 2013). The learning environment is the institutional setting that can either facilitate or hinder the relationship between attitude and intention to improve current knowledge (Foong and Khoo 2015).

Researchers and practitioners encourage the use of digital learning environments in higher education for two key reasons. Firstly, in a progressively digitalized world, education has to be digital as well. Secondly, digital learning environments have the potential to improve learning and teaching by enhancing learner motivation, adjusting to students‘ past knowledge and allowing for mobile and ubiquitous learning (Kümmel *et al.* 2020). The student's ability to learn nearly anything at any time has increased as a result of technological advancements. Traditional learning records, such as transcripts, do not adequately capture and represent all of the knowledge that students acquire (American Library Association 2019).

Financial accounting educators have been urged by the accounting profession to create a learning environment that fosters the development of lifelong learning skills, analytical thinking and teamwork abilities (Foong and Khoo 2015). Accounting technology has been incorporated into education, based on the desire of teachers, who recognise that it is a tool for enhancing classroom instruction (Contreras and Mayorga 2019). Technologically-supported learning environments are compelling educators from all disciplines to establish new learning opportunities; as well as applying fresh accounting teaching methods to testing and utilising innovative ways (Virtanen *et al.* 2018).

2.3.2 Learning challenges using technology in South Africa

Ogbomo (2011) asserted that the recent rapid advancements in information and communication technologies have resulted in key developments in how society operates and communicates; and both the content and delivery requirements for educational and training services appear to be impacted by this. As a result, there is increased pressure on policymakers to acquire new technologies. Ghavifekr *et al.* (2016) pointed out that, in the digital age, using ICT in the classroom is essential to providing students with opportunities to learn and use the required twenty-first century skills. However, integrating ICT into teaching and learning is a complicated process that can be full of challenges. Mathevula and Uwizeyimana (2014) found that the impact of ICT on teaching and learning has yet to be established in the literature. Even after years of ICT use, and research into its impact, there is still some debate over its educational advantages and disadvantages.

Scheepers (2015) concluded that keeping up with the increasing number of accounting education innovations is a challenging task. Despite the many educational technologies, most academics are appointed with little teaching preparation or experience, and their understanding of effective teaching and learning is based on their experiences as students. As a result of their lack of prior experience as students using these tools, academics tend to rely on traditional teaching assumptions when implementing education technologies.

Ng'ambi *et al.* (2016) noted that, as students' use of digital devices increases in South Africa, a small but growing group of first-year students come to university with inadequate ICT exposure or basic computer literacy skills. A new set of academic skills is required of students who want to succeed in a digital age. Brown and Mayisela (2015) indicated that universities around the world have shifted their focus from computer skills to digital literacy and associated graduate attributes. These digital literacies are now widely recognised as a requirement for students in higher education. According to du Preez and Sinha (2020) university students must be taught how to achieve a new level of digital competence, and how to use interdisciplinary activities to

access a variety of intellectual domains. Furthermore, the 4IR is an ideal platform for this new educational concept to cultivate a mindset that aspires to be more than ordinary.

Covid-19 accelerated the digital transformation (Coci 2020). Digital learning solutions have unquestionably become more important since the Covid-19 pandemic (Dwolatzky and Harris 2020). South African higher education institutions (SAHEIs) quickly adopted internet technology to facilitate interaction between students and academics (Mhlanga and Moloi 2020).

The higher education landscape in South Africa is caught between institutional contextual issues rooted in previous educational policies, and the generation of endless opportunities enabled by emerging technologies. These challenges are so inextricably linked that they must be addressed simultaneously. While these challenges are not exclusive to South Africa, they do have an impact on education policies and, as a result, perceptions of technology-assisted learning (Bozalek and Ng'ambi 2015).

2.4 The importance of accounting technologies in teaching and learning

2.4.1 Teaching and learning

One dilemma for higher education is to properly harness the potential of signature pedagogies and collaborative technology for the creation and evaluation of high-quality learning experiences that are guided by the most recent learning research (Jacobsen, Brown and Lambert 2013). Accounting professionals and academics from a variety of jurisdictions have recognised the value of accounting education staying relevant (Samkin and Stainbank 2016). Accounting is one of the professions with methods that have been greatly influenced by the incorporation of improved hardware and software technologies in recent decades (Yaftian, Mirshekary and Mihret Dessalegn 2017). As a result of recent developments in the accounting field, traditional face-to-face instruction has become obsolete. With the advent of current technologies, significant modifications in modern teaching methods have been shown to be the solution (Ramen and Jugurnath 2016).

The speed at which technology is moving affects many elements of life (Yaftian, Mirshekary and Mihret Dessalegn 2017). Students enrolled for accounting programmes are rapidly subjected to the benefits and versatility of computers and are empowered to use technology (Boulianne 2014). The use of ICTs in accounting has resulted in significant improvements in the structure and function of education (Ramen and Jugurnath 2016). It is fascinating to consider new ways of communicating with students; reimagined methods of presenting materials; the possibility of social connections with individuals via sophisticated communication systems; and novel ways of measuring learning (Kavanaugh 2018).

While the principles of the accounting process have not changed (at least not considerably), the way accounting data is processed and reported has changed considerably. As a result, all business students who are required to study financial accounting as part of their qualification programmes must also be computer-literate in their disciplines in order to have the skills that are applicable in a computerised environment (Yaftian, Mirshekary and Mihret Dessalegn 2017). Accounting programmes are taught using a number of software applications that allow for the attainment of various teaching and learning objectives. In essence, the use of computers is not limited to the installation of software; it also includes the use of the Internet to access instructional resources (Dimitrios *et al.* 2013). Table 2.6 reflects the main types of software employed in accounting education.

Table 2.6: Accounting education software

Productivity software	These programmes are designed to help students learn basic accounting processes while also developing abilities such as the capacity to identify, analyse, interpret, and select from a variety of options.
Drill-and-practice software	This includes accounting problem-solving programmes that allow students to practise and correct their errors.
Modelling software and simulation software	These programmes are aimed to provide an accounting problem for students to address in the real world, within the parameters of (simulated) reality.

Source: Boyce (1999) as cited by Dimitrios *et al.* (2013), and adapted

Emerging accounting technologies have a positive impact on pedagogical practise, particularly in terms of immediate feedback, collaboration, and interaction between teachers and students (Bozalek, Ng'ambi and Gachago 2013). When a teacher-controlled environment is transformed into a more learner-controlled environment, it becomes increasingly easier and less tutoring is needed. The teachers are obviously the important actors in the efficient realisation of integrated ICT learning. Therefore, it is crucial to be able to efficiently integrate technology with education through the proper approach to, and perception about, ICT. The perceptions and goals of students must also be taken into account, since they affect their space and style of learning (Ali 2020). Several experts have suggested that the potential benefits of ICT and computer technology be used in accounting education to improve the teaching and learning processes. Computer simulations and spreadsheet models as educational tools may improve experiential learning opportunities for students who prefer more abstract and theoretical learning styles (Nori *et al.* 2016).

2.4.2 The use of accounting software in accounting programmes

In today's economy, no profession can claim to be exempt from the pervasiveness of software development (Wosu 2008). Over the last few years, technology has had a significant impact on society. It has had an impact, not only on business, but also on other sectors such as healthcare, communication and education (Habash 2021). Accountants have been on the cutting edge of accounting technology since mathematician Luca Pacioli formalised the system of double-entry bookkeeping over 500 years ago (Keystone 2017). A wide range of financial software has been developed in response to the increased demand for automated processes. Thus, employee workloads are reduced greatly and errors have decreased to a minimum. As a result, modern technological education must be introduced at the higher education institutions (HEIs) in order for students to become familiar with technology before entering the labour market (Habash 2021).

Ganyam and Ivungu (2019) noted that accounting information systems (AIS) are integral tools in the arsenal of managers seeking to keep their competitive edge in the midst of rapid technological advancement. Marushchak *et al.* (2021) pointed out that accounting software has become a necessary component in all types of businesses. There are over 150 well-known software products in the world. Al-Delawi and Ramo (2020)added that accounting information systems are in high demand due to their significant impact on organisational performance. Epstein (2021) noted that an accounting software is a basic application that allows a company to record the flow of money for review and auditing.

The accounting profession has put a lot of pressure on tertiary accounting programmes to include information technology (Bromson, Kaidonis and Poh 1994). According to the accounting profession, accounting software packages should be used in the classroom to promote student learning and prepare students for employment in accounting (Lusher, Huber and Valencia 2012). Many prominent academic scholars have advocated for the use of accounting software in accounting teaching and learning (Nori *et al.* 2016). Despite the need for IT-related modules by financial students, they are not offered, or are only offered to a small number of students, due to a shortage of staff and facilities. The most typical difficulties encountered when integrating internet-based on-line assessment are issues with technology infrastructure, such as program inconsistencies, access issues, and technical support (Senik and Broad 2011). Modern accounting professionals should be both proficient in, and comfortable with, the use of technology in this digital age (Lusher, Huber and Valencia 2012).

Lusher, Huber and Valencia (2012) stated that accounting professionals work in technologically advanced contexts; thus, accounting graduates should be able to demonstrate technological proficiency. Nori *et al.* (2016) noted that teaching and learning is a two-way communication

process in which both academics and students must actively participate. However, students prefer to remain silent in class and let the academics do the talking. The use of accounting software in teaching accounting programmes is undoubtedly crucial in overcoming this apparent shortcoming in higher education. Furthermore, accounting software encourages active learning and is advantageous since it allows the attainment of multiple teaching and learning objectives at the same time. Habash (2021) stated that accounting software applications, such as QuickBooks, should be introduced to students in university accounting programmes.

IT competency is one of the key technical skills required of accounting graduates. Universities are required to incorporate these IT software tools into accounting units in order to help students become 'work ready'. Because the accounting curriculum is already overburdened with ever-expanding subject knowledge, it is not possible to teach these skills through additional units. Furthermore, learning about information systems and technologies outside of an accounting context is difficult and has not been shown to be effective. IT tools that are relevant, appropriate, and up to industry standards must be embedded in the accounting context and taught using modern pedagogy. To prepare accounting graduates, schools must incorporate framework concepts such as network security; accounting forensics; IT controls; and software such as SAP (Seethamraju 2010).

The findings of a survey of Ghanaian accounting graduates and employers on accounting knowledge and skills were presented in a paper. Despite the fact that employers rated technological skills as extremely important, only 38% of private sector employers rated graduates as good or very good in information technology; and only 25% rated graduates as very good or good in general knowledge and skills. Furthermore, the review discovered that 76% of the accounting graduates had no accounting-related IT skills when they were hired (Awayiga, Onumah and Tsamenyi 2010).

A study that sought to provide a pedagogical discussion on the potential of using accounting software in the teaching and learning of accounting knowledge concluded that accounting educators must modify course syllabuses to keep up with technological changes in the business world. Furthermore, it was determined that accounting software packages have the potential to improve a student's understanding of accounting concepts. As a result, teaching and learning activities can be divided into traditional methods and the use of accounting software to accelerate students' knowledge acquisition (Nori *et al.* 2016).

Accounting professionals perform daily tasks by utilising broad computer applications. In most organisations, computerised accounting software has completely replaced manual accounting systems (Boulianne 2014).Graduates who have only received manual accounting training are more of a burden than an asset to such a modern entity (Habash 2021). A study conducted at

Botswana's Botho University to determine whether students enrolled in an accounting programme faced any accounting software challenges during their internship period observed that computerised accounting assisted students in mastering skills required during the internship, as well as in industry and commerce after the accounting programme was completed (Machera and Machera 2017).

2.5 Impact of Fourth Industrial Revolution (4IR) technologies on South African higher education institutions (SAHEIS)

2.5.1 Higher education's response to the 4IR

Although the precise effects of 4IR technology on people and the environment are uncertain, it appears that substantial and rapid transformation will take place. The need for higher education to adapt is pressing, due to the possibility of inevitable loss of control over networks of powerful artificial intelligence (AI) agents with increasing autonomy within the financial sector and urban infrastructure, as well as the power of technology to have either positive social effects or cause catastrophic environmental harm (Penprase 2018). As a consequence of these innovations, a new type of teacher-student relationship has emerged – one that does not require a physical location. Physical learning spaces are replaced with virtual or hybrid learning in online learning environments, with both benefits and flaws (Herrador-Alcaide, Hernández-Solís and Sanguino Galván 2019).

Humans now live in an unstable and unpredictable world, characterised by dramatic worldwide changes in all areas. The 4IR is one trend that continues to stimulate worldwide political discussions in both the economic and educational spheres. Furthermore, the 4IR has unsettled the educational world at large, raising concerns about the type of education that students should receive in order to be skilled in the era of the 4IR (Mahlaba 2020).

The 4IR is outpacing and outlasting the Third Industrial Revolution (3IR), which has repercussions for higher education in Africa. Higher education in Africa is at risk of slipping behind if the 4IR is not incorporated (Fomunyam 2020). There are specific areas of excellence in South Africa that are propelling the education system into the 4IR, which has the potential to greatly increase access to education. Even though the COVID-19 pandemic wreaked havoc on so many people, it also presented an opportunity to examine how well or poorly implemented technological solutions have performed (Mhlanga and Moloi 2020).

Shahroom and Hussin (2018) pointed out that the university campus will not survive as a residential institution. Today's university buildings are woefully inadequate and completely unnecessary. Consequently, there will be many changes in teaching and learning methods in

the future, in the teaching content, and in the roles of academics and students. Penprase (2018) argued that the importance of rapidly adapting to, and ramping up, new 4IR forms of accounting education must be recognized by higher education, in order to ensure the environmental and economic sustainability, as well as the relevance, of higher education as an adaptable and crucial component of the community.

2.5.2 Accounting profession's response to the 4IR

The Fourth Industrial Revolution is defined as a new era in which the influence of digitalization is expanding in unexpected ways. This is predicted to have an impact on employment security, particularly among graduates. Computerisation will largely replace jobs that were previously performed by people. As robots can carry out not only routine operations, but also complex tasks, Industry 4.0 provides opportunities for those who embrace it. Computerisation also poses significant challenges to traditional professions such as accounting. Accounting methods are expected to be influenced by Industry 4.0 because accounting professionals will be able to collect initially inaccessible data in real time, improve data integrity through increased precision and timeliness, and improve data efficiency and data assurance, among other things. (Ghani and Muhammad 2019).

Software development has given accountants more time to devote to interpreting financial data and, as a result, they have become more engaged in strategic planning (Asonitou 2015). With improvements in information technology and the globalisation of economies, the environment in which accounting professionals work is rapidly changing. To tackle the challenges posed by these changes, university accounting programmes must provide graduates with solid technical knowledge, as well as the ability find work and contribute immediately to a company (Tan and Laswad 2018).

The accounting profession is clearly shifting away from traditional accounting work, to newer, more value-adding activities such as tactical planning, systems improvement and product profitability (Asonitou 2015). Industry 4.0 is the result of the rapid progress of smart technologies. The 'internet of things' is a component of Industry 4.0, and it is intended to offer a massive amount of data with seamless interconnectivity. Germany was the first country to implement Industry 4.0, followed by the United States, Japan and China. Industry 4.0 is expected to result in a significant drop in human-intensive labour, perhaps leading to high unemployment rates, particularly among graduates around the world. This is because, in an Industry 4.0 world, regular jobs would be phased out in favour of highly skilled jobs (Ghani and Muhammad 2019).

Modern technology has an impact on employment, as well as work structures. Advancements in technology can endanger standard manual jobs, but they can create new jobs that require highly skilled workers. Workers constantly need to develop their skills to remain relevant and competitive in the job market (Chuang and Graham 2018). Therefore, universities need to create curricula that focus on emerging technologies (Penprase 2018). An organisation's ambitions for expansion and innovation can be stifled by a shortage of digital talent. An organisation must hire employees who can use new technologies efficiently (Kolding *et al.* 2018).

2.6 Technology changes to the financial accounting curriculum

2.6.1 The impact of accounting technology on the financial accounting curriculum

Around 100BC, Luca Pacioli invented the journal, ledger and cashbook, which were managed by business merchants and scribes. The invention of computers in the nineteenth century, followed by the use of application software, changed accounting practices across business organisations (Salawu and Moloi 2020). According to some accountants, artificial intelligence (AI), machine learning, and blockchain are threatening their very existence. The function of bookkeepers and accountants will unarguably and inevitably shift dramatically, within the next five years. As a result of automated processes, the value of daily business activities such as journal entries and account preparation will be substantially reduced (Ryan 2019).

The accounting profession is rapidly evolving, and educational curricula should follow suit in order to produce technologically competitive graduates. The digital era acted as the primary accelerator, resulting in globalisation, increased financial accounting reporting obligations, and the creation of new rules and procedures. The accounting profession is rooted far back in the ancient Mesopotamian scribes and the Roman empire's bookkeepers. Even though most of the principles of accounting have not changed, new accounting standards are being introduced and technological advances are evolving, which need to be included in today's higher education (HE) accounting curricula (Mahambo 2020). Artificial intelligence (AI) and robotics go beyond journal entries The ability to record accounting transactions alone is not sufficient. Accounting professionals must have additional skills, such as in business rescue; the migration of financial accounting data; and independent evaluation (Ryan 2019). The new role of professional accountants in the 4IR is being contemplated, as is the impact of artificial intelligence on employment security (Terblanche and De Clercq 2021).

The development of new and developing accounting technology is disrupting traditional business models. Intelligent automation technologies, such as robotic process automation, artificial intelligence and machine learning, automate routine activities and reporting, while also

being responsible for real-time performance data (Ryan 2019). Technological advances, combined with rapid changes in the accounting profession, are forcing HEIs to reconsider their teaching methods and approaches. This should not be taken lightly, given that students with the expertise and knowledge required to enter their chosen industries are largely dependent on HE institutions (Karsten, van der Merwe and Steenekamp 2020). Lim, Lee, Yap and Ling (2016), as cited by Terblanche and De Clercq (2021), noted that professional accountants are expected to be more than just bookkeepers; they are also required to be tactical analysts, associates and knowledge professionals.

Universities should be in a position to collaborate with industry to ensure that accounting graduates have the knowledge and skills needed in the 4IR, such as the use of artificial intelligence (AI) and big data technology. In this era, the following skills will be required:

- the ability to evaluate data in order to recognise the factors that drive business;
- understanding what customers require and how to track it;
- the ability to make business decisions using new types of data; and
- the ability to interpret data in order to provide decision makers with more meaningful information (Surianti 2020).

The challenge at many universities is that 'old school' academics are hesitant to change to the new pedagogy of teaching and learning. In addition to building a student mindset with a strong commitment to adhere to ethical standards, preparing a competent workforce for 4IR necessitates developing a student mindset with a strong belief in adhering to ethical standards. Unfortunately, technology is being abused for the wrong objectives (Espahbodi 2020). Accounting education must evolve to address the requirements of a rapidly expanding profession which is going to concentrate on the open procurement of diverse knowledge. Accounting professionals must possess, preserve, and constantly and consistently encourage, increased levels of competence to address the increasingly more diverse expectations from accounting services. University programmes are not adequately preparing future accounting professionals to deal with the turbulent global environment of the future (Asonitou 2015).

2.6.2 Technological trends influencing the financial accounting curriculum

The Association of Chartered Certified Accountants (ACCA) (2013) listed ten accounting technologies that might have a great impact on the accounting profession. The ACCA stressed the importance of keeping abreast of new technologies used by accounting professionals, as these technologies can be exploited in such a way that they will minimise the daily repetitive and time-consuming burdens of accounting work to maximise the benefits of producing high-quality work through data generated by these technologies. The ten technology trends, illustrated in Table 2.7, are as follows:

Table 2.7 ACCA: Technology trends

Mobility
Cloud
Big data
Payment systems
Social collaboration
Cyber security
Robotics
Augmented and virtual reality
Artificial intelligence
Digital delivery

Source: The Association of Chartered Certified Accountants (ACCA) (2013)

The South African Institute of Chartered Accountants (SAICA) (2018) identified eight technologies and labelled them as the ‘essential eight technologies’, and the technologies that will transform the finance function, as illustrated in Table 2.8 below:

Table 2.8: SAICA Essential Technologies

Artificial Intelligence(AI)
Augmented reality
Blockchain
Drones
The Internet of Things(IoT)
Robotics
Virtual Reality
3-D printing

Source: Adapted The South African Institute of Chartered Accountants (2018)

While the fundamentals of teaching and learning accounting have remained the same, technology advances have had a significant impact on how they are currently carried out in the commercial world; and the delivery methods, learning outcomes, and evaluations in educational curricula should reflect this. Significant changes will occur in the accounting profession, and higher educational institutions across the world will need to adapt (Mahambo 2020). Accounting education has remained focused on the traditional manual accounting method, with little integration of accounting software or other learning tools, despite the rapid technological revolution in industry. It appears that accounting education is focused on content, rather than skills development, and that financial accounting curriculums are limited, obsolete, and/or useless. Yet an accounting graduate with the appropriate ICT abilities would be more useful and employable as a career accountant (Lautenbach 2015).

Several universities in various countries have made changes to their curriculum content by integrating Big Data and data analytics programmes, with some requiring accounting education to include ICT, accounting software packages, systems analysis and design topics (Gamage 2016). However, it is recognised that independent courses, such as Big Data cannot easily be added without sacrificing programmes that are already part of the accounting qualifications' curriculum. Therefore, one possible solution is to include related topics in existing courses (Surianti 2020).

Not everyone regards the integration of technology into the accounting education curriculum in a favourable light. The impact of technological changes on accounting, according to some researchers, will be draining on accounting students. As a result, it is necessary to replace outdated content with fresh, up-to-date learning resources so that students are not overburdened by dated learning material, while also attempting to keep up with new technology. The consequences of an out-of-date accounting education are disastrous. The following are the consequences of outmoded traditional accounting curricula and teaching methods:

- Graduates are poorly prepared for a dynamic career.
- Graduates with hardly any broad experience will be produced.
- Higher education institutions will produce graduates who are not employable.
- There will be little exposure to accounting technology.
- As a result of rote learning , there will be an increase in the number of graduates who lack the ability to interact, verify, or apply financial information (Mahambo 2020).

2.6.3 Overview of technology-related courses offered at other Universities of Technology in South Africa offering the Diploma in Accounting

The Cape Peninsula University of Technology (CPUT) offers four modules (Business Computer Applications and Accounting Information 1 A-C) that are aimed at bridging the gap between technology and accounting to prepare students for real-world accounting. These four modules are covered in the first and second years of the Diploma in Accountancy. Students are introduced to Excel (Solver; Scenario Manager; Pivot Tables and Charts) and Database (Access) (Cape Peninsula University of Technology 2022).

The Mangosuthu University of Technology (MUT) offers a Diploma in Accounting that has three subjects relating to accounting and the use of technology. Business Information Systems is offered in the first year and covers the basics of Microsoft Office and networks. Practical Accounting and Practical Integrated Accounting are offered in the third year and these subjects introduce students to Pastel Accounting and Pastel Payroll (Mangosuthu University of Technology 2022).

The Tshwane University of Technology offers various modules relating to accounting and technology that are spread throughout the three years of the Diploma in Accounting. Students are introduced to Microsoft Office and network basics in the first year. The Business Information IA and IB modules train students to be competent in advanced Excel functions. Work-integrated learning (WIL) is offered from the first year until the third year. WIL in accounting (simulation) introduces students to Pastel Accounting and VIP Payroll. WIL (simulation) facilitates the use of

technology-assisted learning to integrate with the theory of accounting and taxation, allowing students to have practical experience (Tshwane University of Technology 2022).

2.7 Advantages of using technologies in accounting education

Over the years, there has been a lot of discussion about how much technology should be used in the teaching and learning of accounting. Some educators argue that students' capacity to acquire the fundamental principles of accounting theory is harmed by their use of computers (Boulianne 2014). Technology integration is frequently employed to boost student motivation. The main focus of technology integration is the use of computers as presentation tools, providing new resources and compelling images to enrich teaching, encourage students and reinforce the idea that students need to employ technology to be equipped for the future (Koç 2005).

Few details are known about how accounting students use and benefit from technology to improve learning outcomes. Despite the fact that commercial enterprises were the first to capitalise on the digital economy, universities were not immune to these changes (Basioudis and de Lange 2009). Palvia *et al.* (2018) emphasised that the pervasiveness of information technology has had an impact on virtually every aspect of life, including how people work, process data into information, analyse, and exchange data. Traditional teaching and learning approaches need to be supplemented by the acceptance of new information and communication technologies (ICTs), which offer new ways of creating, disseminating, and receiving a university education (López-Pérez, Pérez-López and Rodríguez-Ariza 2011).

The use of technology in the classroom is not a novel approach. Online learning management systems (LMS), such as Blackboard and Moodle, are commonly used in higher education institutions (HEIs) (Staples, Chandler and Lowe 2018). Students are accustomed to constant access to the virtual world and are at ease with using various digital devices in their everyday lives. Daily reliance on digital devices has an impact on the teaching environment, as universities attempt to fulfil the learning requirements of these digital natives by introducing these resources into the classroom. Regardless of their level of comfort with mobile devices, the majority of students prefer technical training and support for academic purposes. Despite the daily use of digital devices, the majority of students do not consider themselves technologically skilled (Kinash, Brand and Mathew 2012).

A majority of students, according to Gong and Wallace (2012), believed that academics did not provide adequate training on how to use educational technology for learning purposes. A significant number of students were eager to learn how to use digital tools in the classroom and had expected more assistance from academics. They added that, while students are familiar

with digital technology for entertainment purposes, they may require assistance in realising its potential as an educational tool. Nori *et al.* (2016) stated that using ICT and computer technologies may significantly improve students' learning experiences. Moreover, incorporating interactive multimedia technology into accounting information system cycles can also simulate the learning experiences that students would have in a real-world setting, providing them with real-world scenarios.

Since computer technology has become more widely available and more reasonably priced, learning management systems (LMS) have become more popular in the educational sector (Basioudis et al. 2012). Mobile technologies, such as iPads, have the potential to improve academic success. The difficulty is balancing the positive and negative effects of faculty instruction and support, such as distraction and frustration (Otieno 2015). Kozma (1991) and Butler and Mautz (1996), as cited by Basioudis *et al.* (2012), stated that a learning management system (LMS) is considered as just another mode of delivery and, as such, is incapable of improving learning under any circumstances. Basioudis *et al.* (2012) further stated that other researchers disagree with this assertion. Since many institutions and instructors argue that LMSs are more convenient and can provide cost savings, a better learning experience, and more motivation.

De Lange et al (2003), Wells et al. (2008) and Basioudis and de Lange (2009), as cited by Basioudis *et al.* (2012), revealed that, according to an Australian study looking at students' perceptions of the usefulness of LMSs, the availability of programme materials, message boards, chat rooms, and a video summary were all positively correlated with student satisfaction with the LMS. New Zealand and the United Kingdom both conducted similar investigations. While students in New Zealand were pleased with the availability of a learning management system (LMS), they were less enthusiastic about interactive activities, according to the study. However, a UK study found a degree of satisfaction with LMSs, which was linked to both one-way communication and interactive activities (Basioudis *et al.* 2012). Halabi *et al.* (2010) indicated that their study found that blended learning increased accounting knowledge and led to a greater level of understanding, when compared to standard lecture programmes.

Another study looked at how accounting software affected students' knowledge of the accounting cycle, an important concept in business and accounting. The study's primary goal was to learn more about how software can be used for knowledge development and to assist in changing curriculum content. There were three student groups: first, those who completed an accounting case with a pencil and paper; second, those who completed an accounting case using software; and finally, those who completed an accounting case by hand, first with pencil and paper, then with software. The findings of the study demonstrated the benefits of a strategy

combining accounting software with pencil and paper. When combined, these two methodologies provided the best results for understanding the bookkeeping cycle (Boulianne 2014).

Experiential learning enhances the students' enthusiasm and dedication to learning, aids in understanding the correlation between theory and application, fosters a greater understanding of working cultures, and contributes to career advancements (Lengyel 2020). A study of computer assisted learning (CAL) packages and students' learning and performance found that CAL had a significant impact on learning objectives and outcomes (Kanapathippillai, Ahamed Shamlee and Dellaportas 2012).

2.8 Students' perceptions of the Fourth Industrial Revolution and using accounting technology

Bozalek and Ng'ambi (2015) stated that higher education must consider technological tools from the perspective of students, as well as the key role of user-driven initiatives and cloud-based educational opportunities for learning with advanced technology, in order to produce graduates with the desired attributes. Elaine Gioiosa and Kinkela (2019) noted that prospective employers seek people who are comfortable with technology and have strong interpersonal skills, indicating that it is critical for students to believe that they are gaining those abilities throughout their higher education. Byrne and Flood (2004), as cited by (Richardson *et al.* 2013), indicated that, according to research, students' perceptions of learning are a significant factor driving their learning style; which, in turn, influences the quality of learning outcomes.

The evolution of technology into the educational process has seen learning strategy shift from desktop to laptop, and from laptop to palmtop devices, such as mobile phones and tablets, in the new era of technology (Marzuki *et al.* 2019). Ernst and Young (2012), as cited by (Richardson *et al.* 2013), concluded that the growing usage of virtual learning environments, as well as the shift away from 'bricks and mortar', has resulted in widespread support for the use of mobile and cloud-based technology in higher education. Herrador-Alcaide, Hernández-Solís and Sanguino Galván (2019) identified that students' perceptions about the online learning environment, and their own competence, may have an impact on how satisfied they are with the programme as a whole.

Concannon, Flynn and Campbell (2005) noted that, in higher education, students perceived the use of technology as an expected and integral component of the learning process. The ease of access to study materials and the offer of a central location for students to find information or extensive resources relating to each module were cited as major benefits (Concannon, Flynn and Campbell 2005). Brooks (2016) as cited by Elaine Gioiosa and Kinkela (2019), indicated

that students agreed that technology helped them complete their programmes successfully. It also emphasised the value of incorporating technology into the classroom; and Stepp-Greany (2002), as cited by Elaine Gioiosa and Kinkela (2019), revealed that approximately 41% of students agreed or strongly agreed that they learned from internet activities.

A focus group study at Botswana's Botho University asked participants (students on internship registered for a Bachelor of Science (Honours) in Accounting) for their opinions on the implementation of a computerised accounting curriculum. All the participants agreed that a computerised accounting curriculum improves accounting students' employability and self-reliance. The participants also agreed that being on an internship without computerised accounting skills was difficult for the majority of them. They believed that most employers preferred students with computerised accounting knowledge and skills (Machera and Machera 2017).

Many universities want to use technology in the classroom, but they are failing in practice. A study that sought to answer the question, “Are accounting curricula adequately preparing graduates to use technology upon graduation?" concluded (Dingus 2021). A study was conducted in the United Arab Emirates with the aim of identifying higher education students' perceptions of employability skills and contrasting these perceptions with the employability skills that employers expect in the job market. According to the findings, students do not fully comprehend the employability skills needed in the 4IR. As a result, there is a misalignment between future demand for employability skills and students' perceptions of that demand (Pauceanu, Rabie and Moustafa 2020).

2.9 Teaching and learning theories

2.9.1 Cognitivism theory

Cognitive theories are centred on the conceptualization of learners’ learning processes, describing how information is collected, arranged, kept and recovered by the mind. Cognitive theories deem learning to be based mainly on what learners know and how they have acquired the information, rather than focusing on what learners do (Silva 2018). The student is required to play a very active role in the process of learning (Ertmer and Newby 2013). The utilisation of technology as part of education greatly promotes skills and cognitive characteristics because new technology enhances the learning and receiving of information (Stošić 2015).

Cognitive load theory is founded on cognitivist notions. The roots of cognitivism, like many other fields of educational psychology, may be traced back centuries. Its latest achievements, on the other hand, began to emerge when behaviourist applications became more widely used. In

reality, the term refers to research into the mental processes that underpin learning (Mostyn 2012).

2.9.2 Behaviourism theory

According to this theory, behaviour is determined by the arrangement of particular stimuli in the environment. It holds that if a behaviour is strengthened or rewarded, it is likely to continue, whereas if it is not enforced, it is likely to cease (Silva 2018). Rather than vigorously investigating the environment, the learner is said to be responsive to its conditions, in this theory (Ertmer and Newby 2013).

There has been an increased interest in using digital gaming as a tool in the learning and teaching of accounting education. Gaming allows for the simulation of specific situations which helps with experimental learning. Behaviourism theory maintains that learning is achieved through the use of stimuli and response through reinforcement, which can be linked to an interactive process in digital gaming. The instructor, as the teacher, can use stimuli such as praise or punishment in the process of learning, as learners are being taken through the curriculum in small steps: for example, when the player (learner) matches the correct answers, a stimulus in the form of praise is given as a response to the player's success (Carenys and Moya 2016).

Behaviourism, which was widely used for over two decades but is now mostly forgotten, contributed certain crucial instructional approaches that have been well evaluated and have effectively become academic orthodoxy. Regrettably, aside from meticulously planned stimulus and response, behaviourist schooling did not allow for any of the many other important mediating (intervening) effects on learning, dooming the theory to failure (Mostyn 2012). Jonassen (2000) argued that computer-assisted instruction can improve achievement by enhancing the automaticity of lower-level skills through constant repetition.

2.9.3 Theory of Reasonable Action (TRA) model

Despite the fact that Fishbein and Azjen's Theory of Reasonable Action (TRA) model was established in 1975 for sociological and psychological research, it has only recently become a foundation for exploring individuals' IT usage behaviour. Human behaviour is anticipated and described in this model by three primary cognitive components: attitudes (a person's favourable or unfavourable feelings about a behaviour); social norms (social influence); and intentions (a person's decision to do, or not perform, a behaviour) (Taherdoost 2018).

TRA is a deep-rooted social-psychological model that is interested in explaining the causal factors of conscious behaviours, primarily the association of attitudes and behaviours within

human action. This theory holds the firm belief that human beings are reasonable and will always contemplate the consequences of their actions before engaging in any behaviour. The Theory of Planned Behaviour (TPB) is an expansion of the TRA which connects human beliefs and behaviour. What TPB does is to extend the TRA by considering circumstances in which humans do not have the ability to be in full control.

2.9.4 Constructivism theory

Constructivism theory stresses that effective learning is not gained from repeatedly replicating the information supplied by the teacher. It highlights the need for the students to construct information inside their minds, taken from their own experiences and prior learning (Aldoobie 2015). Constructivism theory stresses the connections between people and the sociocultural factors which have created shared experiences (Silva 2018). In his theories of learning and human development in the 1960s and 1970s, Jean Piaget formulated and codified what became known as constructivist learning theory (Mostyn 2012).

Constructivism theory, as a learning theory, is centred around student discovery learning, where students learn by doing. The development and implementation of educational technology in relation to constructivism theory is echoed in the development of educational games, multimedia developments and effective online communication (Ouyang and Stanley 2014). Jonassen (1991), as cited by Koç (2005), suggested that learning is mastered with the support of technology and the resulting environment is one in which technology enhances, rather than being the object or subordinate of learning. These are the most innovative and efficient ways of using technology in the classroom. Hof (2020) stated that the origins of constructivism theory are firmly linked to technology in general and to programming as a method of self-expression.

2.10 Theoretical framework of the study: Technology Acceptance Model (TAM)

Davis introduced this model in 1986. TAM, according to Davis, provides a powerful explanation for user acceptance and usage behaviour of information technology. It is important to note that TAM was developed from the TRA (Lee, Kozar and Larsen 2003). The TAM model was designed to aid in the prediction of technology acceptance based on the constructs of perceived usefulness; perceived ease of use; attitudes; and behavioural intention. Figure 2.1, below, illustrates the TAM model.

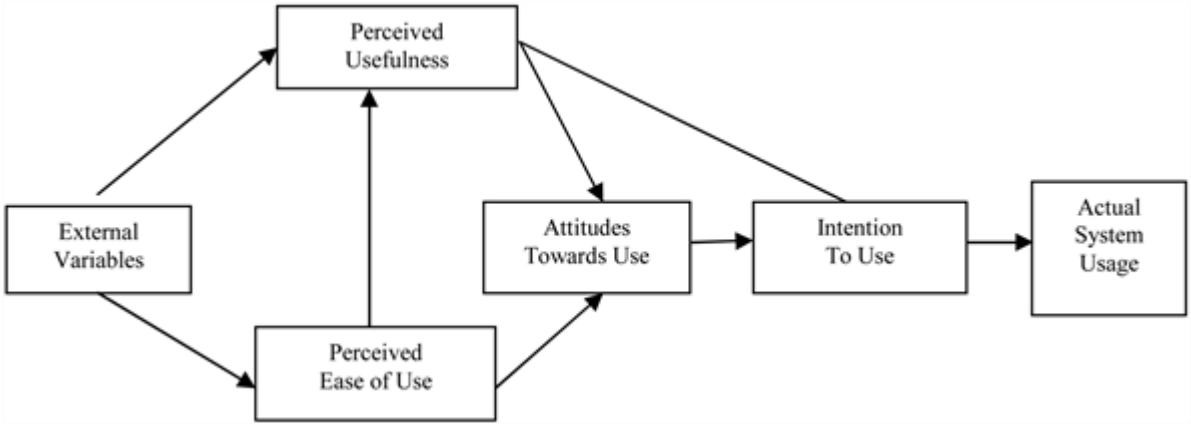

Figure 2.1: TAM 1

Source: Davis (1989)

TAM is a model that has been widely applied in a variety of fields, including commerce, government and education, which use information technology in their routine processes. There are countless researchers in the field of education who have employed TAM to explain why people use technologies like e-learning; multimedia learning tools; digital libraries; e-journals; etc. (Napitupulu *et al.* 2017). Davis (1989), as cited by Azli, Shah and Mohamad (2018), stated that a person's behavioural intention to adopt a system is based on two beliefs: perceived usefulness and perceived ease of use. Perceived usefulness is defined as the degree to which individuals think the new system will improve their performance; whereas perceived ease of use is defined as the degree to which individuals believe using the system will be effortless (Davis, Bagozzi and Warshaw 1989).

Davies and Venkatesh later expanded TAM1 into the TAM2 model and several social constructs were added, including subjective norms, voluntariness and image (Venkatesh and Davis 2000). Venkatesh and Bala (2008) then developed TAM3 by combining TAM2 (Venkatesh and Davis 2000) and the model of the determinants of perceived ease of use (Venkatesh 2000), as shown in Figure 2.2, below.

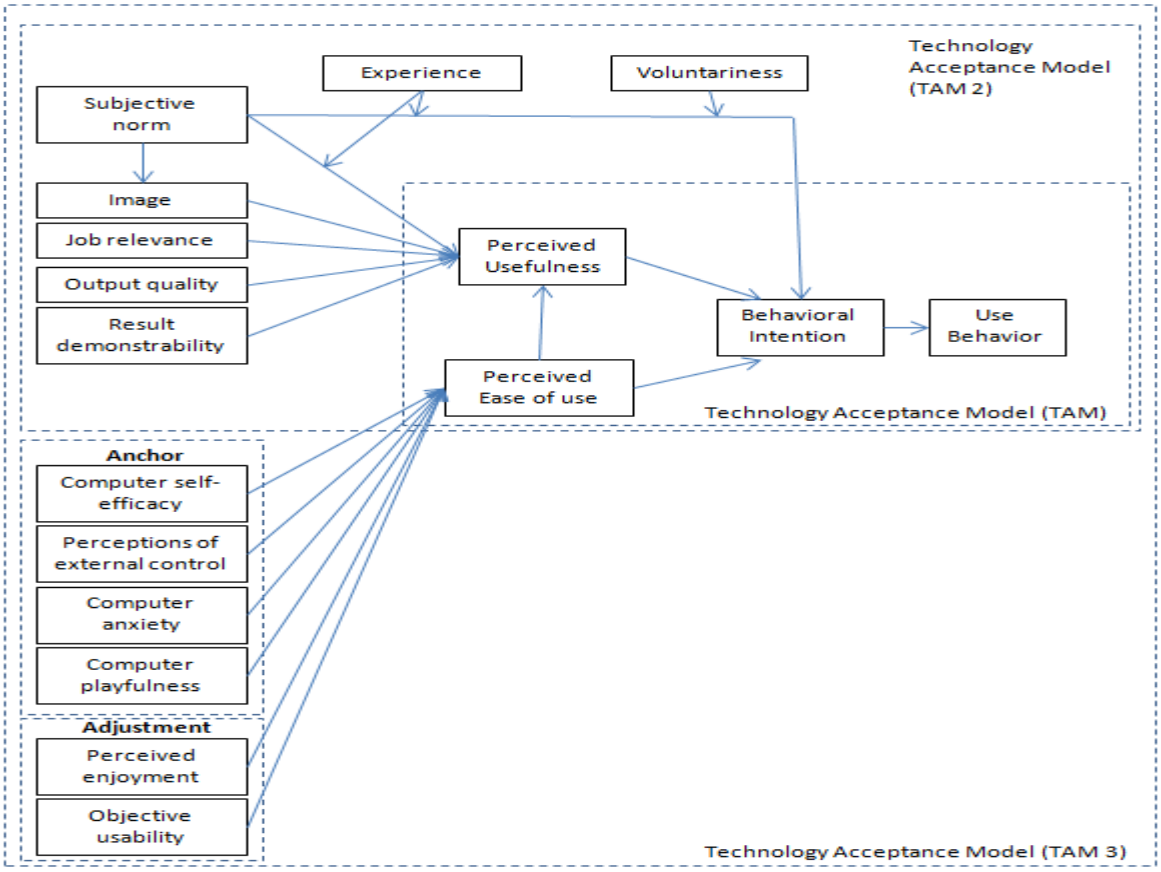

Figure 2.2: Expanded TAM

Source: Davis (1989),Venkatesh and Davis (2000), and (Venkatesh and Bala 2008)

TAM as a model of technology is crucial as it forecasts the acceptability of tools or technologies. Furthermore, it plays an important part in identifying the modifications required to make technologies acceptable to users. Accounting technology is constantly evolving, so it is critical to determine what factors will motivate accounting professionals to accept these technologies and then integrate them in the completion of their accounting tasks. TAM plays a large role in accounting technology as accountants need to believe that emerging technologies will indeed improve their performance as professionals (Lagaras 2018). Guzman and Nussbaum (2009) argued that simply acquiring hardware or software is inadequate for technology integration, emphasizing the importance of the user's attitude. stated that the use of the TAM model may result in several recommendations being made to an organisation for improvements, allowing the organisation's system to be improved even further. Despite the TAM model's increased popularity, it has received criticism from a number of academic scholars for being too broad (Salovaara and Tamminen 2009).

2.11 Chapter summary

This chapter examined the literature to provide a detailed review of the 4IR, its influence on accounting technology and its impact on higher education (HE) and the accounting profession. It covered the significant literature relevant to the study's background, as well as key concepts which influence education and accounting technology in higher education for the teaching and learning of the financial accounting curriculum. It focused on the impact of the 4IR on South Africa's higher education sector, the financial accounting curriculum and accounting professionals. The advantages of using technology in financial accounting teaching and learning were highlighted. In addition, different theories were highlighted in this chapter which guided the selection of the most appropriate theory, that being the TAM model.

The following chapter will discuss the research methodology used in this study. It will provide a detailed discussion of the research design; target population; sample size; data administration and collection; and analysis.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter provided an overview of the literature relevant to this study, exploring current literature on the use of accounting technology in the teaching and learning of financial accounting in the era of the Fourth Industrial Revolution (4IR). This study focuses on the applicability of accounting software systems (accounting software packages) in the teaching and learning of financial accounting in the 4IR at the Durban University of Technology (DUT), Ritson Campus in KwaZulu-Natal. The primary purpose of any form of research is to unearth previously undiscovered or unrecognised facts (Mishra and Alok 2017). This chapter will describe the research design, research methods, research instrument as well as the target population and sample size.

3.2 Research methodology

3.2.1 Research design

The more methodologically coherent the research, the more likely the findings are to be valid; at least within the context of a specific methodological paradigm and approach. A research design is a rational method of increasing the validity of findings, Martin and Bridgmon (2012) stated that research designs provide the basic framework for uncovering answers to research questions. Bryman (2012) stated that a research design creates a foundation for data collection and analysis. Table 3.1, below, illustrates five different research designs.

Table 3.1: Research designs

Case study
Cross-sectional or survey design
Experimental design
Longitudinal design
Comparative design

Source: Adapted Bryman (2012)

The research questions posed in Chapter One were important when selecting the type of study and developing the research design for the study. The study design reflects the relative importance accorded to various aspects of the research process. This study used a quantitative strategy with a cross-sectional design that included case study elements. Each of these components will be discussed in detail in the chapter.

3.2.2 Quantitative strategy

When conducting a quantitative research, one must collect numerical data, think deductively about the relationship between theory and study, and favour an approach based on natural science, particularly positivism and an objectivist definition of social reality (Bryman 2012). Mertler (2016) explained that one of the conceptual beliefs behind quantitative research is that the world is relatively stable and homogeneous, allowing us to measure, comprehend and make broad generalisations about it.

Leedy and Ormrod (2015) pointed out that the following steps are followed by quantitative researchers:

- conceptualization of the research hypothesis to be tested;
- separation of the variables to be studied;
- use of standard protocols to collect statistical data in some form;
- use of statistical procedures to analyse the data; and
- deductions or conclusions drawn from the data.

Queirós, Faria and Almeida (2017) stated that quantitative research uses defined procedures and formal data gathering instruments and data is obtained objectively and methodically. Furthermore, the statistical analysis of numerical data is routinely performed using software such as SPSS, R Software and Stata. Table 3.2 outlines the four fundamental elements upon which quantitative research is built and four criticisms of quantitative research methods.

Table 3.2 Advantages and Disadvantages of Quantitative Research Strategy.

Advantages- Quantitative Research Strategy	**Disadvantages- Quantitative Research Strategy**
Measuring (looking for indicators): allows for the identification of minimal diversity of human characteristics. **Provides a uniform yardstick for measuring and exact assessments of the degree of connection between concepts.**	The measurement procedure demonstrates an inaccurate sense of accuracy and precision.

The concept of causation: cause-and-effect conclusions.	The connection between research and everyday life is hampered by the heavy reliance on instruments and procedures.
The ability to generalise being able to use the findings in a variety of situations	Inability to distinguish between individuals, social structures, and the "natural world."
Replication: when the study is duplicated, the results are the same, emphasising the data's trustworthiness and validity.	The analysis of variable relationships produces a static view of social life that is unrelated to people's lives.

Source: Bryman (2012)

3.2.3 Case-study

A case study that is associated with a specific location, such as a community or organization, is the most common use of the term "case.". The focus has traditionally been on in-depth investigation of the setting. Contextual investigations are as often as possible related with subjective examination; however this affiliation is mistaken. Both quantitative and qualitative research frequently employ case studies. It can be challenging to determine whether a study should be classified as a case study or a cross-sectional research design when only quantitative data are available (Bryman 2012). A case study could be exploratory, descriptive or explanatory (Teegavarapu, Summers and Mocko 2008).

A case study is especially helpful when learning more about a situation that is new or that is not easy to understand. Additionally, it can be utilized to investigate how a person or program evolves over time, possibly as a result of particular initiatives or events (Leedy and Ormrod 2015). A case study investigates specific research questions and looks for various types of evidence that must be abstracted and compiled in order to get the best possible answers to the research questions. This evidence must be present in the context of the case. There is no single type or source of evidence that can be solely relied on. A key aspect of case study research is the use of multiple sources of evidence, each with its own set of advantages and disadvantages (Gillham 2000).

Crowe *et al.* (2011) listed the primary stages of research activity when designing and conducting a case study namely:

Stage 1: Defining the case;

Stage 2: Selecting a case (s);

Stage 3: Data collection; and

Stage 4: Analysing and interpreting data, as well as reporting findings.

3.2.4 Cross-sectional design/survey

Bryman (2012) explained that the cross-sectional design is generally referred to as a survey design, but the concept of a survey is so commonly linked in most people's minds with questionnaires and structured interviews that the more generic-sounding term ‘cross-sectional design’ is preferable. Leedy and Ormrod (2015) noted that, when broken down into its most basic components, designing a survey is quite simple: The researcher collects data from participants through a series of questions and summarises their responses using percentages, frequency counts, or more sophisticated statistical indices. The sample's responses are then used to draw conclusions.

Cross-sectional designs, such as those used in survey research, are frequently seen as limited, due to the difficulties in imputing causality (Bryman 2012). The widespread use of surveys does not make them any less demanding in terms of design requirements, or any easier to conduct, than other types of research (Leedy and Ormrod 2015).

Islamoğlu and Almaçık (2014), as cited by Gürbüz (2017), mentioned the following assumptions that allow for the accuracy and usefulness of survey data:

- All of the variables that will be measured in the survey have been conceptualised in a clear and intelligible manner by the researcher.
- The survey takers (respondents) have no bearing on the results of the survey.
- All questions are answered correctly by the responders.
- All questions are accurately perceived by the respondents.
- The theories, aims and issues of the study are unknown to the respondents.
- The respondents are unaffected by the interview status or the interviews.

According to Büyüköztürk *et al.* (2012), the survey development process can be divided into four stages namely:

Stage 1: Identifying the problem (determining the purpose and the questions);

Stage 2: Item drafting (forming the draught form);

Stage 3: Gathering expert opinions and creating a pre-application form; and

Stage 4: Pre-application, analysis and the survey's final form.

3.2.5 Justification for the research design

A case study, with a survey design using a questionnaire to collect data, were all considered to be appropriate approaches for carrying out this study. For this study, the survey approach was chosen for only third year students who were enrolled for a Diploma in Accounting. These students have the experience and maturity to express their perceptions on the applicability of accounting software packages in the teaching and learning of financial accounting curriculum in the era of the 4IR. A descriptive case study was chosen to access a sample at a certain point in time without making rash assumptions. The use of a quantitative questionnaire was justified in this study because it allowed for the collection of a large amount of data in a short period of time. The researcher only used closed-ended questions. In a closed-ended questionnaire, for example, the respondent will mark the proper response with a tick or a circle. According to Bryman (2012), closed-ended questions, are simple to process.

3.3 Research approach

3.3.1 Research setting and study population

The term 'population' has a far broader meaning in research than it does in common usage, when it usually refers to a country's whole population. For research purposes, the population refers to the universe of units from which the sample will be drawn. The term 'units' is used since the researcher may want to sample from a universe of nations, cities, regions, firms and so on, rather than just people (Bryman 2012). This research was conducted at the Durban University of Technology, Ritson Campus, Durban , KwaZulu-Natal.

The population chosen for this study was students studying Financial Accounting 3 who were registered for the Diploma in Accounting at DUT, Ritson Campus After graduation, this cohort of students will be expected to use accounting software packages and work as financial accountants for a variety of organisations. They may also start their own businesses or become entrepreneurs. According to the Department of Financial Accounting’s 2022 class list, 257 students were enrolled in Financial Accounting 3 as part of the Diploma in Accounting at the Ritson Campus.

3.3.2 Census study

A census study is an attempt to measure the characteristics of one or more elements within a group and to list all of the elements within that group. Traditionally, the group is a nationwide population, but it can also include every property, corporation and homestead. A census could provide statistics for rare population groups or small geographic areas by collecting extensive

data on all or most aspects of a population. A sample survey and a census have many similarities, including the need to process and edit data, the use of a questionnaire to collect data and the vulnerability to a variety of errors (Cantwell 2008).

This study adopted a census research method. It is acknowledged that the current research study concentrated on a small number of students, limiting the generalisability of results. As a result, no probability or non-probability sampling was required. According to Chawla and Sondhi (2011), a census is applicable when gathering data from a small population.

3.3.3 Questionnaire

As the data gathering instrument, closed-ended questionnaires were used. According to Gillham (2000), questionnaires are not very useful when it comes to meaning and comprehension and are an overused research technique because they are thought to be simple to create. However, they are useful in case studies. Table 3.3, below, lists the advantages and disadvantages of using questionnaires.

Table 3.3: Advantages and disadvantages of using questionnaires.

Advantages of using questionnaires	**Disadvantages of using questionnaires**
Questionnaires are an effective method for collecting information because the responses are usually simple to tabulate or score and the resulting data is simple to analyse, especially if the questionnaires mostly consist of checkbox items.	Response rates to questionnaires are frequently low. However, when conducting an in-person or phone interview with potential respondents, researchers should anticipate higher response rates. When the questionnaire is mailed to people who do not know the researcher, the response rate is generally low.
Questionnaires administered anonymously can be used to gather information on sensitive issues. When respondents are aware that their responses will be anonymous, they are more truthful.	The reason why questionnaires might only offer a snippet is because they function best when they contain items that can be objectively scored, like choice items and short-answer questions with a very small number of possible responses.
Cost-effective research uses questionnaires. While one-on-one personal interviews are the most expensive, especially if the interviewers must travel to reach the respondents, mailing questionnaires allows researchers to communicate with a large number of far-off respondents.	Another disadvantage of questionnaires is that some respondents may be influenced by their perceived social attractiveness. That is, even if they are not entirely honest, they may respond in a socially acceptable manner.

Source: Patten (2016)

The population in this study comprised of third year university students. The questionnaire was the primary data collection tool. The questionnaire for the study was created in Microsoft Forms and a link to it was sent to all those enrolled for Financial Accounting 3 in the Diploma in

Accounting. The link to the questionnaire was active for 26 days, which gave the students adequate time to respond.

3.3.4 The questionnaire structure

The questionnaire used a five-point Likert scale and was created to answer the research questions about the applicability of accounting software packages in financial accounting curricula in the 4IR. Leedy and Ormrod (2015) reported that a rating scale is more useful when evaluating a behaviour, attitude, or other occurrence of interest on a scale of 'inadequate', to 'excellent'; 'never' to 'always'; or 'strongly disapprove' to 'strongly approve'. Rensis Likert developed the rating scales now known as Likert scales in the 1930s to assess people's thoughts and opinions.

The questionnaire included five sections (see Table 3.4 and Appendix F) and as previously mentioned, closed-ended questions were used. Section B used a 'never' and 'very often' rating scale. From Sections C through E, respondents were requested to read the statements in the questionnaire and respond on a five-point Likert scale ranging from 5 = strongly disagree, 4 = disagree, 3 = neutral, 2 = agree and 1 = strongly agree.

Table 3.4 Questionnaire sections

Section A	Demographic characteristics.
Section B	Accounting software package understanding, knowledge and usage.
Section C	Students' perceptions of accounting software packages.
Section D	Benefits of using accounting software packages.
Section E	Students' understanding of the Fourth Industrial Revolution.

3.3.5 Pilot Study

Bryman (2012) stated that a researcher should not begin collecting data before determining the study's objectives. The researcher must also develop a data-collection instrument. Furthermore, if the researcher fails to do so, the results may not be sufficient to answer the research questions. Leedy and Ormrod (2015) noted that innovative researchers use a variety of tactics to increase the validity of their assessment instruments. One important option is to search the literature for measurement procedures that have proven successful in previous investigations. Another method is to show the first drafts of an instrument to experienced colleagues and ask their feedback and suggestions.

Bryman (2012) insisted that, if at all possible, a researcher should conduct a small pilot study to see how well the research instruments work. Bacon-Shone (2013) pointed out that other significant operational challenges for questionnaires include ensuring that respondents are qualified to respond, keeping questions brief, avoiding negative items and avoiding biased items (wording is key, positive vs. negative words). Questionnaire design, which is both an art and a science, necessitates the use of a pilot.

The primary goal of the pilot study was to determine whether the instructions were clear and the language and terminology were understandable. The pilot questionnaire was tested with experienced academics at the Vaal University of Technology (VUT) and the Durban University of Technology (DUT). Eight accounting academics and a qualified statistician with extensive knowledge of SPSS V25 took part in the pilot study. The key reason for selecting these experts was to guarantee that the questionnaire was clear of any questions which were ambiguous or perplexing for students. All the academics that were recruited have taught financial accounting modules and are familiar with conducting research studies. The statistician selected is a qualified and accredited quantitative statistician.

The results of the pilot were used to ensure that the questions and instructions were clear. The questions were easy to understand, according to all pilot participants. As a result, no significant changes were made to the questionnaire. Saunders, Lewis and Thornhill (2012) explained that a pilot study is conducted to ensure that respondents have no difficulties in answering the questions and that data analysis is error-free.

3.3.6 Data collection

A gatekeeper's letter (see Appendix C) and permission to collect data from the Department of Financial Accounting (see Appendix E) were procured before data was collected to carry out a study at the Durban University of Technology. Prior to data collection, ethical clearance was also acquired (see Appendix D). Due to the COVID-19 pandemic, the questionnaire for the current study was created in Microsoft Forms. A link to the questionnaire was sent to all students enrolled for Financial Accounting 3 in the Diploma in Accounting at Ritson Campus. The link was active from 10 May 2022 to 4 June 2022. Fan and Yan (2010) concluded that the response rates for web surveys are significantly low.

3.3.7 The questionnaire dissemination and gathering

Using an online survey questionnaire was the easiest and most efficient way to acquire the most information with the highest participation rate. Due to Covid 19 restrictions, students were instructed to attend Microsoft Teams classes online as it was the chosen platform and for

teaching and learning activities. The questionnaire for the study was created in Microsoft Forms and a link to it was sent to all students enrolled for Financial Accounting 3 in the Diploma in Accounting in Ritson Campus in Durban.

The students received an online notification from the Financial Accounting 3 lecturer informing them of the link to the questionnaire. The Microsoft Forms questionnaire settings were purposefully adjusted to only allow students with a valid DUT email address to access the link and the settings selection ensured that a student would not be able to access the questionnaire more than once.

The response rate was low in the first two days of the link's operation, with only 19 students out of 257 participating. Weekly communication sessions with class representatives were initiated to remind students of the link to the questionnaire. The link was operational for 26 days. There were 257 students enrolled for Financial Accounting 3 in the Diploma in Accounting, 172 students completed the online questionnaire used in this study. This represented a 66.9% response rate. Table 3.5 below illustrates the response rate for the study.

Table 3.5 Response rate

	Planned sample	**Achieved**	**Rejected**	**Usable**
Total	257	172	0	172 (66.9%)

3.4 Reliability and validity

Although the terms ‘validity’ and ‘reliability’ appear to be nearly synonymous, they are analytically distinct and have very different meanings. They are related because validity tends to suggest reliability (Bryman 2012). Reliability and validity for quantitative data are discussed in this section.

3.4.1 Reliability

The issue of whether a study's results are reproducible is addressed by reliability. The word is frequently applied to whether the measurements devised are consistent. In the case of quantitative research, reliability is very important. Whether or not a measurement is stable is likely to be of interest to the quantitative researcher (Bryman 2012). More broadly, reliability refers to a measurement instrument's capacity to consistently produce a specific, consistent result when the thing being tested has not changed (Leedy and Ormrod 2015).

Reliability refers to the consistency of the conceptual scale. Table 3.6 illustrates the three main factors involved in assessing the reliability of a measurement:

Table 3.6 Factors influencing measurement reliability

Stability	**This consideration involves asking if the metric is stable over time. This ensures that the results associated with that metric do not change in the respondent's sample.**
Internal reliability	Whether the consistency of the indicators that comprise the scale or index, or whether respondents' scores tend to be related to those of other indicators, is an important question.
Inter-observer consistency	When multiple 'observers' perform tasks that require a lot of subjective judgement, such as categorising data and recording observations, the results may be inconsistent.

Source: Bryman (2012)

As part of the data collection process, the students were informed that completing the questionnaire was entirely voluntary. There is no reason to think that the results would have differed had the questionnaire been administered at a different time or under different conditions. The reliability ratings of the questionnaire were found to be higher than the recommended Cronbach's alpha value, indicating that the research has an acceptable and consistent level of scoring. Cronbach's alpha, an internal reliability test, is widely used. A calculated alpha coefficient will range between 1 (denoting perfect internal reliability) and 0 (denoting no internal reliability). The Cronbach's alpha results will be discussed in Chapter 4.

3.4.2 Validity

No matter which research methodology the researcher chooses, the researcher must consider the approach's general validity for the researcher's purpose – the likelihood that it will yield accurate, meaningful and credible results that may assist the researcher in addressing the research problem. It will be worthwhile for the researcher if he or she can draw meaningful and persuasive conclusions from the data. A variety of research methods are used to support the findings' validity. Depending on the type of data and the method used, different solutions work in different situations (Leedy and Ormrod 2015). The degree to which a study examines or accurately reflects a specific research question is referred to as validity (Pickard 2013).

A researcher who creates a new measurement should, at the very least, ensure that it has face validity, which is that it appears to reflect the substance of the notion in question. Face validity can be determined by asking other individuals if the measurement appears to be addressing the subject under consideration. In other words, persons with knowledge or skill in an area may be requested to act as judges to decide if the measurement appears, on the surface, to reflect the issue in question. As a result, determining face authenticity is primarily an intuitive procedure (Bryman 2012). Table 3.7 illustrates the different types of validity.

Table 3.7 Types of validity

Face Validity: is the degree to which an instrument appears to be measuring a specific characteristic on the surface.
Content validity: is the degree to which a measurement tool resembles a representative sample of the subject matter being measured.
Construct validity: is the degree to which an instrument measures a characteristic that cannot be directly observed but is assumed to exist based on patterns in people's behaviour.
Criterion validity: is the degree to which the results of an assessment instrument correlate with another, possibly related measurement.

Source: Leedy and Ormrod (2015) adapted

The questionnaire was created in accordance with the objectives of the study in order to determine validity. The pilot study involved eight lecturers. They were chosen as the experts for this study because they have experience teaching accounting courses and are familiar with research discipline. The findings of the pilot study revealed that the questionnaire was simple and easily understandable and no significant changes were made to the questionnaire The questionnaire was created to be straightforward and easy to grasp for the students. As a result, face and content validity can be considered to be addressed in this study. Construct validity of the research instrument was tested using factor analysis. The factor analysis results will be discussed in Chapter 4.

3.5 Data analysis

Quantitative data analysis

Data analysis is divided into several stages. On the most fundamental level, it could be viewed as the application of statistical methods to the collected data. The primary goal of data analysis is data reduction, or reducing the vast data sets gathered by the researcher so that they may be understood (Bryman 2012). Every research project prompts logical reasoning. Deductive reasoning is more widely used by quantitative researchers because they begin with specific premises (such as hypotheses or theories) and then draw logical implications from them. They further aim to maintain impartiality in their data analysis by applying predetermined statistical methods and analysing the results of those operations using reasonably objective criteria

(Leedy and Ormrod 2015). To analyse the collected quantitative data, descriptive statistics were used to present the data in the form of graphs, cross tabulations and other figures. The quantitative data from the study was analysed using the Statistical Package for Social Sciences, version 25.0.

3.6 Ethical considerations

The Faculty Research Ethics Committee (FREC) granted ethical approval (see Appendix D) for the study. Mustajoki and Mustajoki (2017) explained that, even if choosing a methodology is straightforward, ethical considerations must always be factored into the process. Many ethical issues are universal in nature, while others are limited to very specific methodologies. When a study involves human beings, Leedy and Ormrod (2015) recommended that ethical considerations surrounding the study be explored.

The respondents' participation in the survey was entirely voluntary. As previously stated, students who agreed to participate were informed of the subject under investigation. Their participation was entirely voluntary. Their participation was anonymous, which protected their privacy. Table 3.8 indicates the dates when ethical clearance and gatekeepers' letters were received.

Table 3.8: Dates of Ethical clearance and gatekeepers' letters

Date	Ethics Committee & Gatekeeper
24 November.2021	DUT Faculty of Accounting and Informatics Research Ethics Committee (FREC)
03 December 2021	DUT Institutional Research and Innovation Committee (IRIC)
02 February 2022	DUT Department of Financial Accounting – Permission to conduct research

3.7 Chapter summary

This chapter outlined the research methodology used in the study.

The analysis and discussion of the research findings will be presented in the following chapter, which will primarily focus on the findings from the data collected and analysed in the study.

CHAPTER FOUR: PRESENTATION AND DISCUSSION OF THE RESULTS

4.1 Introduction

The previous chapter discussed the research methodology. This chapter presents and discusses the findings obtained from the study's questionnaire. The questionnaire was the primary data collection tool and it was distributed to Financial Accounting 3 students enrolled for the Diploma in Accounting at DUT, Ritson Campus. The survey questionnaire for the study was created in Microsoft Forms and a link to it was sent to all students registered for Financial Accounting 3 on 10 May 2022. The link was active from 10 May 2022 to 5 June 2022. The data collected from the responses was analysed using SPSS version 25.0.The data was analysed using both descriptive and inferential statistics. The descriptive statistics used in this analysis determined means and standard deviations, where applicable. Frequencies are represented in tables or graphs. The research questions in the study were evaluated using inferential statistics in the form of the chi-square test, factor analysis and the one sample t-test. The Chi-square goodness-of-fit test is a univariate test. Item groupings were determined using factor analysis. The one sample t-test is used to determine whether a mean score differs significantly from a scalar value. Cronbach's Alpha was used to determine the reliability of the questionnaire.

4.2 Restatement of research objectives

The main purpose of this study was to investigate the role of accounting technology, namely accounting software packages, in the teaching and learning of financial accounting at DUT in the era of the fourth industrial revolution. The following research objectives were formulated to achieve the study's purpose:

- to identify awareness, knowledge and usage of accounting information systems in the teaching and learning of financial accounting;
- to explore students' perceptions of accounting information systems and their use in learning financial accounting;
- to determine ways in which accounting information systems can benefit the learning of financial accounting; and
- to explore students' knowledge of the Fourth Industrial Revolution.

4.3 Restatement of research questions

The objectives of the study resulted in the following research questions:

- Which accounting software packages are students aware of, knowledgeable about, use and are competent in?
- What are the student's perceptions about the use of accounting information systems in the process of learning financial accounting?
- In what way can accounting information systems can benefit the learning of financial accounting?
- What do students know about the Fourth Industrial Revolution?

4.4 The sample and response rate

A census approach was considered more appropriate for this study. As a result, all students registered for Financial Accounting 3 for the Diploma in Accounting at DUT's Ritson Campus were chosen as respondents. There were 257 students registered for Financial Accounting for the Diploma in Accounting in 2022. A total of 172 students participated in the study.

A good response rate allows for data saturation, resulting in a study that is both reliable and valid (Saunders, Lewis and Thornhill 2012). The percentage of a sample that agrees to participate is referred to as the response rate (Bryman 2012). The response rate is analysed further in Table 4.1.

Table 4.1: Response rate.

	Number of respondents	**Percentage (%)**
Targeted respondents (sample)	257	100%
Sample Size	172	66.9%

4.5 The research instrument

The research instrument consisted of 30 items, with measurement at a nominal or an ordinal level. The questionnaire was divided into five sections which measured various themes, as illustrated below:

1. Section A Biographical data.
2. Section B Accounting software packages.
3. Section C Perceptions of using accounting software packages.
4. Section D Benefits of using accounting software packages.
5. Section E Knowledge of the Fourth Industrial Revolution.

4.6 Validity and Reliability

Reliability and validity are the two most significant components in precision. Several measurements on the same subjects are used to calculate reliability. A reliability coefficient of 0.70 or higher is regarded as acceptable.

Table 4.2, below, displays the Cronbach's alpha coefficient scores which were calculated for each questionnaire factor.

Table 4.2 Cronbach's alpha Score.

Factor	Section	Construct	Items included	Number of items	Cronbach's alpha
1	C: Perceptions of using accounting software packages	Importance of inclusion (IMP)	3.1, 3.2, 3.3, 3.6, 3.7, 3.8 & 3.11	7	.851
2	C: Perceptions of using accounting software packages	Adequacy of teaching (ADEQ)	3.4, 3.5, 3.9 & 3.10	4	.735
3	D: Benefits of using accounting software packages	Benefits (BEN)	4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7 & 4.8	8	.885
4	E: Knowledge of the Fourth Industrial Revolution	Knowledge (KNOW)	5.1, 5.2, 5.4 & 5.5	4	.831

As shown in Table 4.2, the Cronbach's alpha score for all of the constructs mentioned was more than the recommended value of 0.70. This indicates a level of acceptable, consistent scoring for these sections of the research. The results indicated that these latent variables are reliable and can be used in further analysis.

4.7 Factor analysis

Factor analysis is a set of statistical procedures used to determine how many unique constructs are considered necessary to account for the pattern of correlations between a set of measurements. To put it another way, factor analysis determines the number of distinct constructs assessed by a set of measurements. The structure of correlations between measurements is assumed to be explained by unobservable constructs called factors (Fabrigar and Wegener 2012). Factor analysis is especially useful for reducing a large number of related variables to a manageable number before using them in other analyses such as multiple regression or multivariate analysis of variance. The idea behind factor analysis is that all variables have some degree of correlation (Shrestha 2021).

Factor analysis with Promax Rotation was applied to the 11 items (refer to Table 4.3). Two factors were extracted which accounted for 47.05% of the variance in the data. A Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) of .838 and a significant Bartlett's test indicated that the data was adequate for successful and reliable extraction. Rotation converged in three iterations. The loadings of each item on their respective factors are shown in Table 4.3.

Table 4.3: Factor loadings.

	Factor	
	1	2
3.2 The teaching of financial accounting should be integrated with the teaching of accounting software packages.	.835	
3.3 Being trained on using accounting software packages is useful.	.818	
3.6 The future of accounting is linked to digital technology (i.e., it is moving away from manual recording towards digital recording of financial information).	.704	
3.1 I think that technology is important in the teaching and learning of Financial Accounting.	.664	
3.8 Financial accounting should be taught primarily using an accounting software package at undergraduate level.	.577	
3.11 There is a need for financial accounting modules to include topics on 4IR	.544	
3.7 I am confident in my ability to engage and learn about accounting software packages.	.501	
3.9 The way we are being taught to use accounting software packages is appropriate.		.854
3.5 I am currently being taught the necessary accounting technological skills that will allow me to compete in the job market.		.683
3.10 I am confident in my abilities to use accounting software packages independently.		.604
3.4 Adequate time is allocated to train students to use an accounting system (accounting package).		.460

The factors and their assigned labels are summarised in Table 4.3 These factors were tested for reliability using Cronbach's alpha. An alpha value >.7 indicates reliability.

Promax Rotation was used to analyse eight items from Section D (Appendix F). Factor analysis was applied to determine groupings; however, they were all grouped onto one factor. The items were combined into a composite variable called BEN. Cronbach's alpha showed a value of .885, which indicated that this factor is reliable. Promax Rotation was also used to analyse four items from Section E (Appendix F). The analysis once again resulted in a single factor. The items were combined into a composite variable called KNOW. Cronbach's alpha showed a value of .831, which indicated that this factor is reliable.

All of the prerequisites for factor analysis have been met. That is, the KMO value for sampling adequacy must be greater than 0.500, while the sig. value for Bartlett's test of sphericity must be less than 0.05.

4.8 Descriptive statistics

Descriptive statistics summarise the overall nature of the data obtained, such as what certain measured characteristics are 'on average'; how much variability exists within a data set; and how closely two or more characteristics are related to one another (Leedy and Ormrod 2015). Creswell (2014) explained that descriptive data analysis involves describing the results using means, standard deviations and range of scores.

Jarman (2013) noted that descriptive statistics are numerical representations of a dataset's characteristics. He explained that descriptive statistics are estimates, which are values calculated from a sample and approximate some characteristic of the entire population. In addition, the average is a common estimate: it is derived from a data sample and approximates the average value of a population.

The data analysis and findings were divided into the demographic statistics of the respondents and the study's objectives.

4.9 Inferential statistics

The purpose of inferential statistics is to draw inferences about large populations from data collected from relatively small samples. Inferential statistics help make reasonable guesses about a large, unknown population by examining a small, known sample. Inferential statistics assist the researcher in making data-related decisions (Leedy and Ormrod 2015).

The one-sample T-test is used to determine whether the mean of the population from which the sample was drawn is the expected value. The T-test is a parametric test because it assumes that the test statistic, typically the sample mean, follows the sampling distribution. The one-sample T-test is used to determine whether or not a sample of observations could have resulted

from a process that follows a specific parameter (like the mean). The one-sample T-test is one of the three types of T-tests (Prabhakaran 2020). T-tests can be used when the sample size is small and the population standard deviation is unknown (Blanche, Durrheim and Painter 2006). The T-test was employed in this study to determine whether mean scores differed significantly from scalar values.

The Chi-square test is a nonparametric test that has two distinct purposes. Firstly, it tests the hypothesis that there is no association between two or more groups, populations, or criteria (i.e., to check independence between two variables). Secondly, it tests how well the observed distribution of data fits the expected distribution (i.e., to test the goodness-of-fit) (Singhal and Rana 2015). Chi-square can be computed for nominal, ordinal, interval, or ratio data (Leedy and Ormrod 2015). The chi-square value means nothing on its own and can only be meaningfully interpreted in relation to its associated level of statistical significance, which in this case is $p < 0.0001$ (Bryman 2012).

4.10 Presentation of findings:

The findings are presented in the same order as the questions in the questionnaire. The quantitative data were presented in table format or graphics. Each data presentation provided an indication of numerical scores and percentages according to related categories in order to provide an overview of the specific grouping of data. Section A will present the biographical information of respondents. Section B to Section E in the questionnaire (Appendix F), were designed to collect data to address the four objectives of the study.

4.10.1 Section A: Biographical data

Section A of the questionnaire gathered respondents' biographical information. Biographical information distinguishes one individual from another. The biographical data was analysed for this study in terms of gender, age and ethnic diversity. This was done to gain insight into the biographical profiles of the third-year students enrolled in Financial Accounting 3 for the Diploma in Accounting at DUT's Ritson Campus.

Figure 4.1, below, gives a summary of the biographical information of the respondents.

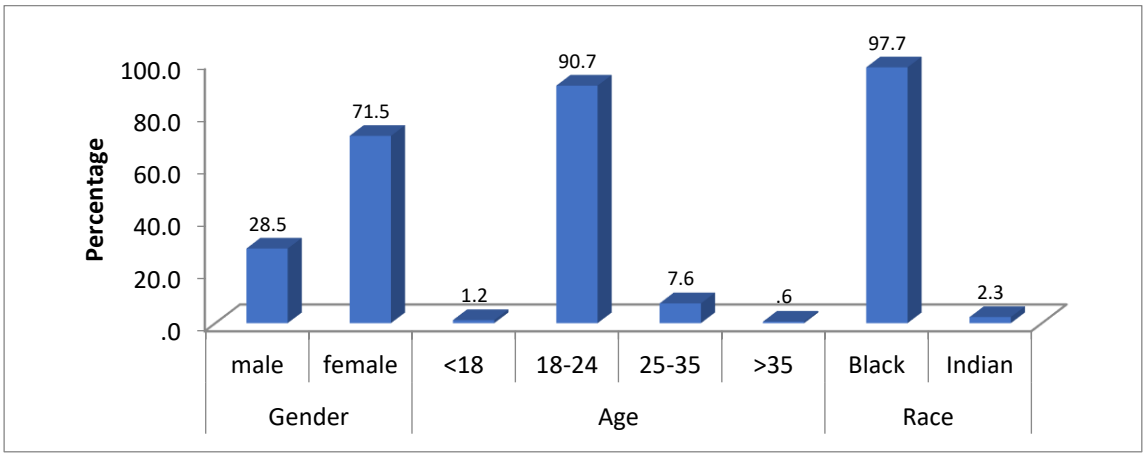

Figure 4.1: Respondents' summary biographical characteristics

In the overall sample, female students made up 71.5% of respondents, while male respondents made up the remaining 28.5%. This showed a gender category difference of 43% (71.5% and 28.5%).

It is evident from the results that the majority of the respondents were in the 18-24 age group (90.7%), followed by the 25-35 group (7.6%). The combined score of the remaining age groups was less than 2%.

It is evident that the majority of the students were Black African (97.7%), followed by Indians (2.3%).

The majority of the respondents in the study were female, Black African and between the ages of 18 and 24, according to the demographic data shown in Figure 4.1.

The next section will present the findings of the study by showing the results for the research objectives. Descriptive statistics and inferential statistics will be presented.

4.10.2 Section B: Accounting software packages - Objective 1:

To identify awareness, knowledge and usage of accounting software packages in the teaching and learning of financial accounting

The first research question of the study aimed to identify the accounting software packages that students were aware of, were knowledgeable about, used and were competent in, by identifying their awareness, knowledge and usage of accounting software packages in the teaching and learning of financial accounting. The questionnaire's Section B (Appendix F) was divided into three subsections to address this research question. Firstly, the respondents' awareness and knowledge about the accounting software packages was determined by Question 2.1. Secondly, their usage of accounting software packages in learning financial accounting was investigated in Question 2.2. Thirdly, the competency of the respondents in using accounting software packages was determined in Question 2.3.

4.10.2.1 Descriptive analysis: Accounting software packages

4.10.2.1.1 Awareness and knowledge of accounting software packages

The responses from students are shown in Figure 4.2 below. A five-point Likert scale, with options ranging from ‘I have never heard of it’ to ‘I have heard of it and know a lot about it’ was used.

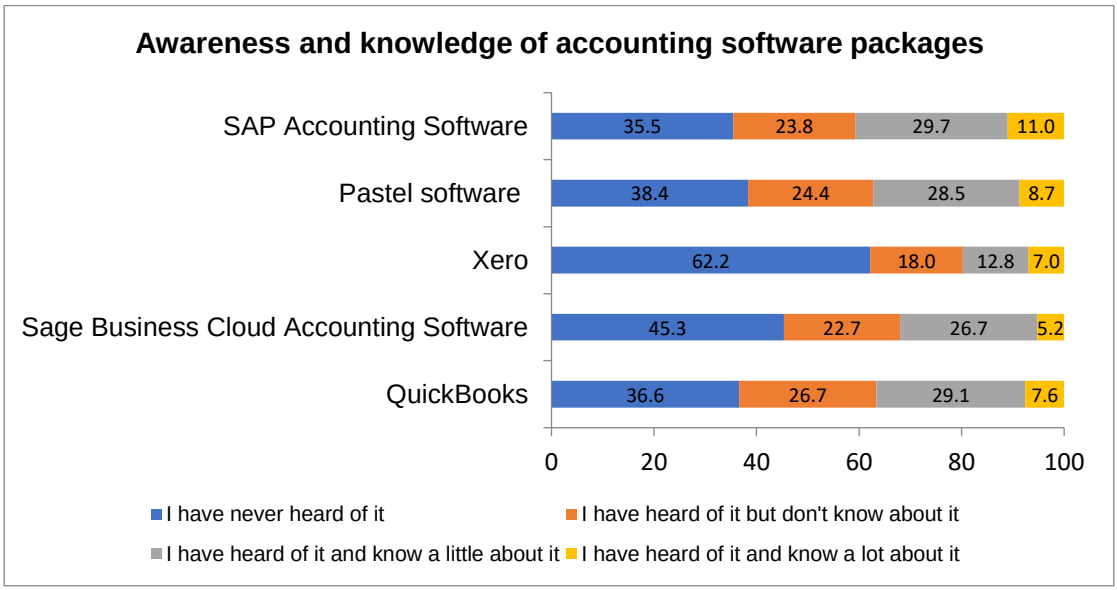

Figure 4.2 Awareness and knowledge of accounting software packages.

Figure 4.2 shows that the highest percentage of students (62.2%) indicated they had never heard of Xero. Sage Business Cloud Accounting Software came in second, with 45.3% of respondents indicating they had never heard of it. Over 35% of respondents said they had

never heard of Pastel software (38.4%), QuickBooks (36.6%), or SAP Accounting Software (35.5%). The results indicate that students are not significantly knowledgeable about accounting software packages. These findings are consistent with the findings of a study conducted in Ghana by Awayiga, Onumah and Tsamenyi (2010), which found that 76% of graduates did not have any accounting-related IT skills when they were hired.

4.10.2.1.2 Usage of accounting software packages in learning financial accounting

Figure 4.3 shows the frequency distribution of student responses. The average usage was compared to a usage rating of '2' on a five-point Likert scale, with responses ranging from 'I never' to 'very often'.

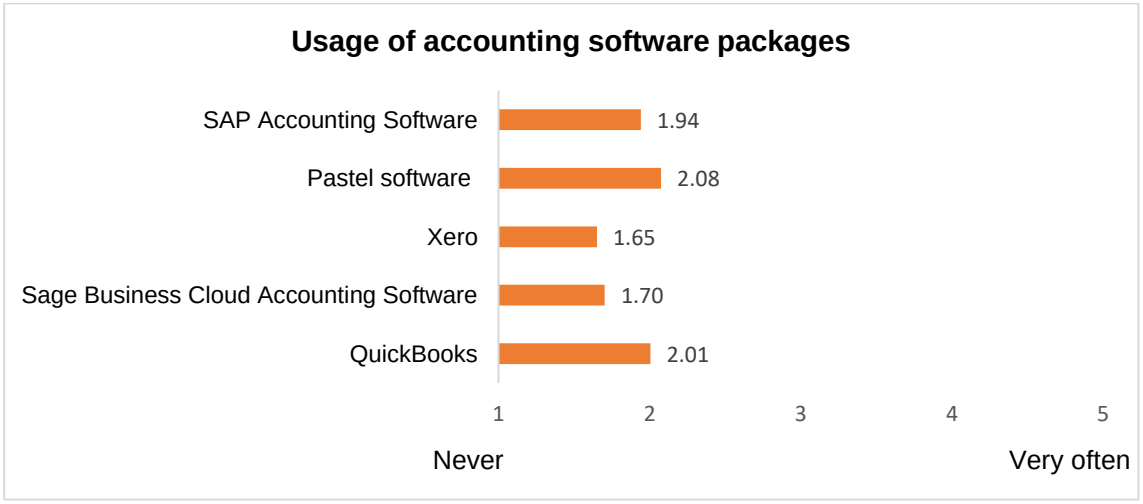

Figure 4.3 Use of accounting software packages in learning financial accounting.

The data analysis revealed a significantly low average usage of accounting software packages for learning financial accounting purposes. As indicated in Figure 4.3, the average usage rating for Xero (1.65) and Sage Business Cloud Accounting Software (1.70) is significantly below '2', while the average rating for Pastel software (2.08), QuickBooks (2.01) and SAP Accounting Software (1.94) is approximately '2'. These findings were anticipated, as the literature review revealed that there is no mention of a comprehensive integration of accounting software packages into the Diploma in Accounting curriculum, as reflected in the Department of Financial Accounting's Handbook 2022. Interestingly, Wessels (2007), as cited by Rhodes (2012), discovered that students had little exposure to the use of accounting software packages in a 2007 study of ICT education offered to accounting students at South African universities.

4.10.2.1.3 Level of competency in using accounting software packages

Figure 4.4 reflects student responses regarding levels of competency in using accounting software packages. A five-point Likert scale was used, with responses ranging from 'not at all competent' to 'extremely competent'.

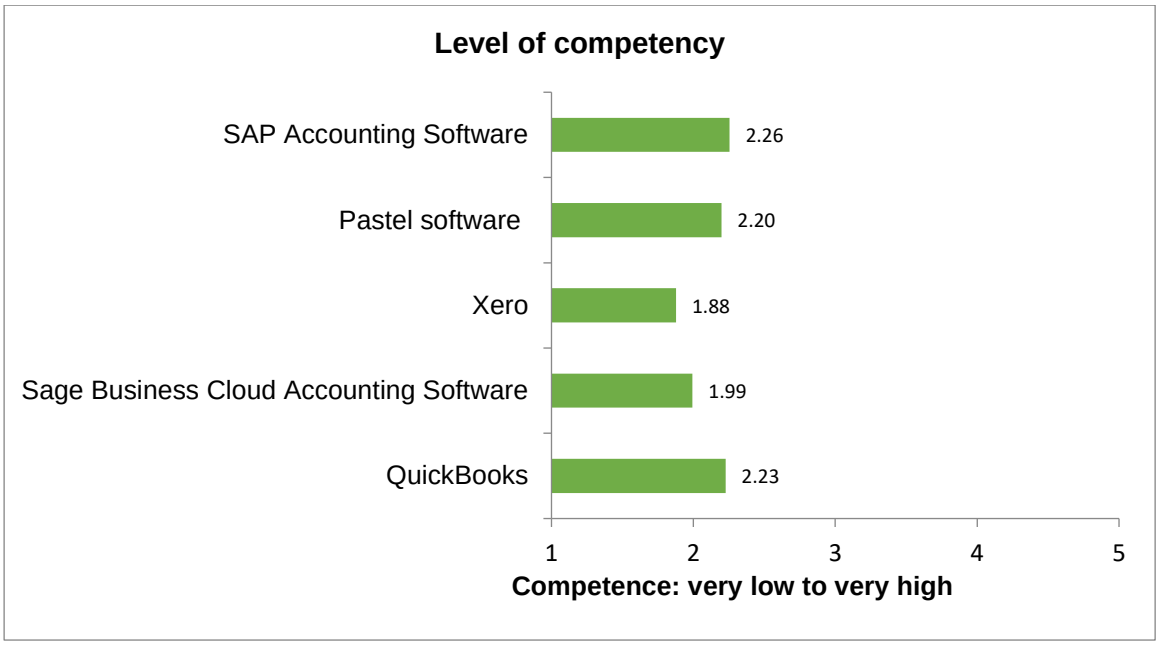

Figure 4.4 Level of competency in using accounting software packages.

Figure 4.4 indicated that SAP Accounting Software (2.26), QuickBooks (2.23) and Pastel software (2.20) scored significantly higher than '2', while Sage Business Cloud Accounting Software (1.99) and Xero (1.88) scored approximately '2'. These results echo a study that sought to answer the question, 'Are accounting curricula adequately preparing graduates to use technology upon graduation?', which discovered that public universities in Tennessee, USA (United States of America) are not adequately preparing graduates (Dingus 2021). According to the descriptive data analysis, there is no significant agreement on an accounting software package that can be identified as being the one that students are significantly aware of, knowledgeable about and competent in using in learning financial accounting. These findings are critical because they indicate the low level of preparedness of financial accounting graduates to make a meaningful contribution in the working world.

4.10.2.2 Inferential analysis: Accounting software packages

4.10.2.2.1 Awareness and knowledge of the accounting software packages

Table 4.4, below, summarises the respondents' responses when asked to indicate their awareness and knowledge of the five accounting software packages listed in the questionnaire. A five-point Likert scale, with statements ranging from 'I have never heard of it' to 'I have heard of it and know a lot about it' was used.

The questionnaire assessed the information from the respondents on a five-point Likert scale. The chi-square goodness-of-fit test and one-sample t-test were used. The highest mean indicates that the majority of respondents agreed on that variable. The lowest standard

deviation indicates that ideas on the specific variable are stable (respondents agree with each other). A very large t-value indicates that the coefficient was estimated with reasonable accuracy. The greater the magnitude of the t-value (over 2), the more evidence there is of a significant difference. The closer the t-value is to 0, the less is the likelihood that a significant difference exists. A p-value less than 0.05 ($p < 0.05$) indicates that the results are statistically significant; a p-value less than 0.001 ($p < .001$) indicates that the results are statistically highly significant; and a p-value greater than 0.05 (>0.05) indicates that the results are not significant.

Table 4.4:Accounting software packages awareness and knowledge.

Item	Responses as Frequency (%)				X^2	Df	p-value
	I have never heard of it	**I have heard of it but don' t know about**	**I have heard of it and know a little about it**	**I have heard of it and know a lot about it**			
2.1.1 QuickBooks	**63 (36.6)**	**46 (26.7)**	**50 (29.1)**	**13 (7.6)**	31.581	3	<.001*
2.1.2 Sage Business Cloud Accounting Software	**78 (45.3)**	**39 (22.7)**	**46 (26.7)**	**9 (5.2)**	55.953	3	<.001*
2.1.3 Xero	**107 (62.2)**	**31 (18.0)**	**22 (12.8)**	**12 (7.0)**	131.209	3	<.001*
2.1.4 Pastel Software	**66 (38.4)**	**42 (24.4)**	**49 (28.5)**	**15 (8.7)**	31.395	3	<.001*
2.1.5 SAP Accounting Software	**61 (35.5)**	**41 (23.8)**	**51 (29.7)**	**19 (11.0)**	22.512	3	<.001*

* indicates significance at the 95% level

The results in Table 4.4 results indicate that:

- A significant number of the respondents either have not heard of QuickBooks (36.6%); or they have heard of it but know either nothing (26.6%) or only a little (29.1%) about it: $x^2 = 31.581$, Df = 3; $p < .001$.
- A significant number of the respondents have either never heard of Sage (45.3%) or they have heard of it but only know a little about it (26.7%): $x^2 = 55.953$, Df = 3; $p < .001$.
- A significant 62.2% of the respondents have never heard of Xero: $x^2 = 131.209$, Df = 3; $p < .001$.
- A significant number of the respondents either have not heard of Pastel Accounting (38.4%); or they have heard of it but either know nothing (24.4%) or only a little (29%) about it: $x^2 = 31.395$, Df = 3; $p < .001$.
- A significant number of the respondents either have not heard of SAP Accounting Software (35.5%); or they have heard of it but know either nothing (23.8%) or only a little (29.7%) about it: $x^2 = 22.512$, Df = 3; $p < .001$.

The data collected revealed that a significant proportion of the students either have not heard of the listed accounting software packages, or they have heard of them but know either nothing or only a little about them. These results are highly significant as the p-value for all items in this section are less than 0.001 (p<.001). The findings highlight that, despite numerous accounting scholars calling for the inclusion of accounting software packages in the accounting curriculum, students are not introduced to accounting software packages. Seethamraju (2010) concluded that universities must use software like SAP in the teaching and learning of accounting in order to prepare accounting graduates. Nori *et al.* (2016) stated that the use of accounting software could assist in accelerating students' knowledge acquisition. According to Habash (2021), students enrolled in university accounting programmes should be introduced to accounting software programmes like QuickBooks.

4.10.2.2.2 Usage of accounting software packages in learning financial accounting

Table 4.5, below, summarises the respondents' replies when asked to indicate how frequently they use the listed accounting software packages in learning financial accounting. A five-point Likert scale was used, with responses ranging from 'I never' to 'very often'.

Table 4.5 Use of accounting software packages.

Item	n	Mean (SD)	t #	Df	p-value
2.2.1 QuickBooks	172	2.01 (1.305)	.058	171	.953
2.2.2 Sage Business Cloud Accounting Software	**172**	**1.70 (1.065)**	**-3.652**	**171**	**<.001***
2.2.3 Xero	**172**	**1.65 (1.152)**	**-3.970**	**171**	**<.001***
2.2.4 Pastel Software	172	2.08 (1.385)	.716	171	.475
2.2.5 SAP Accounting Software	172	1.94 (1.328)	-.574	171	.567

One-sample t-test: mean compared to '2'
* Significant at 95% level

The results in Table 4.5 results indicate that:

- The mean value scores and standard deviations ranged from *M* = 2.08, *SD* = 1.385 (the highest) to *M* =1.65 , *SD* =1.065 (the lowest).
- Sage Business Cloud Accounting Software, Xero and SAP Accounting Software items had negative t-values.
- Sage Business Cloud Accounting Software: *M* = 1.70, *SD* = 1.065; t (171) = -3.652; p = <0.001.
- Xero: *M* = 1.65, *SD* = 1.152; t (171) = -3.970; p <0.001.
- Pastel Software: *M* = 2.08, *SD* = 1.385; t (171) =.716; p = .475.
- SAP Accounting Software: *M* = 1.94, *SD* = 1.328; t (171) = -.574; p = .567.

- QuickBooks: *M* = 2.08, *SD* = 1.385; t (171) = .058; p = .953.

Based on the findings in this section, students do not significantly agree that they use accounting software packages in learning financial accounting as the mean scores are low. Only two items, Xero and Sage Business Cloud Accounting Software, had p values of p <0.001.The highest mean value is *M* = 2.08, for two items: QuickBooks and Pastel Software. The findings are consistent with the findings of an American study, which concluded that graduates have had little to no exposure to the accounting-specific accounting software packages that they will use the most in their careers (Dingus 2021).

4.10.2.2.3 Level of competency

Table 4.6 summarises the respondents' answers when asked to indicate their level of competency with the listed accounting software packages in the questionnaire. A five-point Likert scale was used, with responses ranging from 'Not at all competent' to 'Extremely competent'. A one-sample t-test was performed with means compared to '2'.

Table 4.6 Level of competency.

Item	N	Mean (SD)	t #	Df	p-value
2.3.1 QuickBooks	172	2.23 (1.402)	2.121	171	.035*
2.3.2 Sage Business Cloud Accounting Software	**172**	**1.99 (1.172)**	**-.065**	**171**	**.948**
2.3.3 Xero	**172**	**1.88 (1.186)**	**-1.350**	**171**	**.179**
2.3.4 Pastel Software	172	2.20 (1.379)	1.880	171	.062
2.3.5 SAP Accounting Software	172	2.26 (1.468)	2.285	171	.024*

One-sample t-test: mean compared to '2'
* Significant at 95% level

The results in Table 4.6 results indicate that:

- The mean value scores and standard deviations ranged from *M* = 2.26, *SD* = 1.468 (the highest) to *M* =1.88 , *SD* =1.379 (the lowest).
- Two items had negative t-values: Sage Business Cloud Accounting Software and Xero.
- Sage Business Cloud Accounting Software: *M* = 1.99, *SD* = 1.172; t (171) = -.065; p = .948.
- Xero: *M* = 1.88, *SD* = 1.186; t (171) = -1.350; p = .179.
- SAP Accounting Software: *M* = 2.26, *SD* = 1.468; t (171) = 2.285; p = .024.
- QuickBooks: *M* = 2.23, *SD* = 1.402; t (171) = 2.121; p = .035.
- Pastel Software: *M* = 2.20, *SD* = 1.379; t (171) = 1.880; p = .062.

The results indicate that students do not significantly agree that they are competent in using accounting software packages as the mean values are low; the highest value being *M* = 2.26 for SAP Accounting Software. These results were expected, as students are not significantly aware of accounting packages and are not using accounting software packages significantly in the learning of financial accounting. These results are in agreement with the findings of Lautenbach (2015), who suggested that the financial accounting curriculum is still focused on content rather than skills.

4.10.3 Section C: Perceptions: Accounting Software Packages - Objective 2:

To explore students' perceptions of accounting information systems and their use in learning financial accounting.

The second research question of the study addressed the students' perceptions about using accounting software packages in learning financial accounting by exploring students' perceptions of accounting software packages.

4.10.3.1 Descriptive analysis: Perceptions: Accounting software packages and technology

Figure 4.5 shows the responses of students when asked to rate their perceptions of accounting software packages and technology on a five-point Likert scale. The questionnaire's Section C (Appendix F) addressed respondents' perceptions of accounting software packages. Respondents rated their perceptions of technology and accounting software packages on a five-point Likert scale with statements (also known as items) ranging from 'Strongly disagree' to 'Strongly agree'.

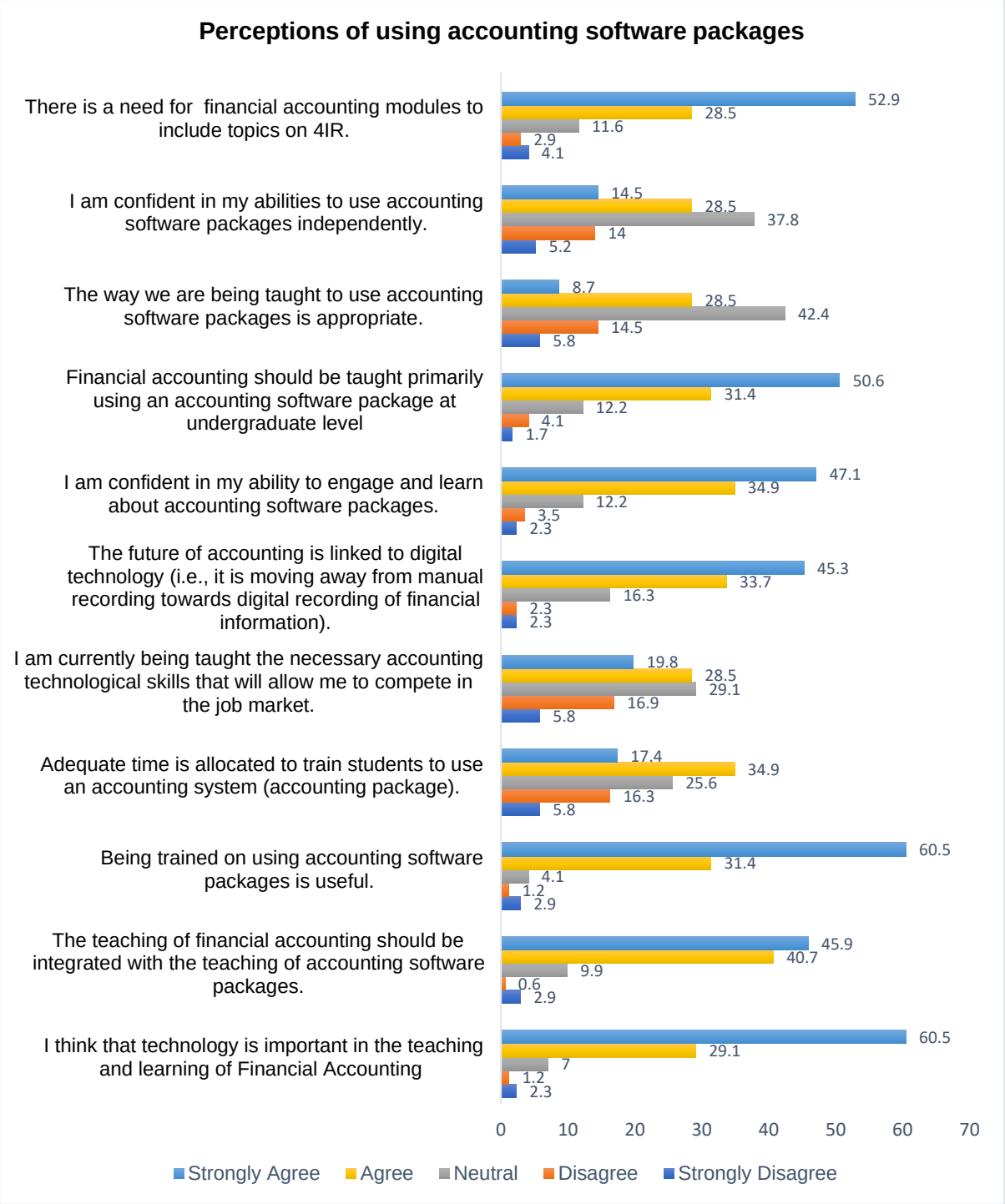

Figure 4.5 Perceptions of using accounting software packages and technology.

As indicated in Section 4.7, two composite variables, IMP and ADEQ, were identified in Section C of the questionnaire (Appendix F). Therefore, the findings will be discussed in terms of the two composite variables identified.

4.10.3.1.1 Importance of using technology in learning accounting (IMP)

The importance of using technology, specifically accounting software packages, for learning financial accounting was assessed among respondents.

Figure 4.5 shows that:

- 91.9% (60.5% 'strongly agree' + 31.4% 'agree') of students agreed that being trained on using accounting software packages is useful.
- 89.6% (60.5% 'strongly agree' + 29.1% 'agree') of students agreed that technology is important in the teaching and learning of financial accounting.
- 86.6% (45.9% 'strongly agree' + 40.7% 'agree') of students agreed that the teaching of financial accounting should be integrated with the teaching of accounting software packages.
- 82% (50.6% 'strongly agree' + 31.4% 'agree') of students agreed that financial accounting should be taught primarily using an accounting software package at the undergraduate level.
- 82% of students (47.1 % *'*strongly agree*'* + 34.9 % *'*agree*'*) are confident in their abilities to engage with and learn about accounting software packages.
- 81.4% (52.9% 'strongly agree' + 28.5% 'agree') of students agreed that financial accounting modules should include topics on 4IR.
- 79% (45.3% 'strongly agree' + 33.7% 'agree') of students agreed that the future of accounting is linked to digital technology (i.e., it is moving away from manual recording towards digital recording of financial information).

Descriptive data analysis revealed that students significantly agreed that accounting software packages and technology are important. These findings are consistent with the literature review, which found that, in higher education, students perceived the use of technology as an expected and integral component of the learning process, according to Concannon, Flynn and Campbell (2005).

4.10.3.1.2 Adequacy using accounting software packages (ADEQ)

Respondents were asked to evaluate the adequacy of using technology, specifically accounting software packages in learning financial accounting.

Figure 4.5 revealed that**:**

- 64.9% (30% 'strongly agree' + 34.9% 'agree') of students agreed that adequate time is allocated to train students to use an accounting system (accounting package).
- 48.3% (19.8% 'strongly agree'+28.5% 'agree') of students agreed with the statement that students are currently being taught the necessary accounting technological skills that will allow them to compete in the job market.
- 43% (14.5% 'strongly agree' + 28.5% 'agree') of students are confident in their abilities to engage and learn about accounting software packages independently.
- 37.2% (8.7% 'strongly agree' + 28.5% 'agree') of students agreed that accounting software packages are being taught in an appropriate way.

Descriptive data analysis showed that only 37.2% of students (8.7% 'strongly agree' + 28.5% 'agree') agreed with the statement that investigated whether accounting software packages are being taught in an appropriate way. This finding echoed the literature, which indicated that university courses are not preparing future accounting professionals appropriately to deal with the chaotic global environment of the future (Asonitou 2015). The data analysis indicated that

only 43% (14.5% ‘strongly agree’ + 28.5% ‘agree’) of students are confident in their abilities to engage and learn about accounting software packages independently. Furthermore, the data analysis revealed that only 48.3% (19.8% ‘strongly agree’+28.5% ‘agree’) of students agreed that they are being taught the necessary accounting technological skills that will allow them to compete in the job market. Erasmus and Fourie (2018) stated that traditional teaching is considered obsolete in today's technologically advanced world. Mahambo (2020) warned against an outdated, traditional accounting curriculum, stating that such a curriculum will result in graduates who are not employer-ready, as well as graduates who cannot communicate, verify, or apply financial information due to rote learning.

4.10.3.2 Inferential analysis: Perceptions: Accounting software packages and technology

A one-sample t-test was used to compare the average agreement scores to the central/neutral score of '3' in order to determine whether there is significant agreement or significant disagreement. The highest mean indicates that the majority of respondents agreed on that variable. The lowest standard deviation indicates that ideas on the specific variable are stable (respondents agree with each other). A very large t-value indicates that the coefficient has been estimated with reasonable accuracy. The greater the magnitude of T (over 2), the more evidence there is that there is a significant difference. The closer T is to 0, the less likely a significant difference exists. A p-value less than 0.05 ($p < 0.05$) indicates that the results are statistically significant. A p-value less than 0.001 ($p < .001$) indicates that the results are statistically highly significant; and a p-value greater than 0.05 (> 0.05) indicates that the results are not significant.

Table 4.7, below, summarises the participants' responses when asked to indicate their perceptions about using accounting software packages and technology.

Table 4.7: Perceptions of using accounting software packages and technology.

Item	Responses as Frequency (%)					N	Mean (SD)	t #	Df	p-value
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree					
3.1 I think that technology is important in the teaching and learning of financial accounting.	**4 (2.3)**	**2 (1.2)**	**12 (7.0)**	**50 (29.1)**	**104 (60.5)**	**172**	**4.44 (0.860)**	**21.993**	**171**	**<.001***
3.2 The teaching of financial accounting should be integrated with the teaching of accounting software packages.	**5 (2.9)**	**1 (0.6)**	**17 (9.9)**	**70 (40.7)**	**79 (45.9)**	**172**	**4.26 (0.883)**	**18.746**	**171**	**<.001***
3.3 Being trained on using accounting software packages is useful.	**5 (2.9)**	**2 (1.2)**	**7 (4.1)**	**54 (31.4)**	**104 (60.5)**	**172**	**4.45 (0.867)**	**21.979**	**171**	**<.001***
3.4 Adequate time is allocated to train students to use an accounting system (accounting package).	**10 (5.8)**	**28 (16.3)**	**44 (25.6)**	**60 (34.9)**	**30 (17.4)**	172	3.42 (1.129)	4.864	171	<.001*
3.5 I am currently being taught the necessary accounting technological skills that will allow me to compete in the job market.	**10 (5.8)**	**29 (16.9)**	**50 (29.1)**	**49 (28.5)**	**34 (19.8)**	172	3.40 (1.152)	4.499	171	<.001*
3.6 The future of accounting is linked to digital technology (i.e., it is moving away from manual recording towards digital recording of financial information).	**4 (2.3)**	**4 (2.3)**	**28 (16.3)**	**58 (33.7)**	**78 (45.3)**	172	4.17 (0.945)	16.296	171	<.001*
3.7 I am confident in my ability to engage and learn about accounting software packages.	**4 (2.3)**	**6 (3.5)**	**21 (12.2)**	**60 34.9**	**81 (47.1)**	172	4.21 (0.950)	16.687	171	<.001*
3.8 Financial accounting should be taught primarily using an accounting software package at undergraduate level.	**3 (1.7)**	**7 (4.1)**	**21 (12.2)**	**54 (31.4)**	**87 (50.6)**	172	4.25 (0.944)	17.374	171	<.001*
3.9 The way we are being taught to use accounting software packages is appropriate.	**10 (5.8)**	**25 (14.5)**	**73 (42.4)**	**49 (28.5)**	**15 (8.7)**	172	3.20 (0.989)	2.621	171	.010*
3.10 I am confident in my abilities to use accounting software packages independently.	**9 (5.2)**	**24 (14.0)**	**65 (37.8**	**49 (28.5)**	**25 (14.5)**	172	3.33 (1.054)	4.122	171	<.001*
3.11 There is a need for financial accounting modules to include topics on 4IR.	**7 (4.1)**	**5 (2.9)**	**20 (11.6)**	**49 (28.5)**	**91 (52.9)**	172	4.23 (1.039)	15.554	171	<.001*

One-sample t-test: mean compared to '3'
* Significant at 95% level

Table 4.7 results indicated that:

- The mean scores for all items differ significantly from '3'. All of the scores are greater than 3, indicating a significant agreement with all the statements.
- The mean values and standard deviations ranged from $M = 4.45$, $SD = 1.152$ (the highest), to $M = 3.20$, $SD = 0.883$ (the lowest).
- I think that technology is important in the teaching and learning of financial accounting: $M = 4.44$, $SD = 0.860$; $t(171) = 21.993$; $p<.001$.

- The teaching of financial accounting should be integrated with the teaching of accounting software packages: *M* = 4.26, *SD* = 0.883; t (171) = 18.746; p<.001.
- Being trained on using accounting software packages is useful: *M* = 4.45, *SD* = 0.867; t (171) = 21.979; p<.001.
- There is a need for financial accounting modules to include topics on 4IR: *M* = 4.23, *SD* = 1.039; t (171) = 15.554; p<.001.
- Adequate time is allocated to train students to use an accounting system (accounting package): *M* = 3.42, *SD* = 1.129; t (171) = 4.864; p<.001.
- I am currently being taught the necessary accounting technological skills that will allow me to compete in the job market: *M* = 3.40, *SD* = 1.152; t (171) = 4.499; p<.001.
- The future of accounting is linked to digital technology (i.e., it is moving away from manual recording towards digital recording of financial information): *M* = 4.17, *SD* = 0.945; t (171) = 16.296; p<.001.
- I am confident in my ability to engage and learn about accounting software packages: *M* = 4.21, *SD* = 0.950; t (171) = 16.687; p<.001.
- Financial accounting should be taught primarily using an accounting software package at undergraduate level: *M* = 4.25, *SD* = 0.944; t (171) = 17.374; p<.001.
- The way we are being taught to use accounting software packages is appropriate: *M* = 3.20, *SD* = 0.989; t (171) = 2.621; p = .010.
- I am confident in my abilities to use accounting software packages independently: *M* = 3.33, *SD* = 1.054; t (171) = 4.122; p<.001.

Inferential data analysis was performed to determine whether there was significant agreement or disagreement about the benefits of using technology, in particular accounting software packages. The findings are consistent with the results of a study that included accounting graduates in internship programmes as respondents. The accounting graduates rated proficiency in using accounting software packages; spreadsheet packages; database packages; and technology management as the top IT skills required in accounting graduates (Awayiga, Onumah and Tsamenyi 2010).

The findings will be discussed in terms of the two composite variables discussed in Section 4.7.

4.10.3.2.1 Importance of using technology in learning accounting

Table 4.8, below, shows the construct (IMP) ranking of the information sources based on their mean values. This analysis was carried out to see if there was significant agreement or disagreement with the statements regarding the perceived importance of accounting software packages in the learning of financial accounting.

Table 4.8: Importance of inclusion (IMP), ranked in descending order by mean value.

Order of agreement	Statement	Mean
1.	**Being trained on using accounting software packages is useful.**	**4.45**
2.	**I think that technology is important in the teaching and learning of financial accounting.**	**4.44**
3.	**The teaching of financial accounting should be integrated with the teaching of accounting software packages**	**4.26**
4.	Financial accounting should be taught primarily using an accounting software package at undergraduate level.	4.25
5.	There is a need for financial accounting modules to include topics on 4IR.	4.23
6.	I am confident in my ability to engage and learn about accounting software packages.	4.21
7.	The future of accounting is linked to digital technology (i.e., it is moving away from manual recording towards digital recording of financial information).	4.17

Table 4.8 results indicate that:

- Respondents significantly agreed with all the statements, as the mean values for all items are above '4'.
- Being trained on using accounting software packages is useful: This item had the highest mean value *(M* = 4.45).
- I think that technology is important in the teaching and learning of financial accounting had the second highest mean value (*M* =4.44).
- The teaching of financial accounting should be integrated with the teaching of accounting software packages had the third highest mean value (*M* = 4.26).
- Financial accounting should be taught primarily using an accounting software package at undergraduate level had the fourth highest mean value (*M* = 4.25).
- There is a need for financial accounting modules to include topics on 4IR had the third lowest mean value (*M* = 4.23).
- I am confident in my ability to engage and learn about accounting software packages: This item had the second lowest mean score (*M* = 4.21).
- The future of accounting is linked to digital technology (i.e., it is moving away from manual recording towards digital recording of financial information): Respondents attached slightly less importance to this item, as it had the lowest mean value (*M* = 4.17).

The inferential data analysis revealed that students significantly agree that technology, especially accounting software packages, is important in the learning of financial accounting, as all statements had high mean values above '4' The statement, 'Being trained on using accounting software packages is useful,' had the highest mean value *(M* = 4.45). 'I think that technology is important in the teaching and learning of financial accounting' had the second highest mean value (*M* =4.44). 'The teaching of financial accounting should be integrated with the teaching of accounting software packages' had the third highest mean value (*M* = 4.26).

These findings are consistent with the results of a study that sought to ascertain students' perceptions of active learning exercises designed to increase confidence in the professional use of technology and oral communication. A significant number of students had positive perceptions of classroom exercises that included the use of technology. Students are stakeholders in higher education, so their perceptions are essential (Elaine Gioiosa and Kinkela 2019). It is worth noting that Concannon, Flynn and Campbell (2005), concluded that, in higher education, students perceived the use of technology as an expected and integral component of the learning process.

4.10.3.2.2 Adequacy of teaching using accounting software packages (ADEQ)

Table 4.9, below, shows the construct (ADEQ) ranking of the information sources based on their mean values. This analysis was performed to determine whether there was significant agreement or disagreement with the statements regarding the perceived adequacy of using accounting software packages in learning financial accounting.

Table 4.9: Adequacy of teaching using accounting software packages (ADEQ) ranked in descending order by mean value.

Order of agreement	Statement	Mean
1.	**Adequate time is allocated to train students to use an accounting system (accounting package).**	**3.42**
2.	**I am currently being taught the necessary accounting technological skills that will allow me to compete in the job market.**	**3.40**
3.	I am confident in my abilities to use accounting software packages independently.	3.33
4.	The way we are being taught to use accounting software packages is appropriate.	3.20

Table 4.9 results indicated that:

- All mean values are above '3', indicating significant agreement.
- Respondents indicated that adequate time is allocated for training students to use accounting software packages, as this item had the highest mean (*M* = 3.42).
- Respondents significantly agreed that they are being taught the necessary accounting technological skills which would allow them to compete in the job market, as this statement had the second highest mean value (*M* = 3.40).
- The respondents' confidence in their abilities to use accounting software packages independently ranked second lowest with a mean value of 3.33.
- Respondents ranked the way they are being taught to use accounting software packages slightly low, as this item had the lowest mean *(M* = 3.20) of all items.

Inferential data analysis showed that students strongly agree that the use of technology, specifically accounting software packages, is adequate in the teaching and learning of financial accounting, as all mean values are greater than three. They are, however, low when compared to the mean values relating to the importance of using accounting software packages in the

teaching and learning of financial accounting, which were above 4. It is necessary to refer to Dingus (2021), a study which concluded that, although many universities have a desire to incorporate technology in the classroom, they are, however, failing in practice. Students should be more confident about their abilities to use accounting software packages. Lusher, Huber and Valencia (2012) stated that modern accounting professionals should be both proficient in and comfortable with, the use of technology in this digital age.

4.10.4 Section D: Benefits of using accounting software packages – Objective 3:

To determine ways in which accounting information systems can benefit the learning of financial accounting.

The third research question of the study aimed to determine how accounting information systems (accounting software packages) can benefit the learning of financial accounting. To answer this research question, the respondents' perceived benefits of using accounting software packages were evaluated.

4.10.4.1 Descriptive analysis: Benefits of using accounting software packages

Section D (Appendix F) in the questionnaire assessed the benefits of using accounting software packages in the learning of financial accounting Respondents rated the benefits of using accounting software packages for learning financial accounting on a five-point Likert scale with statements (also known as items) ranging from 'Strongly disagree' to 'Strongly agree', as in Figure 4.6 , below.

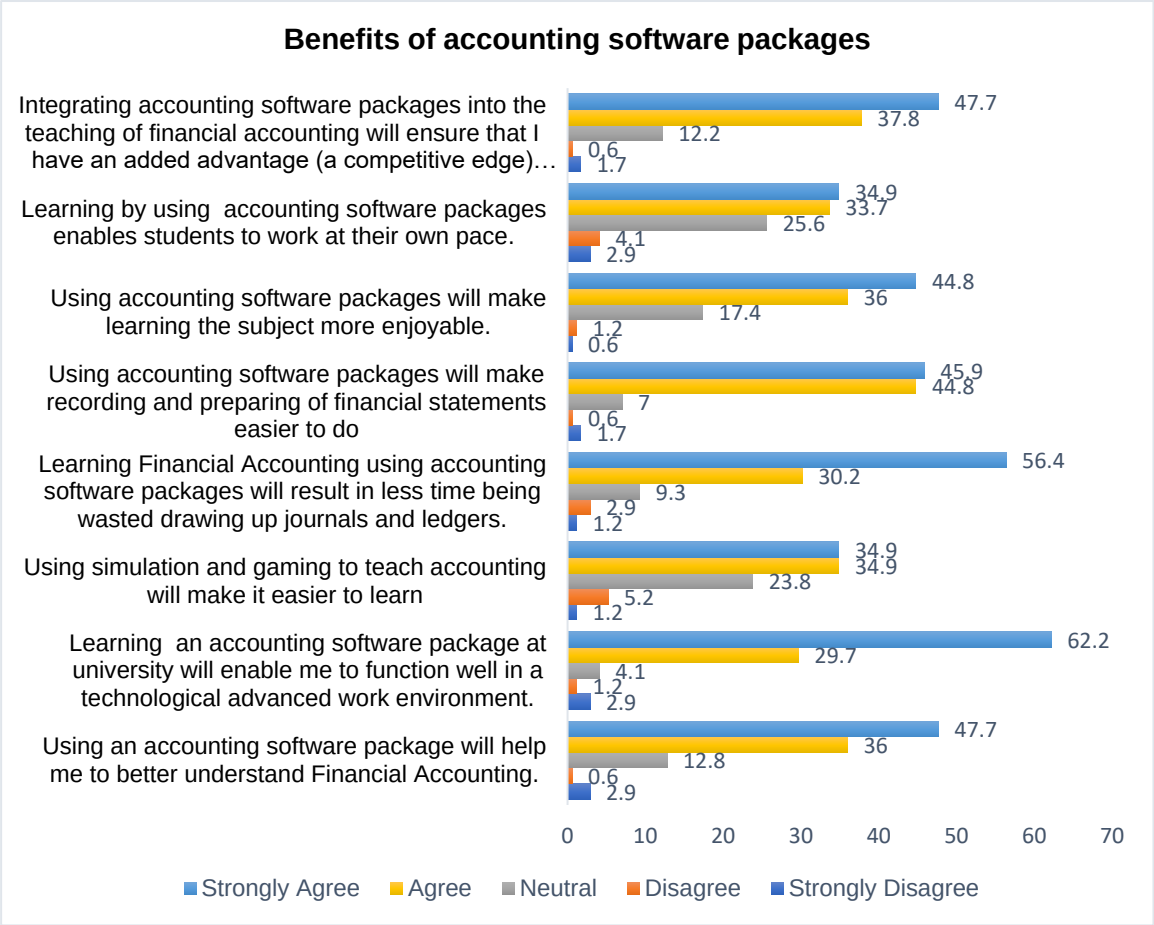

Figure 4.6 Benefits of using accounting software packages and technology.

Figure 4.6 revealed that:

- 91.9% of students (62.2% ‘strongly agree’ + 29.7% ‘agree’) agreed that learning an accounting software package at university will prepare them to function well in technologically advanced work environments.
- 90.7% (45.9% ‘strongly agree’ + 44.8% ‘agree’) of students agreed that using accounting software packages make recording and preparing of financial statements easier.
- 86.6% (54.4% ‘strongly agree’ + 30.2% ‘agree’) of students agreed that learning financial accounting using accounting software packages will result in less time being wasted drawing up journals and ledgers.
- 83.7% of students (47.7% ‘strongly agree’ + 36% ‘agree’) agreed that using accounting software packages will help them better understand financial accounting.
- 80.8% of students (44.8% ‘strongly agree’ + 36% ‘agree’) agreed that using accounting software packages makes learning the subject more enjoyable.
- 69.8% (34.9% ‘strongly agree’ + 34.9% ‘agree’) agreed with the statement that looked into the use of simulation and gaming in accounting education.
- 68.6% (34.9% ‘strongly agree’ + 33.7% ‘agree’) of students agreed that learning through accounting software packages allows students to work at their own pace.

A majority of students agreed with the eight statements listed in this section: 91.9% of students (62.2% ‘strongly agree’ + 29.7% ‘agree’) significantly agreed that learning an accounting software package at university will prepare them to function well in technologically advanced work environments; 90.7% (45.9% ‘strongly agree’ + 44.8% ‘agree’) of students agreed that using accounting software packages makes recording and preparing financial statements easier. It is also important to note that 83.7% of students (47.7% ‘strongly agree’ + 36% ‘agree’) agreed that using accounting software packages will help them better understand financial accounting.

These results are significant because they indicate that students perceive technology, especially accounting software packages, as useful. Kanapathippillai, Ahamed Shamlee and Dellaportas (2012) concluded that the computerised consolidation accounting package (CCAP) assisted students in understanding consolidation concepts. The literature review indicated that employers in the accounting industry assume that students have the necessary knowledge and skills to work in a technological environment (Herrador-Alcaide, Hernández-Solís and Sanguino Galván 2019). Ghavifekr and Rosdy (2015) concluded that using ICT makes for more interesting and engaging lesson plans, which help students learn more efficiently. Lacy *et al.* (2019) also stated that accounting software avoids mistakes made by humans and saves time.

As seen in the literature review, Marriott (2004) argued that computer simulations give students hands-on accounting experience in a realistic business environment. It is worth noting that 69.8% (34.9% ‘strongly agree’ + 34.9% ‘agree’) agreed with the statement that looked into the use of simulation and gaming in accounting education. According to Carenys and Moya (2016), there is a growing interest in using digital gaming as a tool in the learning and teaching of

accounting. Similarly, 68.6% (34.9% ‘strongly agree’ + 33.7% ‘agree’) of students agreed that learning through accounting software packages allows students to work at their own pace.

4.10.4.2 Inferential analysis: Benefits of using accounting software packages

A one-sample t-test was used to compare the average agreement scores with the central/neutral score of '3' in order to determine whether there is significant agreement or significant disagreement. The highest means indicate that the majority of respondents agreed on that variable. The lowest standard deviations indicate that ideas on the specific variable are stable (respondents agree with each other). A very large t-value indicates that the coefficient has been estimated with reasonable accuracy. A p-value less than 0.05 ($p < 0.05$) indicates that the results are statistically significant. A p-value less than 0.001 ($p < .001$) indicates that the results are statistically highly significant; and a p-value greater than 0.05 (> 0.05) indicates that the results are not significant.

Table 4.10, below, summarises the benefits of using accounting software packages for learning financial accounting.

Table 4.10 Benefits of using Accounting Software Packages.

Item	Responses as Frequency (%)					N	Mean (SD)	t #	df	p-value
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree					
4.1 Using an accounting software package will help me to better understand financial accounting	**5 (2.9)**	**1 (0.6)**	**22 (12.8)**	**62 (36.0)**	**82 (47.7)**	172	4.25 (.912)	17.974	171	<.001*
4.2 Learning an accounting software package at university will enable me to function well in a technologically advanced work environment.	**5 (2.9)**	**2 (1.2)**	**7 (4.1)**	**51 (29.7)**	**107 (62.2)**	**172**	**4.47 (.868)**	**22.223**	**171**	**<.001***
4.3 Using simulation and gaming to teach accounting will make it easier to learn.	**2 (1.2)**	**9 (5.2)**	**41 (23.8)**	**60 (34.9)**	**60 (34.9)**	172	3.97 (.952)	13.381	171	<.001*
4.4 Learning financial accounting using accounting software packages will result in less time being wasted drawing up journals and ledgers.	**2 (1.2)**	**5 (2.9)**	**16 (9.3)**	**52 (30.2)**	**97 (56.4)**	**172**	**4.38 (.860)**	**21.016**	**171**	**<.001***
4.5 Using accounting software packages will make recording and preparing of financial statements easier to do.	**3 (1.7)**	**1 (0.6)**	**12 (7.0)**	**77 (44.8)**	**79 (45.9)**	**172**	**4.33 (.779)**	**22.317**	**171**	**<.001***
4.6 Using accounting software packages will make learning the subject more enjoyable.	**1 (0.6)**	**2 (1.2)**	**30 (17.4)**	**62 (36.0)**	**77 (44.8)**	172	4.23 (.819)	19.738	171	<.001*
4.7 Learning by using accounting software packages enables students to work at their own pace.	**3 (2.9)**	**7 (4.1)**	**44 (25.6)**	**58 (33.7)**	**60 (34.9)**	172	3.96 (.963)	13.059	171	<.001*
4.8 Integrating accounting software packages into the teaching of financial accounting will ensure that I have an added advantage (a competitive edge) when I enter the job market/look for a job.	**3 (1.7)**	**1 (0.6)**	**21 (12.2)**	**65 (37.8)**	**82 (47.7)**	172	4.29 (.836)	20.252	171	<.001*

One-sample t-test: mean compared to '3'
* Significant at 95% level

The results in Table 4.10 indicated that:

- The mean scores for all items differ significantly from '3'. All of the scores are greater than 3, indicating a significant agreement with all statements.
- The mean values and the standard deviations ranged from *M* = 4.47, *SD* = .963 (the highest), to *M* =3.96 , *SD* = .779 (the lowest).
- Learning an accounting software package at university will enable me to function well in a technologically advanced work environment: *M* = 4.47, *SD* = .868; t (171) = 22.223; p<.001. This statement had the highest mean value;
- Learning financial accounting using accounting software packages will result in less time being wasted drawing up journals and ledgers: *M* = 4.38, *SD* = .860; t (171) = 21.016; p<.001. This statement had the second highest mean value.
- Using accounting software packages will make recording and preparing of financial statements easier to do: *M* = 4.33, *SD* = .779; t (171) = 22.317; p<.001. This statement had the third highest mean value.

- Integrating accounting software packages into the teaching of financial accounting will ensure that I have an added advantage (a competitive edge) when I enter the job market/look for a job: *M* = 4.29, *SD* = .836; t (171) = 20.252; p<.001. This statement had the fourth highest mean value.
- Using an accounting software package will help me to better understand financial accounting: *M* = 4.25, *SD* = .912; t (171) = 17.794; p<.001. This statement had the fifth highest mean value;
- Using accounting software packages will make learning the subject more enjoyable: *M* = 4.23, *SD* = .819; t (171) = 19.738; p<.001. This statement had the sixth highest mean value;
- Using simulation and gaming to teach accounting will make it easier to learn: *M* = 3.97, *SD* = .952; t (171) = 13.381; p<.001. This statement had the second lowest mean value.
- Learning by using accounting software packages enables students to work at their own pace: *M* = 3.96, *SD* = .963; t (171) = 13.059; p<.001. This statement had the lowest mean score.

Inferential data analysis revealed that respondents agreed significantly that using accounting software packages in the teaching and learning of financial is beneficial, as all statements had mean values exceeding '3' and most exceeded '4'. 'Learning an accounting software package at university will enable me to function well in a technologically advanced work environment' had the highest mean value (*M* = 4.47), followed by 'Learning financial accounting using accounting software packages will result in less time being wasted drawing up journals and ledgers', with the second highest mean value (*M* = 4.38). 'Using accounting software packages will make recording and preparing of financial statements easier to do' had the third highest mean value of (*M* = 4.33). These findings indicate that students consider the use of technology to be critical in their learning, which is consistent with studies mentioned in the literature review which emphasise the importance of incorporating technology, particularly accounting software packages, into the financial accounting curriculum. These findings are consistent with a UK study which found that a significant number of students found the use of technology in learning to be beneficial (Basioudis *et al.* 2012).

Inferential data analysis revealed that the item that stated that 'Using simulation and gaming to teach accounting will make it easier to learn' had a mean value of *M* = 3.97. It is important to note the findings of Lengyel (2020), which revealed that experiential learning increases students' enthusiasm and dedication to learning. According to Nori *et al.* (2016), incorporating interactive multimedia technology into accounting information system cycles can also simulate students' learning experiences in a real-world setting by providing them with real-world scenarios.

4.10.5 Section E: Knowledge of the Fourth Industrial Revolution – Objective 4

To explore students' knowledge of the Fourth Industrial Revolution

The fourth research question aimed to determine what students know about the 4IR and to address this question, students' knowledge of the 4IR was explored.

4.10.5.1 Descriptive data analysis: Knowledge of the Fourth Industrial Revolution

Figure 4.6, below, shows the students' knowledge of the 4IR. The questionnaire's Section E (Appendix F) assessed the respondents' knowledge of the 4IR. Respondents rated their knowledge of the 4IR on a five-point Likert scale with statements (also known as items) ranging from 'Strongly disagree' to 'Strongly agree'.

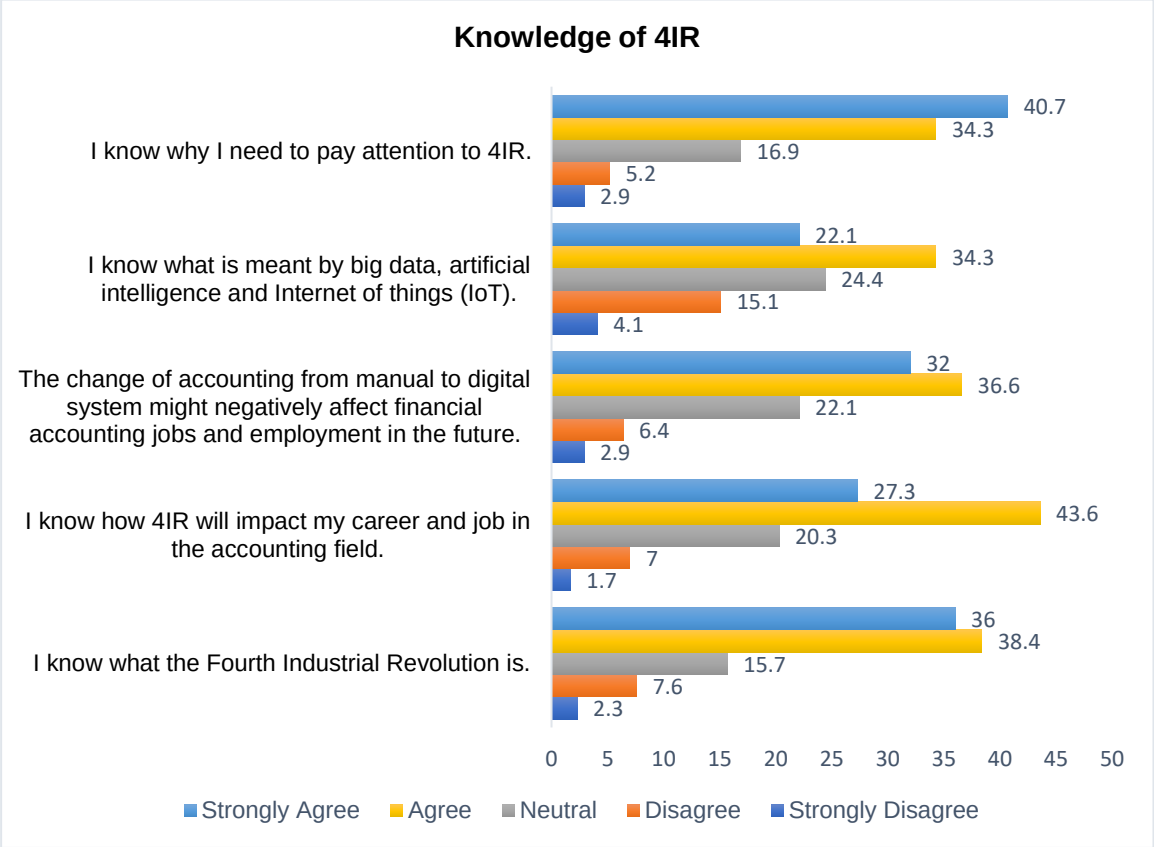

Figure 4.7 Respondents' knowledge of the Fourth Industrial Revolution (4IR).

The findings shown in Figure 4.7 revealed that:

- 75% (40.7% 'strongly agree' + 34.3% 'agree') agreed that they understand why they should pay attention to the 4IR.
- 74.4% (36% answered 'strongly agree' and 38.4% 'agreed'), said they were knowledgeable about the Fourth Industrial Revolution.
- 70.9% of students (27.3% 'strongly agree' + 43.6% 'agree') said that they understand how 4IR will affect their career and work in the accounting field.

- 68.6% of students (32% ‘strongly agree’ + 36.6% ‘agree’) thought that the transition from a manual to a digital accounting system might have a negative impact on employment and careers in financial accounting in the future.
- 56.4% of students (22.1% ‘strongly agree’ + 34.3% ‘agree’) agreed that they understand what big data, artificial intelligence and the Internet of Things (IoT) are.

The literature suggested that, in order for higher education to give students an education that prepares them for the demands and challenges of the 4IR, more flexible curricula and teaching methodologies are necessary (Menon and Castrillón 2019). It is important to note that the students understand the importance of the 4IR and how it will affect their future careers.

Understanding how accountants’ roles are changing is important so that students can be equipped with the necessary skills that will be useful in a job market influenced by technological advancements. Data analysis revealed that students are knowledgeable about the 4IR and its impact on the accounting industry. However, students' knowledge of the 4IR is limited, as data analysis revealed that only 56.4% of students (22.1% ‘strongly agree’ + 34.3% ‘agree’) understand what big data, artificial intelligence and the Internet of Things (IoT) are. Furthermore, it is interesting to note that 68.6% of students agreed that the transition from a manual to a digital accounting system will have a negative effect on future employment and careers in financial accounting. As routine accounting duties and activities have become increasingly automated, the underlying role of the accountant has changed to include critical thinking, problem-solving and analytical skills, which all require higher-order thinking capabilities (Terblanche and De Clercq 2021).

4.10.5.2 Inferential analysis: Knowledge of the 4IR

A one-sample t-test was used to compare the average agreement scores with the central/neutral score of '3' in order to determine whether there is significant agreement or significant disagreement. The highest mean indicates that the majority of respondents agreed on that variable. The lowest standard deviation indicates that ideas on the specific variable are stable (respondents agree with each other). The greater the magnitude of T (over 2), the more evidence there is that there is a significant difference. A p-value less than 0.05 ($p < 0.05$) indicates that the results are statistically significant. A p-value less than 0.001 ($p < .001$) indicates that the results are statistically highly significant and a p-value greater than 0.05 (> 0.05) indicates that the results are not significant.

Table 4.11, below, summarises respondents’ knowledge of the 4IR.

Table 4.11: Knowledge of the Fourth Industrial Revolution.

Item	Responses as Frequency (%)					N	Mean (SD)	t #	Df	p-value
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree					
5.1 I know what the Fourth Industrial Revolution is.	**4 (2.3)**	**13 (7.6)**	**27 (15.7)**	**66 (38.4)**	**62 (36.0)**	**172**	**3.98 (1.017)**	**12.668**	**171**	**<.001***
5.2 I know how 4IR will impact my career and job in the accounting field.	**3 (1.7)**	**12 (7.0)**	**35 (20.3)**	**75 (43.6)**	**47 (27.3)**	172	3.88 (0.950)	12.115	171	<.001*
5.3 The change of accounting from manual to digital systems might negatively affect financial accounting jobs and employment in the future.	**5 (2.9)**	**11 (6.4)**	**38 (22.1)**	**63 (36.6)**	**55 (32.0)**	172	3.88 (1.028)	11.037	171	<.001*
5.4 I know what is meant by big data, artificial intelligence and the Internet of Things (IoT).	**7 (4.1)**	**26 (15.1)**	**42 (24.4)**	**59 (34.3)**	**38 (22.1)**	172	3.55 (1.115)	6.498	171	<.001*
5.5 I know why I need to pay attention to 4IR.	**5 (2.9)**	**9 (5.2)**	**29 (16.9)**	**59 (34.3)**	**70 (40.7)**	**172**	**4.05 (1.025)**	**13.391**	**171**	**<.001***

One-sample t-test: mean compared to '3'
* Significant at 95% level

The results in Table 4.11 indicated that:

- The mean scores for all items differ significantly from '3'. All of the scores are greater than 3, indicating a significant agreement with all statements regarding the respondents' knowledge of the 4IR.
- The means and standard deviations ranged from *M* = 4.05, *SD* = 1.115 (the highest), to *M* =3.55 , *SD* = 0.017 (the lowest).
- I know why I need to pay attention to 4IR: M = 4.05, SD = 1.025; t (171) = 13.391; p<.001.
- I know what the Fourth Industrial Revolution is: *M* = 3.98, *SD* = 1.017; t (171) = 12.668; p<.001.
- I know how 4IR will impact my career and job in the accounting field: *M* = 3.88, *SD* = 0.950; t (171) = 12.115; p<.001.
- The change of accounting from manual to digital systems might negatively affect financial accounting jobs and employment in the future: *M* = 3.88, *SD* = 1.028; t (171) = 11.037; p<.001.
- I know what is meant by big data, artificial intelligence and Internet of Things (IoT): *M* = 3.55, *SD* = 1.115; t (171) = 6.498; p<.001.

Inferential data analysis revealed that respondents significantly agreed with the statement regarding the 4IR, as all mean values are above '3'. It is important to note that students

significantly agreed with the statement that the transition of accounting from manual to digital systems may have a negative impact on financial accounting jobs and employment in the future, with a mean value of *M* = 3.88. This indicates that students are concerned about job security in the accounting sector. These findings are consistent with Chuang and Graham (2018) findings that technological advancements can jeopardise traditional manual jobs. Industry 4.0 is expected to result in a significant decrease in human-intensive labour, potentially leading to high unemployment rates globally, particularly among graduates. This is due to the fact that, in an Industry 4.0 world, routine jobs will be phased out in favour of highly skilled jobs (Ghani and Muhammad 2019).

Inferential data analysis indicated that the statements: 'I know why I need to pay attention to 4IR' and 'I know what the Fourth Industrial Revolution is', had the highest mean values (*M* = 4.05 and *M* = 3.98, respectively). These are significant findings because they show that financial accounting students understand the impact of the 4IR on the accounting industry. These findings contradict those of Pauceanu, Rabie and Moustafa (2020) who stated that students are not fully aware of 4IR employability skills. The statement 'I know what is meant by big data, artificial intelligence and Internet of Things (IoT)' had the lowest mean value (M = 3.55). These findings indicate that some students lack a thorough understanding of 4IR trends. This is concerning because, as a result of technological advancements, the accounting profession is clearly shifting away from traditional accounting working activities and towards newer and more value-added activities (Asonitou 2015).

4.11 Theoretical Framework: Technology Acceptance Model (TAM) in relation to Figure 4.9 and Figure 4.10 below.

The Technology acceptance model (TAM) was chosen as the theoretical framework for the study, as previously stated and discussed in Chapter 2. A diagram to illustrate the TAM model is shown in Figure 4.8.

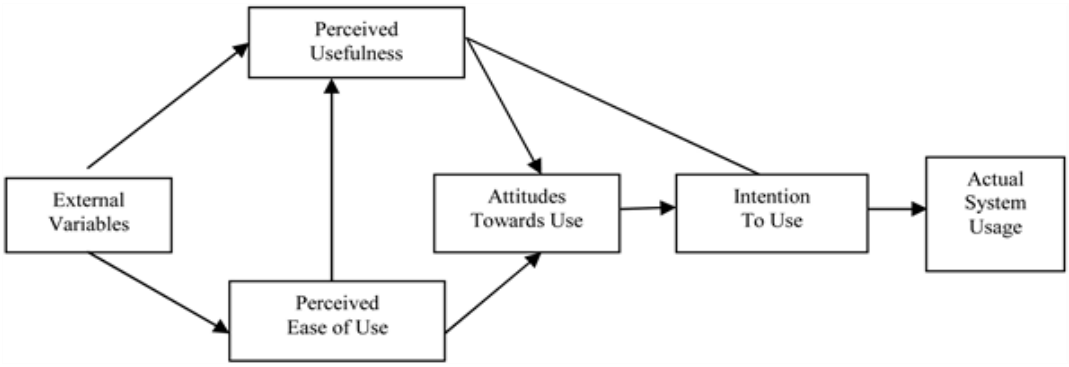

Figure 4.8 Technology acceptance model (TAM)

Source: (Davis, Bagozzi and Warshaw 1989)

The study examined respondents' perceptions of the perceived usefulness of accounting software packages by identifying statements (Figure 4.9 and Figure 4.10) below that related to the study's theoretical framework of Technology acceptance model (TAM). Respondents rated their perceptions on five-point Likert scale statements (also known as items) ranging from ‘Strongly disagree’ to ‘Strongly agree’. The review of the literature revealed that the use of the TAM may result in several recommendations being made to an organisation for improvements, allowing the organisation's system to be improved even further (Natasia, Wiranti and Parastika 2022). The use of the TAM may result in recommendations that the university can apply to improve the teaching and learning of financial accounting by using accounting software packages efficiently.

Figure 4.9, below, shows frequency distribution of the perceived usefulness of accounting software packages.

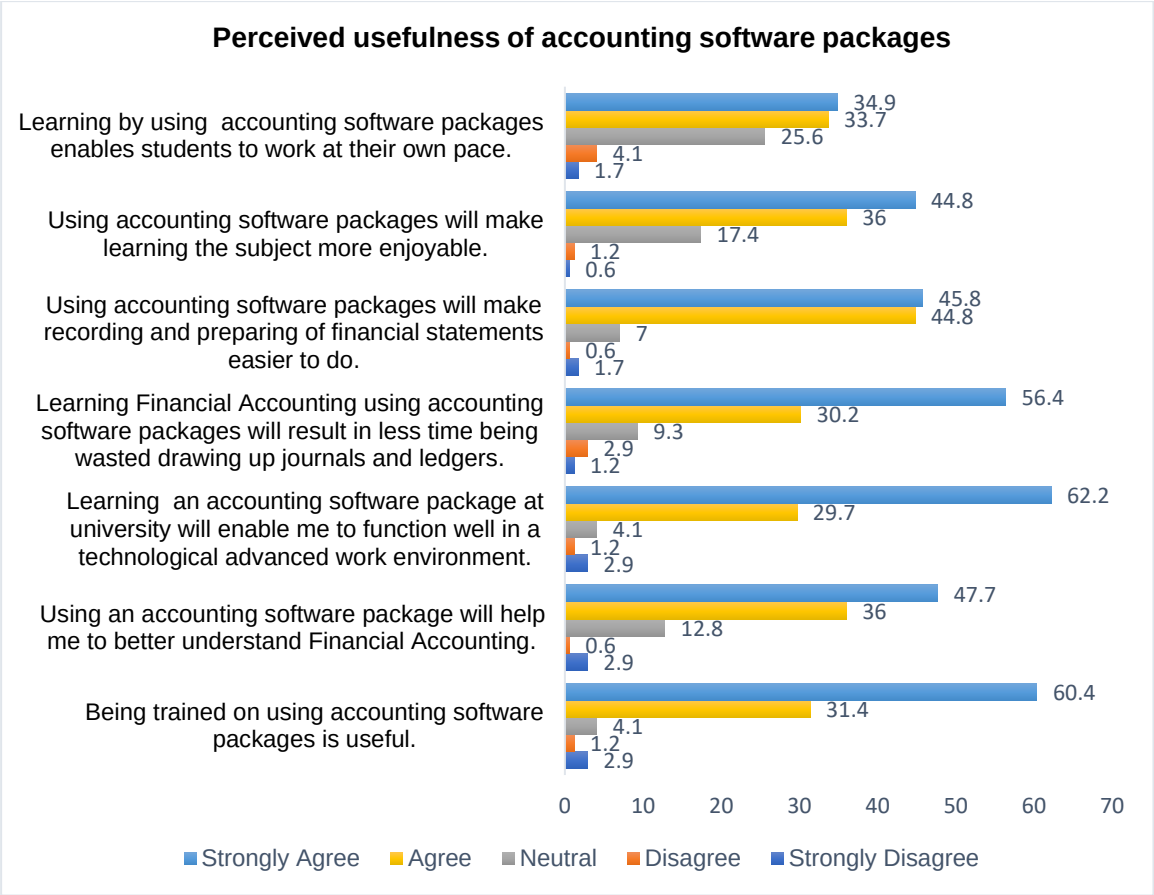

Figure 4.9 Perceived usefulness of accounting software packages.

Descriptive data analysis showed that students have a positive perception of the usefulness of accounting software packages. Figure 4.9 indicated that the statement, 'Being trained on using accounting software packages is useful' had a significantly high positive response from students, as 91.9% (60.5% 'strongly agree' + 31.4% 'agree') of students agreed with the statement. Additionally, the statement 'Learning an accounting software package at university will enable me to function well in a technologically advanced work environment' also had a response of 91.9% (62.2% 'strongly agree' + 29.7% 'agree') of students who agreed with the statement. Of the students, 90.7% (45.9% 'strongly agree' + 44.8% 'agree') agreed with the statement that: 'Using accounting software packages will make recording and preparing of financial statements easier to do'. The results indicated that students have a positive perception of the usefulness of accounting software packages in their learning of financial accounting. These results are significant because the literature showed that the Technology acceptance model (TAM) above plays a big role in accounting technology, as professional accountants need to believe that emerging technologies will indeed improve their performance (Lagaras 2018).

Figure 4.9 indicated that 86.6% (54.4% 'strongly agree' + 30.2% 'agree') of students agreed with the item that stated: 'Learning financial accounting using accounting software packages will result in less time being wasted drawing up journals and ledgers. Of the students, 83.7% (47.7% 'strongly agree' + 36% 'agree') agreed with the statement that: 'Using an accounting software package will help me to better understand financial accounting'. 'Using accounting software packages will make learning the subject more enjoyable' found 80.8% (44.8% 'strongly agree' + 36% 'agree') of students agreeing with the statement. Of the students, 68.6% (34.9% 'strongly agree' + 33.7% 'agree') agreed with the item that stated that: 'Learning by using accounting software packages enables students to work at their own pace'.

These above findings are important as they indicate how accounting software packages are perceived as being useful in improving students' understanding of financial accounting and how useful the accounting software is in facilitating the learning of financial accounting.

Table 4.10 below shows the construct (BEN) ranking of the information sources based on their mean values. This analysis was performed to determine whether there was significant agreement or disagreement with the statements regarding the benefits of using accounting software package learning of financial accounting curriculum.

Table 4.10 Benefits (BEN) ranked in descending order by mean value

Order of agreement	Statement	Mean
1.	Learning an accounting software package at university will enable me to function well in a technological advanced work environment.	4.47
2.	Learning Financial Accounting using accounting software packages will result in less time being wasted drawing up journals and ledgers.	4.38
3.	Using accounting software packages will make recording and preparing of financial statements easier to do.	4.33
4.	Integrating accounting software packages into the teaching of financial accounting will ensure that I have an added advantage (a competitive edge) when I enter the job market/look for a job.	4.29
5.	Using an accounting software package will help me to better understand Financial Accounting	4.25
6.	Using accounting software packages will make learning the subject more enjoyable.	4.23
7.	Using simulation and gaming to teach accounting will make it easier to learn.	3.97
8.	Learning by using accounting software packages enables students to work at their own pace.	3.96

Table 4.10: results indicated that:

- Respondents significantly agreed that learning an accounting software package at university will enable them to function well in a technologically advanced work environment as this statement had the highest mean value (*M* = 4.47), indicating that respondents agree significantly that learning how to use accounting software packages is beneficial. This was followed by the second highest mean (*M* = 4.38) as respondents

significantly agreed that learning financial accounting using accounting software packages will result in less time being wasted in drawing up journals and ledgers manually.

- Respondents significantly agreed that accounting software packages provide a benefit with regards to recording and preparing financial statements as this item had the third highest mean (*M* = 4.33).
- Data indicated that students significantly agreed on the accounting software packages being beneficial when it comes to providing them with a competitive edge in the job market with a high mean (*M* = 4.29) .
- Respondents significantly agreed that accounting software packages are beneficial in the learning of financial accounting as results indicated that accounting software packages help students to better understand financial accounting (*M* = 4.25) and using accounting software packages makes learning financial accounting more enjoyable (*M* = 4.23).
- Respondents agreed that using accounting software packages for simulation and gaming to help them learn financial accounting this item had the second lowest mean value (*M* = 3.97).
- Interestingly respondents find accounting software packages slightly less beneficial when it comes to learning financial accounting at their own pace as this statement had the lowest mean (*M* = 3.96) in all of the items.

Data analysis revealed that respondents significantly agreed that using accounting software packages in the teaching and learning of financial is beneficial as all statements had mean values exceeding '3', approximately '4'. This finding is significant because the literature review in relation to TAM found that using accounting software packages helps students learn accounting. According to the research findings of Kanapathippillai, Ahamed Shamlee and Dellaportas (2012), the computerised consolidation accounting package (CCAP) assisted students in understanding consolidation concepts.

4.12 Chapter summary

In this chapter, the data obtained from the research questionnaire was presented. Descriptive and inferential statistics were used to interpret the findings from the questionnaire completed by Financial Accounting 3 students registered for the Diploma in Accounting at the Durban University of Technology's Ritson Campus. The results were analysed and discussed in relation to what the data revealed and how they related to the objectives and research questions of the study.

The study revealed that a significant proportion of the students have either not heard of the accounting software packages listed in the questionnaire; or they have heard of them but know either nothing or very little about them. The data analysis revealed a significantly low average usage of accounting software packages in learning financial accounting. Additionally, the results revealed that students are not significantly competent in using the accounting software packages listed in the questionnaire.

The findings revealed that students agree ‘significantly’ that accounting software packages are important and useful in their learning of financial accounting and that accounting software packages should be integrated into the undergraduate financial accounting curriculum. The findings of the study and the ensuing discussion revealed that students ‘significantly’ agree that there are benefits to using accounting software packages in the learning of financial accounting. Furthermore, the study revealed that a significant number of students understand what the 4IR is and its impact on the financial accounting sector.

The following chapter presents the conclusions from and recommendations of the study. In addition, the realisation of the study's objectives will be underlined. Finally, the study's limitations and areas for future research will be highlighted.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The previous chapter presented the results and discussed the findings of the study. The case study was conducted at the Durban University of Technology's (DUT) Ritson Campus in Kwa-Zulu Natal. This study was conducted using a quantitative methodology. This approach was implemented using a survey that used a closed-ended questionnaire (five-point Likert scales) which was completed by 172 students out of the 257 sample population. This study was a census study as the sample comprised all those registered for the Diploma in Accounting.

This chapter will cover the research questions, the findings and the implications of the study and will present a brief conclusion. The chapter will also include a section on the limitations of the study as well as suggesting areas for future research. Finally, this chapter provides a thorough analysis of how the research objectives of the study were achieved.

5.2 Research aim and objectives

5.2.1 Research aim

The aim of this study was to examine the applicability of accounting information systems in the teaching and learning of financial accounting at DUT in the era of the fourth industrial revolution, using a case study.

5.2 2 Research objectives

The following objectives were addressed in order to achieve the aforementioned aim:

- to identify awareness, knowledge and usage of accounting information systems in the teaching and learning of financial accounting;
- to explore students' perceptions about accounting information systems and their use in learning financial accounting;
- to determine ways in which accounting information systems can benefit in the learning of financial accounting; and
- to explore students' knowledge of the Fourth Industrial Revolution.

5.3 To identify awareness, knowledge and usage of accounting information systems in the teaching and learning of financial accounting.

Section B (Appendix F) of the questionnaire was divided into three parts. Firstly, students were asked to indicate their awareness and knowledge of the five accounting software packages listed in the questionnaire on a five-point Likert scale with statements ranging from 'I have never heard of it' to 'I have heard of it and know a lot about it'. Secondly, on a five-point Likert scale, with items ranging from 'Never' to 'Very often', students were asked to indicate how often they use the five accounting software packages to learn financial accounting. Thirdly, students were asked to indicate their level of competency in using the five accounting software packages listed in the questionnaire on a five-point Likert scale with items ranging from 'Not at all competent' to 'Extremely competent'. This allowed the first objective of the study to be met, as the data analysis revealed the students' awareness and knowledge of accounting software packages, their use of accounting software packages and their level of competency in using accounting software packages.

It is important to note that the literature review revealed how technological advancements and particularly the effects of the 4IR, are altering the accounting profession. With the development of information technology and the globalisation of economies, the environment in which accounting professionals work is fast changing (Tan and Laswad 2018). Most organisations have completely replaced manual accounting procedures with computerised accounting software (Boulianne 2014). Universities have a duty to prepare students for the labour market so that they are qualified for their positions. Students who study financial accounting are required to have technology skills. Financial accounting students must be competent users of accounting software packages, in addition to being aware of and knowledgeable about, accounting software packages.

As shown in Table 4.4, a significant proportion of the students either have not heard of QuickBooks (36.6%); or they have heard of it but know either nothing (26.7%) or only a little (29.1%) about it. A significant proportion of the students have either never heard of Sage (45.3%) or they have heard of it but only know a little about it (26.7%) and 62.2% have never heard of Xero. A significant proportion of the students either have not heard of Pastel Accounting (38.4%); or they have heard of it but know either nothing (24.4%) or only a little (28.5%) about it. A significant proportion of the students either have not heard of SAP Accounting Software (35.5%); or they have heard of it but know either nothing (23.8%) or only a little (29.7%) about it. Data analysis revealed that none of the accounting software packages listed on the questionnaire obtained a significant score for the statement: 'I have heard of it and

know a lot about it'. Therefore, the results demonstrated that, even while students are aware of some accounting software packages, they do not know much about them.

Inferential analysis using a one-sample t-test was conducted to compare the average usage with a usage rating of '2'. The results shown in Table 4.5 showed that the average rating of usage of Xero and Sage Business Cloud Accounting Software is significantly less than '2'; while the average rating of the remaining three (QuickBooks, Pastel software and SAP Accounting Software) packages is approximately '2'. The data analysis revealed that significant low usage was reflected for all of the accounting software packages listed in the questionnaire.

One-sample t-test analysis was done that compared the average competence, where 1 = not at all competent and 5 = extremely competent. The results, as in Table 4.6, showed that QuickBooks and SAP are rated significantly higher than '2' while the others are rated approximately '2'. The data analysis revealed that students were not competent in any of the listed accounting software packages. This is not surprising, as the data analysis revealed that a significant proportion of the students did not know a lot about any of the listed accounting software packages and use of these accounting packages was significantly low.

5.4 To explore students' perceptions of accounting information systems and their use in learning financial accounting.

Section C (Appendix F) of the questionnaire contained eleven statements. The students' perceptions of using accounting software packages were assessed in this section using a five-point Likert scale with items ranging from 'Strongly disagree' to 'Strongly agree'. The answers allowed the second objective to be met.

The results, as shown in Table 4.7, revealed that students significantly agreed with all of the statements regarding the importance of accounting software packages and technology. These findings are significant, because they show that students are aware of the importance of technological advancements and view technology as a helpful tool for learning financial accounting. Statements about the adequacy of using accounting software packages for teaching financial accounting, on the other hand, scored slightly lower than statements about the importance of accounting software packages for learning financial accounting.

The data analysis (with results shown in Table 4.7) revealed that 64.9% of students agreed that adequate time is allocated to train students to use an accounting system (accounting package). Findings indicated that only 48.3% of students agreed with the statement that investigated whether students are currently taught the necessary accounting technological skills to compete in the job market. Also, only 37.2% of students agreed with the statement that investigated the

appropriateness of the way accounting software packages are taught. Furthermore, the findings of the study revealed that only 43% of students are confident in their ability to engage with and learn about, accounting software packages independently.

When analysing the data in this section, it is important to keep the findings of the Dingus study in mind. This study concluded that universities are not teaching graduates to use accounting software programmes effectively (Dingus 2021). Likewise it important to note, from the literature review, that according to Mahambo (2020), an outdated, traditional accounting curriculum will produce graduates who are not employer-ready, as well as graduates who cannot communicate, verify, or apply financial information due to rote learning.

5.5 To determine ways in which accounting information systems can benefit the learning of financial accounting.

Section D (Appendix F) of the questionnaire contained eight statements that were scored on a five-point Likert scale with items ranging from ‘Strongly disagree’ to ‘Strongly agree’ to assess the benefits of using accounting software packages for learning financial accounting. The responses provided information that enabled the third objective to be met.

It is important to note that, according to Marriott (2004), computer simulations provide students with hands-on accounting training in a real-world business environment. Accounting software packages used in the teaching of financial accounting can help students prepare for the real world. The literature reviewed cited the findings of a study by Kanapathippillai, Ahamed Shamlee and Dellaportas (2012) which found that the computerised consolidation accounting package (CCAP) assisted students in understanding consolidation concepts.

As shown in Table 4.10, a significant number of students agreed with the eight statements listed in this section. Learning an accounting software package at university, according to 91.9 % of students, will better prepare them to function in technologically advanced work environments. Data analysis revealed that 83.7% of students agreed that using accounting software packages will assist them in understanding financial accounting better. Furthermore, 90.7% of students agreed that using accounting software packages facilitates the recording and preparation of financial statements. It is worth noting that a significant number of students agreed with all the statements in this section. However, the findings also revealed that statements about gaming and simulation, as well as the statement about accounting software packages allowing students to work at their own pace, scored less than 70%.

The findings of the study indicated that students regarded accounting software packages as important and beneficial in the learning of financial accounting. However, gaming and simulation

questions received lower scores, indicating that they are not used in the teaching and learning of financial accounting. Furthermore, less than 70% of students perceived accounting software packages were useful for learning financial accounting at their own pace. More students would have agreed that using accounting software packages aided them in learning financial accounting at their own pace if accounting software was used effectively in the teaching of financial accounting.

5.6 To explore students' knowledge of the Fourth Industrial Revolution.

Section E (Appendix F) of the questionnaire contained five statements that were scored on a five-point Likert scale with items ranging from 'Strongly disagree' to 'Strongly agree' to assess students' knowledge of the 4IR. The responses provided information that enabled the fourth objective to be met.

As shown in Table 4.11, there is significant agreement among students regarding their knowledge of the 4IR. The data analysis revealed that students are knowledgeable about the 4IRand its impact on the accounting industry. Data analysis indicated that 75% of students agreed that they know why they should be paying attention to 4IR and results also showed that 74.4% of students agreed to knowing what the 4IR is. Additionally, 70.9% of students agreed that they understand how the 4IR will impact their careers and work in the accounting industry.

Interestingly, the findings of the study revealed that students' knowledge of the 4IR is limited, as data analysis revealed that only 56.4% of students agreed that they understand what big data, artificial intelligence and the Internet of Things (IoT) are. Additionally, 68.6% of students indicated that they agreed that the transition from a manual to a digital accounting system will have a negative effect on future employment and careers in financial accounting. These two results indicate that students lack in-depth knowledge about the 4IR and its impact on the accounting sector.

As the 4IR has shaken the world of education, concerns have been raised about the type of education that students should receive in order to be competent in their knowledge of the 4IR (Mahlaba 2020). According to Terblanche and De Clercq (2021), there is an ongoing debate about the future role of professional accountants in the 4IR, as well as the impact of machines and artificial intelligence (AI) on job security. The role of universities in influencing new knowledge has become increasingly important. According to the literature, universities help to create new knowledge (Shrivastava and Shrivastava 2014). Universities need to take the lead in educating students about the 4IR to prepare students for their future careers.

The findings of the study indicated that, while 4IR topics are covered in the Business Information Systems curriculum, 4IR trends are not covered in depth because students are not well-versed in these topics. Furthermore, these findings revealed that more than 60% of students have negative perceptions of 4IR, believing that it will have a negative impact on their future employment. In-depth teaching of 4IR would have made students aware that 4IR will create new opportunities for employees whose skills align with emerging technologies and who are willing to be retrained to adopt new technology.

5.7 Theoretical framework: Technology acceptance model (TAM)

The technology acceptance model (TAM) was selected as the study's theoretical framework because of its applicability to the use of accounting software packages in the learning of financial accounting. The theory provided a deeper and clearer understanding of how students perceive the accounting software packages. The TAM model was designed to assist in predicting technology acceptance using the constructs of perceived usefulness; perceived ease of use; attitudes; and behavioural intention.

The research used the TAM construct, perceived usefulness, as the foundation for the theoretical framework of the study. This construct was selected because it is a good indicator of a user's intention to use new technology. The perceived usefulness of accounting software packages is critical as students are introduced to accounting software packages at university. It will influence how students will accept accounting software packages when they use them in their working environments.

The TAM theory assisted in the design of the study's research instrument. The instrument elicited responses for how accounting software packages were perceived by respondents. The TAM theory also contributed to the data analysis process. Positive responses about the use of accounting software packages were regarded as consistent with the theorical framework of the study.

The results shown in Figure 4.9 and Figure 4.10 indicated that students have positive perceptions of accounting software packages, as 91.9% of students indicated that being trained using accounting software packages is useful. The majority of students significantly agreed with all statements that evaluated the perceived usefulness of accounting software packages. The chosen theorical framework supported the study. The TAM framework may be used to analyse the usefulness of accounting software packages in the learning of financial accounting.

5.8 Summary of the study

There were several similarities between the findings of the study and the literature review. Section 2.2.1 of the second chapter defined the 4IR. The literature in section 2.8 of the second chapter indicated students do not fully comprehend the employability skills needed in the 4IR. As a result, there is a misalignment between future demand for employability skills and students' perceptions (Pauceanu, Rabie and Moustafa 2020). However, the findings of the study revealed that students understand the importance of the 4IR and how it will affect their future careers. Descriptive data analysis revealed that 70.9% (27.3% 'strongly agree' + 43.6% 'agree') of students agreed that they understand how 4IR will affect their career and work in the accounting field. It is important to note that students' knowledge of the 4IR is limited, as data analysis revealed that only 56.4% of students (22.1% 'strongly agree' + 34.3% 'agree') understand what big data, artificial intelligence and the Internet of Things (IoT) are.

Section 2.2.3 of the second chapter defined and discussed literature pertaining to accounting information systems and accounting software packages. The results of the empirical study indicated that, there is no accounting software package that can be identified as being the one that students are significantly aware of, knowledgeable about and competent in using in learning financial accounting. These findings of the study highlight the literature as discussed in Section 2.4.2 where Awayiga, Onumah and Tsamenyi (2010) discovered that 76% of the accounting graduates had no accounting-related IT skills when they were hired. Nori *et al.* (2016) determined that accounting software has the potential to improve a student's understanding of accounting concepts. The findings of the study indicated that 83.7% of students (47.7% 'strongly agree' + 36% 'agree') agreed that using accounting software packages will help them better understand financial accounting.

Furthermore, section 2.8 of the second chapter discussed the students' perceptions regarding the use of accounting technology. Concannon, Flynn and Campbell (2005) noted that, in higher education, students perceived the use of technology as an expected and integral component of the learning process. The findings of the study indicated that students find accounting software packages useful. Students have positive perceptions about accounting software packages. 91.9% of students indicated that being trained on using accounting software packages is useful as Elaine Gioiosa and Kinkela (2019), indicated that students agreed that technology helped them complete their programmes successfully. The findings of the study indicated that the chosen theorical framework, the Technology acceptance model (TAM) supported the study.

Figure 5.1, below, gives a summary of key findings in relation to TAM of the study. The findings of the study were gathered from 172 respondents as indicated in the third chapter.

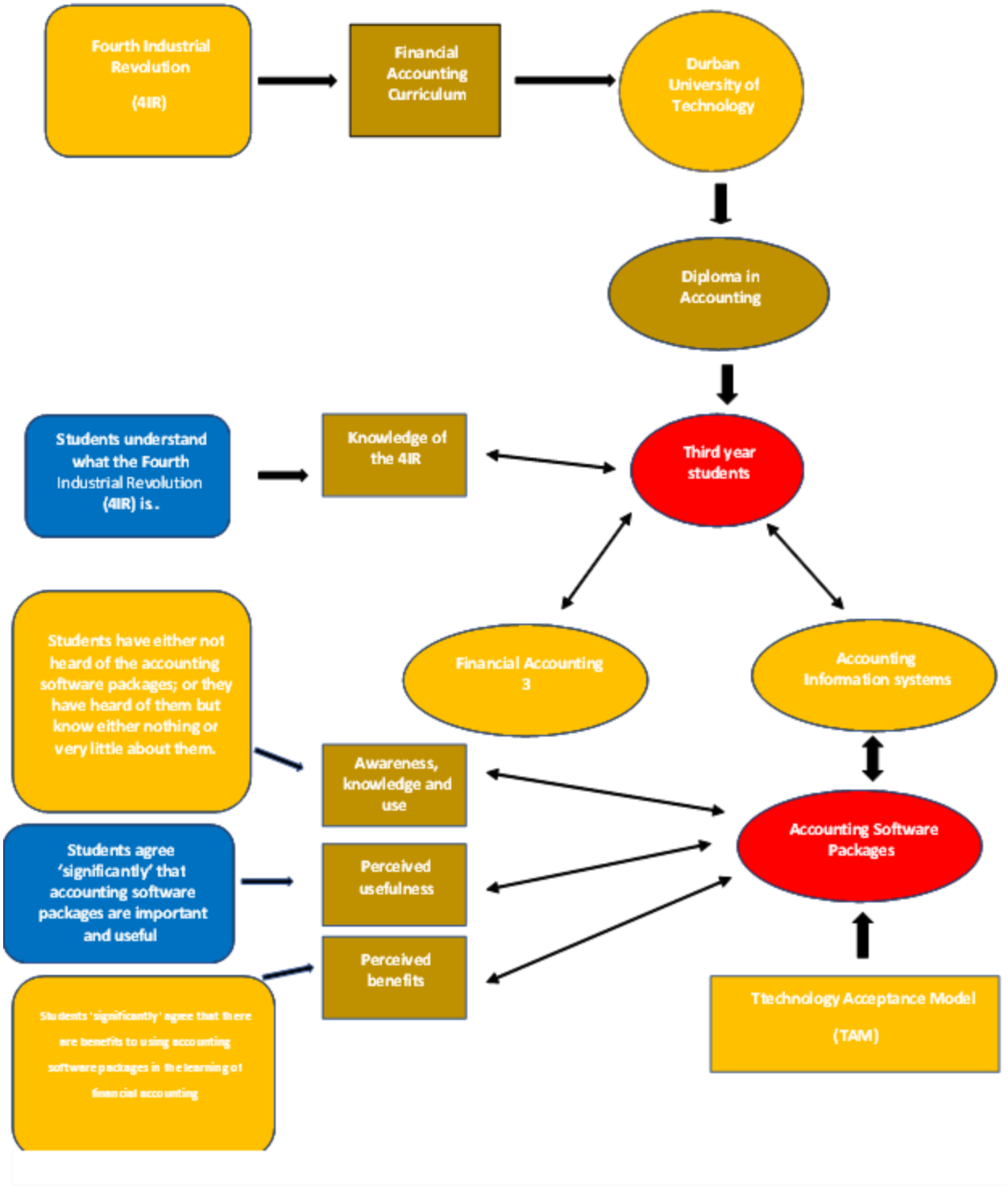

Figure 5.1 Summary of the key findings in relation to TAM

5.9 Recommendations

The four objectives of the study were met in terms of the applicability of accounting information systems (accounting software packages) in the teaching and learning of financial accounting at DUT in the fourth revolution era. The following recommendations are made, based on the research findings:

5.9.1 Recommendation 1: Review the curriculum to development of knowledge and skills

The financial accounting curriculum has possibly been criticised for years for falling behind industry standards and for producing graduates who are unprepared for today's technologically advanced workplace. Accepting the impact of technology is critical for the teaching and learning process. The university must ensure that the financial accounting curriculum changes in accordance with the latest technologies. It is critical to prepare students for the evolving profession and the essential knowledge and skill sets must be made available to them. The university has developed a strategy called Envision 2030. Envision 2030 will contribute to ensuring that the university can develop graduates who are innovative and equipped with the skills to respond to change (Durban University of Technology 2019). Therefore, it is recommended that the university implement a project that will have multiple stages: evaluating the current curriculum; developing curriculum proposals; getting the proposals approved at the Centre for Quality Promotion and Assurance (CQPA); putting these changes into practice; and evaluating the effects of the changes. Engaging in this project will ensure that DUT financial accounting graduates are knowledgeable about accounting software packages, understand how to use them and are competent and confident in their abilities to use accounting packages when they enter the world of work or become entrepreneurs. Students must understand the impact of 4IR on the accounting sector.

5.9.2 Recommendation 2: Technologically competent academics

The accounting world is changing as a result of technological advances. Because of these rapid changes, some people may believe that the financial accounting curriculum cannot keep up with real-world changes. If indeed the curriculum fails to keep up with technological advances, accounting graduates will be underprepared for the real world. One factor that may be preventing the financial accounting curriculum from keeping up with technological changes could be academics who are out of touch with, or unskilled in, teaching financial accounting using accounting software packages. Competence in using accounting software packages is an essential and expected skill for today's accounting graduates. It is, therefore, recommended that the university ensure that only academics with technological skills and abilities be assigned to

curriculum design and development. The university should, preferably, appoint academics who have practical expertise and experience with technologies utilised in the accounting environment, to design and develop the financial accounting curriculum. Accounting software packages would be much easier to incorporate into the teaching and learning of financial accounting if academics responsible for curriculum development are familiar with technology.

5.9.3 Recommendation 3: Establishment of an accounting technical committee

Employers, entrepreneurs and accounting professional bodies can play an important role in accounting education. Accounting professionals understand which technologies are current and useful and employers and entrepreneurs understand which technical accounting skills accounting graduates should have. It is therefore recommended that links be established with accounting professional bodies and recruiters, with the specific mandate of determining what technological knowledge and skills are required of financial accounting graduates with a Diploma in Accounting. This would not be an advisory board, but rather a committee driven by technological advancements and the impact of the 4IR. The primary responsibility of this technical committee would be to make sure that the financial accounting curriculum is in line with the most recent accounting technology that is applicable in the labour market.

5.9.4 Recommendation 4: Inclusion of accounting software packages into the curriculum

The Department. of Financial Accounting should prioritise the use of technology, especially accounting software packages. Teaching students how to use accounting software packages in a single semester is insufficient; it represents an ‘afterthought approach’ to important accounting software packages. Financial accounting graduates are expected to be competent in using accounting software packages. The university does not need to teach students several accounting software packages. Students must be given curriculum teaching or training in one or two packages. It is, therefore, recommended that accounting software packages be taught throughout the undergraduate level. This ensures that students have both basic and advanced, knowledge and skills. Furthermore, it is recommended that accounting software developers issue certificates to students each year to indicate the level of competency attained by the students.

5.9.5 Recommendation 5: Simulation to create relevant business experience

DUT must differentiate itself from other universities by producing graduates with job-related skills or graduates with entrepreneurial skills who can use their skills to start their own businesses. The financial accounting curriculum, alone, is insufficient to ensure that students understand all of the required procedures and financial information, let alone the impact of rapid

technological changes. As a result, it is recommended that the university offers a two-year business simulation project, commencing at least in the second year of the Diploma in Accounting.

The use of simulation as a technique for accounting education learning and teaching has gained popularity. Simulated settings can be created, which aid in experiential learning. The use of accounting software packages, as well as other software packages used for other modules like taxation and auditing, can be incorporated into this business simulation project. Since the business simulation project would require students to make connections across several courses, it could aid in achieving integrated learning. Students will gain a better understanding of how a real business operates through the incorporation of educational, entrepreneurial and technological skills into the business simulation project. The students' work over the two-year period would be documented in their portfolios of evidence; and by so doing, creating a logbook. Students could present their portfolios of evidence to potential employers. The university can use technology to create an environment that produces graduates with relevant and documented business experience gained from simulations.

5.10 Contribution of the study

The study contributes to the increasing interest and research into how accounting technology positively impacts teaching and learning of financial accounting. Many researchers have emphasised the importance of technology in the teaching and learning process. Few studies, however, have been conducted to investigate how students perceive the use of accounting software packages in learning financial accounting.

The study provides a unique perspective on the applicability of accounting software systems in the form of accounting software packages in a South African context, as most related studies have not been conducted in South Africa. Furthermore, the study provides a unique insight into the use of accounting software packages by utilizing one of the TAM's constructs, namely perceived usefulness.

The study has highlighted the importance of incorporating 4IR topics into the financial accounting curriculum. There is a need to close the knowledge gap, as the results of this study have indicated that accounting students do not have an in-depth knowledge of 4IR trends like big data, artificial intelligence (AI) and the Internet of Things (IoT).

The findings of the study can guide the Durban University of Technology in determining how well it is equipping accounting students for the working environment that is continually changing as a result of technological developments. The outcomes of this study can be adapted to other higher education institutions that use accounting-related software packages for teaching and

learning. Universities must periodically assess whether their qualifications are adequately preparing graduates with the relevant and current technological skills.

5.11 Future research

The recommendations provided in this study could be discussed at department meetings and then further research could be conducted to investigate how the recommendations can be implemented; and also how effective they are in improving accounting software package use and knowledge of 4IR topics. Additionally, possible future studies that could be undertaken include:

- a study to investigate the preferred accounting software packages students can learn which will support them in the world of work;
- a similar study at various other universities of technology in South Africa;
- a study to investigate how lecturers perceive the incorporation of accounting software into the financial accounting curriculum; and
- a study on how the 4IR has impacted accounting education in South Africa.

5.12 Limitations of the study

The study's population was limited to students registered for Financial Accounting 3 in the Diploma in Accounting at Durban University of Technology, so the study's findings may not be generalizable to all HEIs. Another limitation is that the primary data collection tool was a questionnaire with closed-ended questions. Interviews and focus groups could have provided additional data because respondents could have given reasons for their responses.

5.13 Conclusion

This chapter discussed how the aim and objectives of the study were met. Furthermore, it presented conclusions based on the findings and also made recommendations in relation to the objectives. The limitations of the current study were discussed, as well as potential areas for future research.

The aim of this study was to examine the applicability of accounting information systems in the teaching and learning of financial accounting at the Durban University of Technology (DUT), in the era of the fourth industrial revolution. The research only examined accounting information systems specific to accounting software packages. The study revealed that a significant proportion of the students either have not heard of the accounting software packages listed in the questionnaire; or they have heard of them but either know nothing, or very little about these packages. In addition, data analysis revealed that the average use of accounting software packages for learning financial accounting is significantly low.

The findings revealed that students are not particularly skilled in using the accounting software packages listed in the questionnaire. Data collected also revealed that students have positive perceptions of accounting software packages and a significant number of students agreed that accounting software packages are important to their learning of financial accounting. A majority of the students agreed that accounting software packages should be integrated into the undergraduate financial accounting curriculum. In addition, students agreed that there are advantages to using accounting software packages. Furthermore, the study showed that a significant number of students understand 4IR and how it impacts their careers.

This study achieved its stated aim and four objectives and answered the research questions. The researcher hopes that this study will serve as a catalyst for other similar studies to be conducted at other higher education institutions (HEIs).

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1. APPENDIX A - LETTER OF INFORMATION

LETTER OF INFORMATION

Title of the Research Study: The applicability of accounting technology for the Financial Accounting curriculum in the 4th Industrial Revolution era: A case at the Durban University of Technology (DUT).

Principal Investigator/s/researcher: Welcome Siphiwe Cele. Qualifications: Post Graduate Diploma in Higher Education (VUT), B. Tech: Taxation (DUT), B. Tech: Corporate Administration (DIT) and CIS (ICSA).

Co-Investigator/s/supervisor/s: Dr Anrusha Bhana, PhD in Man. Science (DUT) and Dr Walter Matli, PhD (UNISA).

Brief Introduction and Purpose of the Study: The Fourth Industrial Revolution (4IR) is influencing how people connect with technology and it is affecting how and where work is carried out. Higher education is influenced by technological developments more than anything else, making it crucial for prospective graduate students (3rd year students) to keep abreast with current and trending technologies. There has been a transformation between technology and accounting which has merged in over the years thus making the old ways of teaching and learning accounting and accounting systems irrelevant. However, the accounting curriculum is still based on manual accounting with little or no integration of accounting technologies in the teaching and learning of accounting. Therefore, this study aims to examine the importance of accounting technologies in the teaching and learning of financial accounting at DUT in the 4Th Industrial Revolution era. The objective of the study is to explore students' understanding and knowledge of accounting information systems and the 4th Industrial Revolution in the teaching and learning of financial accounting. To explore 3rd year students' perceptions towards accounting information systems in learning of financial accounting which will possibly benefit the learning of financial accounting. The study will use a quantitative questionnaire in a census study to understand the applicability of accounting information systems in Financial Accounting course curriculum in the 4th Industrial Revolution era.

Hello,

I hope this letter finds you well.

I am a master's student at DUT doing research for a Master of Accounting in Financial Accounting.

I would like to invite you to participate in the research.

What is Research (Research is a systematic search or enquiry for generalized new knowledge)

Outline of the Procedures: A quantitative method will be used for the study. A self-administrated questionnaire containing closed-ended questions will be employed. The questionnaire will be administered

to students who are registered for Financial Accounting 3 (Module one and Module two) which are part of the Diploma programme. A census approach study has been chosen for this study. Close-end questions will allow respondents to answer the 5- Likert scale questionnaire. The letter of information has ensured that the respondents are aware of the purpose of the study, so they have given consent to participate the study.

Risks or Discomforts to the Participant: There are no risks or discomfort to the participants. If any of the questions are found to be offensive or sensitive in nature, the participant may choose not to answer the question. The questionnaires will be done anonymously; hence, there would be no fear of retribution (See confidentiality section).

Explain to the participant the reasons he/she may be withdraw from the Study: Participation in the study is voluntary and they are free to withdraw or terminate at any time.

Benefits: The researcher will present this study at a conference, publish journal articles and it will be placed in the DUT library.

Remuneration: Participants will not be subjected to any remuneration for taking part in the study.

Costs of the Study: Participants will not be expected to cover any costs relating to the study.

Confidentiality: The data obtained from participants will be kept confidential and only the researcher will have access to it. In addition, participant anonymity will be ensured by not revealing data that can potentially be traced back to them.

Results: The final research results will be available to all interested parties as the University will publish it in the University repository.

Research-related Injury: There will be no injury that is research related.

Storage of all electronic and hard copies including tape recordings: All collected data will be kept at the university for five years, in a locked cupboard with the supervisor, thereafter it will be shredded.

Persons to contact in the Event of Any Problems or Queries:(Supervisor and details) Please contact the researcher (Welcome Cele – 076 549 5235), my supervisor (Dr A. Bhana – 084 564 7507 and Dr Walter Matli – 076 288 3345) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Director: Research and Postgraduate Support Dr L Linganiso on 031 373 2577 or researchdirector@dut.ac.za.

General: A copy of the information letter should be issued to participants. The information letter and consent form must be translated and provided in the primary spoken language of the research population e.g. isiZulu.

2. APPENDIX B- CONSENT

CONSENT

Statement of Agreement to Participate in the Research Study:

I hereby confirm that I have been informed by the researcher, ……..name of researcher), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number:

I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.

I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.

In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.

I may, at any stage, without prejudice, withdraw my consent and participation in the study.

I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.

I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	**Date**	**Time**	**Signature**

I, _____ (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full Name of Researcher	**Date**	**Signature**
_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**
_____	_____	_____
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

3. APPENDIX C – ETHICAL CLEARANCE

Faculty Research Office
Durban University of Technology
24 November 2021

Student: WS Cele
Student Number: 19912265
Degree: Master: M Acc: Financial Accounting
Email: 19912265@dut4life.ac.za
Supervisor: Dr Anrusha Bhana
Supervisor email: anrushab@dut.ac.za

Dear WS Cele

I am pleased to inform you that the Faculty Research Ethics Committee (FREC) following feedback from two reviewers, has granted preliminary permission for you to conduct your research "The applicability of Accounting Information Systems for the Financial Accounting curriculum in the 4th Industrial Revolution era: A case at the Durban University of Technology (DUT)."

When ethics approval is granted:
You are required to present the letter at your research site(s) for permission to gather data. Please also note that your research instruments must be accompanied by the letter of information and the letter of consent for each participant, as per your research proposal.

This ethics clearance is valid from the date of provisional approval on this letter for one year. A student must apply for recertification 3 months before the date of this expiry.

Recertification is required every year until after corrections are made, after examination, and the thesis is submitted to the Faculty Registrar.

A summary of your key research findings must be submitted to the FRC on completion of your studies.

Kindest regards.

Yours sincerelv

Dr Olga Sizakele Ndlovu
FREC Chair
Faculty of Accounting and Informatics
Durban University of Technology
Ritson Campus
Durban, South Africa 4001

4. APPENDIX D - GATEKEEPERS PERMISSION

Directorate for Research and Postgraduate Support
Durban University of Technology
Tromso Annexe, Steve Biko Campus
P.O. Box 1334, Durban 4000
Tel.: 031-3732576/7
Fax: 031-3732948

3rd December 2021
Mr Simphiwe W Cele
c/o Department of Financial Accounting
Faculty of Accounting and Informatics
Durban University of Technology

Dear Mr Cele

PERMISSION TO CONDUCT RESEARCH AT THE DUT

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research and Innovation Committee (IRIC) has granted **Full Permission** for you to conduct your research "The applicability of Accounting Information Systems for the Financial Accounting curriculum in the 4th Industrial Revolution era: A case at the Durban University of Technology (DUT)." at the Durban University of Technology.

The DUT may impose any other condition it deems appropriate in the circumstances having regard to nature and extent of access to and use of information requested.

We would be grateful if a summary of your key research findings would be submitted to the IRIC on completion of your studies.

Kindest regards.
Yours sincerely

_____
DR LINDA ZIKHONA LINGANISO
DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT DIRECTORATE

5. APPENDIX E - DEPARTMENT OF FINANCIAL ACCOUNTING'S PERMISSION

RE: Consent to collect data- MACC- Financial Accounting

Ferina Marimuthu <ferinas@dut.ac.za>
Tue 2022/02/01 00:39

To: W Cele (19912265) <19912265@dut4life.ac.za>

Dear Mr Cele,

I trust that you are well.

I hereby grant you permission to conduct research in the Department of Financial Accounting, based on the ethics documents provided.

Kind regards,

DUT
DURBAN UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF FINANCIAL ACCOUNTING

DR FERINA MARIMUTHU
Head of Department
Department of Financial Accounting
Faculty of Accounting and Informatics
Durban University of Technology
Ritson Campus
P O Box 1334, Durban, 4000
Tel: +27 31 373 5645
email: ferinas@dut.ac.za
www.dut.ac.za

6. APPENDIX F – QUESTIONNAIRE

Dear Participant

Thank you for agreeing to participate in this research study entitled "The applicability of accounting technology for the Financial Accounting curriculum in the 4th Industrial Revolution era: A case at the Durban University of Technology (DUT). This study aims to examine the importance of accounting technologies in the teaching and learning of financial accounting at DUT. It would be highly appreciated if you can take a few minutes of your time to sincerely answer the questions contained herein.

Please note the following important information:

i. Participation in the study is completely voluntary and anonymous.
ii. The study was formally reviewed and approved by the DUT – Faculty Research Ethics Committee (DUT – FREC).
iii. The information received during the project will only be used for research purposes.
iv. You are under no obligation to participate in the study and should not participate in the study if you don't want to.

SECTION A: Background Information

1.1. Gender

Male	
Female	

1.2. Age:

Below 18 years	
18 – 24 years	
25 – 35 years	
Older than 35 years	

1.3. Ethnicity category:

Black	
Coloured	
Indian	
White	

SECTION B: Accounting Software Packages

2.1 Indicate your awareness and knowledge of the following accounting software packages:

	Accounting software	I have never heard of it	I have heard of it but don't know about it	I have heard of it and know a little about it	I have heard of it and know a lot about it
2.1.1.	QuickBooks				
2.1.2.	Sage Business Cloud Accounting Software				
2.1.3.	Xero				
2.1.4.	Pastel software				
2.1.5.	SAP Accounting Software				

2.2. Indicate how often you use the following accounting software packages in learning financial accounting:

Accounting software	Never 1	2	3	4	Very often 5
QuickBooks					
Sage Business Cloud Accounting Software					
Xero					
Pastel Software					
SAP Accounting Software					

2.3. Indicate your level of competency regarding the use of the following accounting software packages:

	Accounting software	Not at all competent 1	2	3	4	Extremely competent 5
2.3.1.	QuickBooks					
2.3.2.	Sage Business Cloud Accounting Software					
2.3.3.	Xero					
2.3.4	Pastel Software					
2.3.5.	SAP Accounting Software					

SECTION C: Perceptions of using Accounting Software Packages

3. Indicate your agreement with the following statements:

Key	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
3.1	I think that technology is important in the teaching and learning of Financial Accounting.					
3.2	The teaching of financial accounting should be integrated with the teaching of accounting software packages.					
3.3	Being trained on using accounting software packages is useful.					
3.4	Adequate time is allocated to train students to use an accounting system (accounting package).					
3.5	I am currently being taught the necessary accounting technological skills that will allow me to compete in the job market.					
3.6	The future of accounting is linked to digital technology (i.e., it is moving away from manual recording towards digital recording of financial information).					
3.7	I am confident in my ability to engage and learn about accounting software packages.					
3.8	Financial accounting should be taught primarily using an accounting software package at undergraduate level.					
3.9	The way we are being taught to use accounting software packages is appropriate.					
3.10	I am confident in my abilities to use accounting software packages independently.					
3.11	There is a need for financial accounting modules to include topics on the Fourth Industrial Revolution (4IR)					

SECTION D: Benefits of using Technology and Accounting Software Packages

4. Indicate your agreement with the following statements:

Key	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
4.1	Using an accounting software package will help me to better understand Financial Accounting					
4.2	Learning an accounting software package at university will enable me to function well in a technological advanced work environment.					
4.3	Using simulation and gaming to teach accounting will make it easier to learn.					
4.4	Learning Financial Accounting using accounting software packages will result in less time being wasted drawing up journals and ledgers.					
4.5	Using accounting software packages will make recording and preparing of financial statements easier to do.					
4.6	Using accounting software packages will make learning the subject more enjoyable.					
4.7	Learning by using accounting software packages enables students to work at their own pace.					
4.8	Integrating accounting software packages into the teaching of financial accounting will ensure that I have an added advantage (a competitive edge) when I enter the job market/look for a job.					

SECTION E: Fourth Industrial Revolution (4IR)- Knowledge

5 Indicate your agreement with the following statements:

Key	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
5.1	I know what the Fourth Industrial Revolution is.					
5.2	I know how 4IR will impact my career and job in the accounting field.					
5.3	The change of accounting from manual to digital system might negatively affect financial accounting jobs and employment in the future.					
5.4	I know what is meant by big data, artificial intelligence and Internet of things (IoT)					
5.5	I know why I need to pay attention to 4IR.					

7. APPENDIX G – LANGUAGE EDITOR'S LETTER

ETHEL ROSS

English language editing and proofreading

10 November 2022

To whomever it may concern:

This letter serves to confirm that I worked as the proofreader and language editor on Welcome Siphiwe Cele's Master's thesis:

The applicability of Accounting Information Systems for the Financial Accounting curriculum in the Fourth Industrial Revolution era: A case study at the Durban University of Technology (DUT).

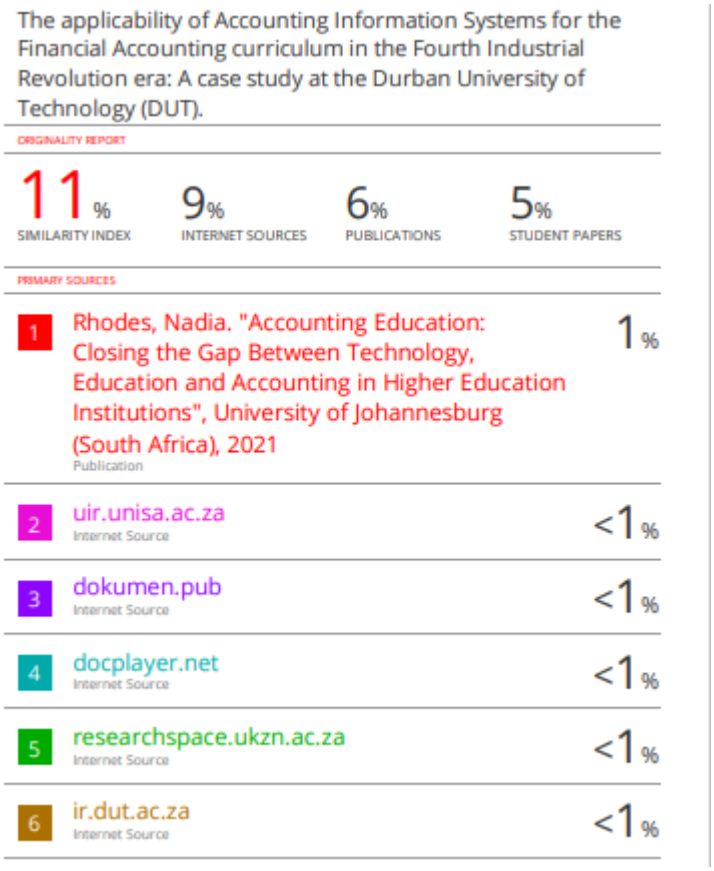
In no way did I change the content.

Yours faithfully

Ethel Ross (BA Hons; H Dip Ed)

Email: clahross1@icon.co.za Tel: 083 954 5412

8. APPENDIX H – TURNITIN REPORT



The applicability of Accounting Information Systems for the Financial Accounting curriculum in the Fourth Industrial Revolution era: A case study at the Durban University of Technology (DUT).

ORIGINALITY REPORT

11%	9%	6%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Rhodes, Nadia. "Accounting Education: Closing the Gap Between Technology, Education and Accounting in Higher Education Institutions", University of Johannesburg (South Africa), 2021 Publication	1%
2	uir.unisa.ac.za Internet Source	<1%
3	dokumen.pub Internet Source	<1%
4	docplayer.net Internet Source	<1%
5	researchspace.ukzn.ac.za Internet Source	<1%
6	ir.dut.ac.za Internet Source	<1%