Gordon Institute of Business Science
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The factors influencing the level of 21st-century digital skills of the knowledge worker: A study of the accounting profession in South Africa

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ABSTRACT

The 21st-century digital skills (21st-CDSs) have emerged as the cornerstone of success and competitiveness for knowledge workers, playing a pivotal role in the growth and sustainability of organisations. Understanding the levels of digital skills and the factors influencing their variations is paramount. However, a research gap exists concerning the levels and determinants of 21st-CDSs in developing economies, particularly in professions such as accounting. South Africa's dynamic market presents a unique context for such an investigation. This study addresses this by adopting a quantitative approach that collected data from 121 accountants across diverse South African sectors and analysed through descriptive statistics, correlation analysis, and multiple regression analysis. The findings of this study reveal significant disparities in the levels of 21st-CDSs among accountants, underlining the importance of targeted skill development efforts. Furthermore, the research uncovers that different factors exert distinct effects on various digital skills, emphasising the need for a tailored approach to enhance each skill. This insight into the nuanced interplay between factors and digital skill levels is essential for organisations and policymakers, offering a roadmap for effectively nurturing digital proficiency within the accounting profession and contributing to the broader competitiveness of South African businesses in the modern economy.

KEYWORDS

21st-century digital skills (21st-CDSs), technology changes, factors, knowledge worker, and the accounting profession.

DECLARATIONS

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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1. CHAPTER 1: INTRODUCTION TO THE RESEARCH PROBLEM

1.1. Background

The future of work has become an essential subject of discussion among economists, futurists, and business executives arising from recent significant advancements in technologies like machine learning, genetics, artificial intelligence, nanotechnology, robots, 3D printing, and biotechnology and, in particular, the extent to which these technologies may replace, change, or generate new occupations (Arntz et al., 2017; Frey & Osborne, 2017). Many recent media articles and academic papers anticipated widespread technology disruption that might fully replace a particular type of employment, and others contend that technological progress could stimulate entrepreneurship, extra high-quality creative work, and increased social freedom (Schwab, 2017; Susskind & Susskind, 2015).

According to Brynjolfsson and McAfee (2011), the flood of new technologies has prompted speculation over whether machines and algorithms may render human labour redundant (Brynjolfsson & Mcafee, 2011). This argument has been triggered by a current spate of "future of work" research, which claims that up to half of the US workers could be highly susceptible to automation in the coming years (Frey & Osborne, 2017). Frey & Osborne (2017) study found that many jobs are highly vulnerable to computerisation. According to Arntz et al. (2017), the current technological innovations are leading to the fourth industrial revolution (4IR). This term describes the current era of fast and radical technological change that affects all aspects of human life. It is marked by merging physical, digital, and biological realms, powered by innovations in AI, robotics, biotech, nanotech, and quantum computing (Schwab, 2016). Manufacturing firms have been implementing 4IR technologies, for instance, cyber-physical systems, intelligent factories, and the Internet of Things. On the other hand, service firms have been using cloud computing platforms, big data analytics tools, online marketplaces, and web-based store systems.

Arntz et al. (2017) assert that existing studies have different views regarding the impact of 4IR technology replacing workers in routine tasks. Acemoglu and Autor's (2011) review found that in many Western economies, some routine tasks in professions are decreasing (Acemoglu & Autor, 2011). However, a study of the US local labour markets found that routine tasks did not suffer employment decreases

(Autor et al., 2015), whilst Gregory et al. (2016) detailed even an increase in labour requirements for routine tasks across European regions (Gregory et al., 2016). There is evidence that industrial robots have no adverse influences on employment in developed nations (Graetz & Michaels, 2018).

Frey and Osborne (2017) compare expert opinions on how likely different jobs are to be automated with the portion of workers in those jobs in the US economy. They create different scenarios of automation based on this. They assign a high probability of automation (98%) to occupations like auditing clerks, accounting, and bookkeeping, regardless of their various tasks. However, Arntz et al. (2017) challenge this view and say that it might be too exaggerated, as many people in such jobs also do tasks that are hard for computers, such as problem-solving or persuasion. Workers are shifting more to diverse tasks that support these technologies. While some workers might lose their jobs altogether, others might require changing their tasks (Arntz et al., 2017). The net effect on employment depends on whether automation creates or destroys more jobs.

Technological advancements such as computerisation, automation, and digitalisation will impact the growth and success of professions. This requires them to be prepared for automation and digital transformation, which demands new specialised capabilities and knowledge (Gulin et al., 2019). Van Laar et al. (2017) refer to these new specialised knowledge and abilities as 21st-century digital skills (21st-CDSs). Consequently, professionals and organisations need to increase their digital maturity because less digitally mature organisations are more fragile, while more flexible organisations often have greater degrees of digital maturity (Fletcher & Griffiths, 2020). The slowed adoption of 21st-CDSs by professionals will result in the profession's demise as this might require outsourcing their tasks to other experts and countries.

1.2. Research problem

Many companies operate in the global markets characterised by intense rivalry and economic linkage, fostering partnerships in the knowledge society (Van Laar et al., 2017). The globalisation of production saw an increase in the automation or relocation of numerous jobs, particularly in manufacturing, to industrialised countries (Van Laar et al., 2017). At the heart of this dynamic creative destruction are information and communication technologies (ICTs), which are fundamental for

innovation. However, on their own, they do not form a knowledge-based economy (Voogt & Roblin, 2012). The modern workplace demands highly skilled workers who can handle progressively complex and cooperating tasks and are anticipated to efficiently sift through vast amounts of information, selecting relevant knowledge and applying it effectively in their professional and personal lives (Van Laar et al., 2017). In addition to technical proficiency, employees also require adaptable abilities to meet the shifting requirements of their jobs.

To enter the workforce, people must have the 21st-CDSs because knowledge has become essential in this century (Van Laar et al., 2017). The abilities referred to as 21st-CDSs denote that they are more closely tied to recent social and economic events than those from the previous century (Van Laar et al., 2017). The growth of the worldwide knowledge association and the quick adoption of ICT makes it crucial to improve the 21st-CDSs required for work and societal involvement. These tendencies need more effort to identify and obtain the competencies people require to participate actively and efficiently in the information community (Van Laar et al., 2017). The competences are essential for individuals and businesses to remain relevant with trends and develop breakthrough products and systems (Lewin & McNicol, 2015).

Understanding the skill set and the factors influencing them has ramifications for developing skill improvement plans. Every 21st-CDS requires a different approach to be developed. Designing effective initiatives requires a knowledge of the aspects that influence skill enhancement at the individual worker level (Van Laar et al., 2019). Many studies that assess digital skills fall short of capturing the full array of skills suggested by frameworks for 21st-century skills, and only rare methodologies integrate digital and 21st-century skills (Van Laar et al., 2018). Over time, the models have considered the different effects of technological change on various occupations. Initially, the models focused on how technology affects workers with different skill levels. They were adjusted to account for how routine the tasks are for each job, and recently, they were updated to consider how complex the tasks are at an occupational level (Arntz et al., 2017).

Academic studies have assessed the impact of technological advancement on the employment market and created detailed models for technological change in developed countries (Caines et al., 2017; Lewin & McNicol, 2015; Van Dijk, 2005;

Van Laar et al., 2017, 2018, 2019, 2020). These studies have focused on the United States (US) and other developed countries; they hardly focus nor incorporate the developing countries. The digital divide, characterised by disproportions in access to and use of technology, has substantial consequences for education, healthcare, economic development, and social well-being (Van Deursen & Van Dijk, 2014). The differential technology adoption between developed and developing countries is influenced by multiple factors, including infrastructure, socioeconomic conditions, government policies, and cultural dynamics. The consequences of the technology gap are wide-ranging and affect various facets of society, which include education, the economy, healthcare, and social inclusion (Van Deursen & Van Dijk, 2014). It would be incorrect to assume that a study done in the US and other developed economies will be generalisable to developing countries. The literature has a knowledge gap in understanding the South African 21st-CDSs levels and the factors influencing them.

The objective of this study is to add to the understanding of the level of 21st-CDSs and the factors that influence them in South Africa's knowledge workers, with a specific focus on the accounting profession. Drucker (1959) defined knowledge workers as highly educated, autonomous, creative, and lifelong learners. They include professionals, managers, researchers, educators, consultants, and analysts. Accountants are knowledge workers who use specialised skills and knowledge to provide financial information and advice.

1.3. Purpose Statement

The focus of this research is on technical advancements and labour economics. This section aims to outline the key deliverables of the study.

Major technological expansions, for instance, robotics, artificial intelligence and machine learning, affect all areas of knowledge workers, especially the accounting profession (Truant et al., 2021; Van Laar et al., 2020). The research aimed to assess the levels of 21st-CDSs in South Africa's knowledge workers, focusing on the accounting profession. The research, furthermore, aimed to identify the elements that influence a person's skill level to comprehend disparities in the degree of these skills among workers. The research wanted to answer the question: Why are certain working professionals more proficient in 21st-CDSs than others?

Studying the levels of 21st-CDSs in South Africa is a foundation for informed decision-making, policy development, and targeted interventions to enhance digital literacy, bridge the digital divide, and enable individuals and societies to fully participate in the digital aera (Van Laar et al., 2020). Examining the levels of 21st-CDSs assesses a country's preparedness to thrive in the digital era. It contributes to identifying strengths and weaknesses in digital literacy, information literacy, and other relevant skills, providing insights into areas that require improvement. Other benefits of knowing the level are identifying skill gaps, informing education and training policies, enhancing workforce development, fostering economic growth and innovation, benchmarking progress, and baselines for monitoring progress over time.

Furthermore, SDGs 9 and 17 recognise the critical role that technological advancement plays in promoting sustainable development and addressing various social, economic, and environmental challenges. They emphasise the significance of investing in infrastructure, innovation, research, and collaboration to harness the potential of technology for sustainable development (United Nations, 2015). A better understanding of the level of 21st-CDSs contributes to efficiently allocating scarce resources.

1.4. Business Rationale

Technology is increasingly notable globally (Lee et al., 2005). The widespread adoption of ICT can bring several benefits to a country and corporates, such as economic growth, job creation, digital transformation, access to services and information, enhanced connectivity and communication, innovation and entrepreneurship, social empowerment and inclusion, international competitiveness (Cruz-Jesus et al., 1 C.E.). Businesses must modify their digital capability to thrive in the current economic environment and achieve long-term growth and profitability (Latifi et al., 2021). Most workers are always required to advance their competencies at work due to technological advancements (Oberländer et al., 2020). It is crucial for South African business organisations to know the levels of 21st-CDSs of their employees to leverage this trend to attain sustained competitive advantage. These skills are relevant for individual and organisational performance, enabling workers to adapt to changing environments, learn from feedback, generate new ideas, and work effectively with others (Binkley et al., 2012).

Furthermore, it will be necessary for corporates to know the factors that influence these levels of 21st-CDSs of their employees, as this will help them design and implement effective interventions to improve these skills. By understanding how these factors influence the levels of 21st-CDSs, corporations can tailor their interventions to their employees' specific needs and characteristics and their work environment (Voogt & Roblin, 2012). This can help them enhance the quality and productivity of their workforce and achieve long-term growth and profitability.

However, there is a lack of empirical evidence on the levels of 21st-CDSs among South African workers and the factors influencing them. This study targeted to fill this gap by conducting a survey among accounting professionals from different sectors and industries in South Africa. The results of this study provide insights for South African business organisations to enhance their human capital digital development and transformation strategies.

1.5. Academic Rationale

Significant scholarly insights have been done in the developed economies on the levels of 21st-CDSs (Caines et al., 2017; Lewin & McNicol, 2015; Oberländer et al., 2020; Van Laar et al., 2017, 2018, 2019, 2020; Voogt & Roblin, 2012); however, it is not clear if this will be generalisable to developing countries. However, there is a scarcity of empirical research in understanding the 21st-CDSs levels in developing economies like South Africa. This study addresses the knowledge gap about the 21st-CDSs levels in South Africa for knowledge workers, focusing on the accounting profession.

The study provides empirical evidence on the levels of 21st-CDSs among accountants in South Africa, a developing country that faces many challenges and opportunities in the digital era. This study contributed to the existing literature by exploring the levels of 21st-CDSs of accountants in South Africa and comparing them with those in other countries and existing studies. The study also investigated the factors that influenced the levels of 21st-CDSs of accountants in South Africa. The findings of this study have important implications for accounting education, training, and practice in South Africa and other developing countries.

1.6. Scope of the research

The scope of the study was restricted to the two constructs of 21st-CDSs levels (Van Laar et al., 2019) and factors which impact the level of 21st-CDSs of the knowledge worker (Van Dijk, 2005). Further, the research scope is limited to South African accounting professionals with no restriction to which industry they are working in.

1.7. Outline of the research

This study is organised as follows: Chapter 2 of this report presents a literature review of the most topical studies and debates regarding the two constructs of the levels of 21st-CDSs and the factors that influence levels of 21st-CDSs for knowledge workers in South Africa, focusing on the accounting profession. The definitions of the constructs, dimensions, and relationships are covered in this chapter. Chapter 3 defines the purpose of the research, established from the literature review, research questions and hypotheses were developed. Chapter 4 outlines the research methodology. This chapter also discusses how the chosen methods addressed the research questions and objectives. The chapter concludes with an overview of the limitations and challenges of the selected methods. Chapter 5 presents the main findings from the data analysis on the data gathered. Chapter 6 discusses the findings from the data analysis. It connects the previous chapters' concepts, literature, theory, and results. Chapter 7 summarises the main conclusions, limitations and recommendations of the study.

1.8. Conclusion

The research problem was introduced in Chapter 1, supported by the literature on 21st-CDSs and the relevant justification in line with the identified research gaps. The research purpose of empirically investigating the relationship between the level of 21st-CDSs and the evolution of knowledge workers was justified, and the relevance both for academic and business were supported in this section. Furthermore, the scope of the study was provided, and an outline of the rest of the document, as well as the document structure, was given. The next chapter outlines the theory and literature review.

2. CHAPTER 2: LITERATURE REVIEW

2.1. Introduction to literature review

As identified in Chapter 1, the purpose of the study was to empirically investigate the association between the level of 21st-CDSs and factors influencing 21st-CDSs of the knowledge worker in South Africa, focusing on the accounting profession. The subsequent literature review aims to synthesise and conceptualise the existing literature on 21st-CDSs of knowledge workers, focusing on the South African accounting profession. It will illustrate the theoretical underpinnings of the study and offer an understanding of the contemporary ideas, hypotheses, and debates utilised to frame the research questions. Chapter 2 reviews the literature, emphasising defining the constructs and determining their dimensions in keeping with the goal. The research hypotheses are then developed and supported by the literature.

Technology, global connections, and fast knowledge creation shape today's world. Most people can be online makers of knowledge (creating information), not just information users. Creativity and social tasks are more valued in work, while robots or machines do routine or manual tasks. Educators have an important role in teaching scholars the 21st-century skills they need for work. These skills are related to content or knowledge with digital aspects (Van Laar et al., 2019). Van Laar et al. (2017) systematically reviewed 21st-CDSs literature and defined 21st-CDSs for knowledge workers. Some employees lack these skills to effectively use ICTs at work and benefit from the diverse activities and learning possibilities they provide (Van Laar et al., 2019).

The motivation for this research came from the identified necessity and difficulties of creating and utilising 21st-CDSs in modern society and the economy, where information, creativity, and collaboration are crucial success factors (Bawden, 2008; Voogt & Roblin, 2012). The research issue was also contemporary and pertinent for the South African accounting industry, which has been experiencing considerable challenges and changes because of the fast development and spread of ICT in current years. The nature and content of accounting work and the expectations and demands from various stakeholders have changed because of ICT advancements (ACCA, 2023; Jackson et al., 2023). Therefore, accounting professionals must keep developing and updating their 21st-CDSs to adapt to the ever-changing conditions and add value to their organisations and society.

2.2. 21st-CDSs trends and constructs

The phrase "21st-CDSs" denotes the knowledge and skills that enable people to utilise ICT effectively in various contexts, including employment, school, and daily life. According to Van Laar et al. (2017), 21st-CDSs comprise core and contextual abilities, further separated into two subskills, as indicated in Table 1.

Table 1: Dimensions of 21st-CDSs

Dimension	Subskill	Definition
Core	Technical	The capability to understand, operate, and control ICTs
	Information management	The capability to explore, choose, assess, and utilise information from numerous sources
	Communication	The capability to communicate appropriately and effectively with others using ICTs
	Creativity	The ability to create, express, and implement new and original ideas using ICTs
	Collaboration	The capability to work together with others using ICTs to achieve a shared objective
	Critical thinking	The capacity to analyse, synthesise, and assess information and arguments using ICTs
	Problem solving	The ability to identify, define, and solve problems using ICTs
Contextual	Ethical awareness	The ability to recognise and respect ethical principles and values when using ICTs
	Cultural awareness	The ability to appreciate and understand diverse cultures and perspectives when using ICTs
	Flexibility	The capability to adapt to changing circumstances and demands when using ICTs
	Self-direction	The capability to determine goals, plan, monitor, and evaluate one's learning and performance when using ICTs
	Lifelong learning	The ability to continuously update and improve one's knowledge and skills when using ICTs

Source: (Van Laar et al., 2017)

Van Laar et al. (2017) created the 21st-CDSs framework (Table 1) of seven core skills to meet the needs of the workforce and distinguish between the core skills (technical, collaboration, communication, problem-solving skills, critical thinking, information, and creativity) and the contextual skills (cultural awareness, self-direction, ethical awareness, lifelong learning, and flexibility). The core skills are essential for executing duties that are vital in a wide span of professions, while contextual skills are needed to benefit from the core skills, which should be linked to core skills. Employees must acquire 21st-CDSs to adapt to and succeed in this changing world (Van Laar et al., 2017). Van Laar et al. (2020) provided the factors influencing each type of the seven core 21st-CDSs to clarify which variables influenced which of these skills.

Developing 21st-CDSs is deemed essential (Bawden, 2008; Voogt & Roblin, 2012) for people to participate in the knowledge society and economy, where information, innovation, and cooperation are crucial success factors. Additionally, companies in various industries and professions are increasingly looking for 21st-CDSs as ICTs have altered both the nature of work and employee expectations (World Economic Forum, 2020).

Numerous studies demonstrate that people's levels of digital proficiency vary substantially (Cruz-Jesus et al., 1 C.E.; Lewin & McNicol, 2015; Oberländer et al., 2020; Susskind & Susskind, 2015; Van Dijk, 2005; Van Laar et al., 2017, 2018, 2019, 2020)). A study by Van Laar et al. (2019) looks at possible motivational, social, and personal variables at the individual worker level to describe variances in the degree of 21st-CDSs. Employers need individuals with superior skills; this emphasises the need to clarify why certain professionals are more proficient in 21st-CDSs than others. The findings show that the level of 21st-CDSs differs substantially. However, the results are only generally applicable to professionals working in the Netherlands' creative industries; further investigation is required to determine whether the results also apply to professionals working in other countries in the creative industries or alternative work situations (Van Laar et al., 2019). Different sectors and countries could have different requirements for specific skills.

Education was identified as the most frequently studied 21st-CDSs field (n = 27) in a rational literature review by Van Laar et al. (2017). Numerous studies made mention of education, including four research on engineering and education and 17

studies on computer science and education. The accounting sector and business management sector were the focus of a single study each. As a result, little research has been performed focusing on knowledge workers, particularly in the accounting industry. In general, the prominence is on content-related abilities, and research frequently focuses on students rather than on skills needed for the workforce (Van Laar et al., 2017).

Van Laar et al. (2019) discovered that although creative industry professionals have a reasonably high level of information management abilities, overall levels of 21st-CDSs are mediocre. This was concerning for other workers because the sample consisted of highly educated professionals, and 21st-CDSs will become more crucial for all workers across all industries. A distinct collection of determinants describes each 21st-CDS's level, and the skills examined are conditional, meaning that someone lacking in one kind of expertise is possibly lacking in another (Van Laar et al., 2019).

Furthermore, what could be identified from the literature is that the definition of digital skills is moving from a narrow technical focus to a more extensive viewpoint considering the content-related abilities. Today's workplace demands workers with the ability to gather, organise, and process information, solve issues creatively and ingeniously, and cooperate and communicate effectively (Van Laar et al., 2018).

The effect of computerisation on employment outcomes is well-documented in the literature, which demonstrates a drop in employment in routine-intensive occupations, i.e., positions mainly composed of tasks that observe clear routines and can be readily carried out by complex algorithms (Frey & Osborne, 2017). Autor and Dorn (2013) demonstrate a structural change in the employment market by showing how people are moving from middle-class manufacturing positions to low-paying service jobs because these manual jobs are less susceptible to computerisation. Problem-solving competences are becoming reasonably productive, supporting a sizable employment expansion in professions requiring intellectual tasks (Autor & Dorn, 2013). The underlying idea behind the current trend towards polarisation of the employment market is the rising employment in high-paying knowledgeable occupations and decreasing employment in low-paying physical occupations, with a hollowing-out of middle-paying repetitive tasks (Frey & Osborne, 2017).

Conflicting views of the consequences of digitalisation have been emphasised in the literature, even though empirical research has examined the state of digitalisation and its use within the accounting profession (Truant et al., 2021). According to Bhimani (2020), digitalisation has fundamentally changed the social sciences and is upending long-held assumptions, and the accounting industry is not exempt. As management accounting has access to more depth, breadth, and diversity of data, its effect on the field is expanding (Bhimani, 2020). Accountants must build new abilities and learn new information applications of digital technologies in the environment to continue delivering benefits for the firm (Gulin et al., 2019). However, no pertinent empirical investigations have been done in developing economies like South Africa.

2.3. Theory on factors impacting 21st-CDSs

The 21st-CDSs are evolving with technological changes, and the level of these skills is impacted by various factors, such as personality, psychological, demographic, socioeconomic, and organisational factors (Van Laar et al., 2018). These factors affect how workers use and apply ICTs in different contexts and domains, such as the tasks they perform in their work, education, or personal life. Some tasks may require more advanced or specialised digital skills than others, such as using digital tools for research, critical thinking, collaboration, communication, creativity, or problem-solving. The availability and affordability of the digital technologies and resources people access also impact the personal levels of 21st-CDSs (Cruz-Jesus et al., 1 C.E.; Van Deursen & Van Dijk, 2014; Van Dijk, 2020). Some digital technologies and resources may be more expensive, difficult to obtain, or require more maintenance than others, depending on the software, hardware, and data infrastructure involved. Other factors that can influence the personal levels of 21st-CDSs are the preferences and acceptance of the users themselves. Some users may prefer more or less guidance from digital technologies, depending on their confidence level, trust, and curiosity. Some users may also have ethical or legal concerns about using digital technologies, especially if they involve artificial intelligence or machine learning. Therefore, people may have different personal levels of 21st-CDSs depending on their needs, opportunities, and choices in the digital age.

Conscientiousness, openness to experiences, extraversion, agreeableness, and neuroticism illustrate personality qualities (Correa et al., 2010), that impact how employees handle stress, connect with others and express their creativity through ICTs (Koehorst et al., 2021; Van Laar et al., 2020). Aspects such as self-efficacy, motivation, attitude, and anxiety are examples of psychological elements that impact workers' feelings of comfort, interest, confidence, and positivity when utilising ICTs (Koehorst et al., 2021; Van Laar et al., 2020). The demographic factors refer to traits like age, gender, degree of education, and occupation, which influence the exposure, opportunity, and experience workers have with ICTs in their personal and professional lives (Koehorst et al., 2021; Van Laar et al., 2020). Income, social class, and internet access are examples of socioeconomic indicators of resources and supports available for ICT use in their personal and professional spheres (Koehorst et al., 2021; Van Laar et al., 2020). Elements like leadership style, job qualities, and organisational culture are considered organisational factors. These factors influence how employees can access ICTs for cooperation, creativity, and feedback (Koehorst et al., 2021; Van Laar et al., 2020). Therefore, the digital age offers different levels of 21st-CDSs to people based on their needs, opportunities, and choices.

These factors are not exhaustive, nor are they mutually exclusive. Depending on the domain and context, they may interact with each other and influence the level of 21st-CDSs in many ways. It is, therefore, vital to consider the complexity and diversity of these factors when assessing and developing 21st-CDSs for workers. The literature review was done on the factors that have been found to affect the level of 21st-CDSs of knowledge workers in general and accounting professionals.

2.3.1. Personal characteristics

Personal characteristics refer to individuals' demographic and psychological attributes that may affect their ability and motivation to acquire and use 21st-CDSs. Some of the personal characteristics that have been studied about 21st-CDSs include age, gender, personality, self-efficacy, and motivation.

The literature on 21st-CDSs frequently examines age as one of the causes. Since they were raised in a digital world, generally, it is believed that younger people are better skilled and at ease utilising ICTs than older generations (Prensky, 2001). However, empirical studies have shown mixed results regarding the relationship

between age and 21st-CDSs. Some studies have found an adverse association between age and 21st-CDSs (Van Deursen & Van Dijk, 2011, 2014), while others have found no significant relationship or even a positive relationship (Hargittai & Hsieh, 2012; Van Laar et al., 2020). These contradictory results may be explained by the interaction of age, education, work experience, and ICT exposure with other characteristics to affect the amount of 21st-CDSs.

The gender aspect has gained much attention in 21st-CDS literature. Due to social and cultural conventions and preconceptions, it is generally believed that men are more proficient and secure in utilising ICTs than women (Margolis & Fisher, 2002). However, empirical investigations on the association between gender and 21st-CDSs have also produced conflicting findings. According to several studies, men and women have significantly different levels of 21st-CDSs (Hargittai & Shafer, 2006; Van Deursen & Van Dijk, 2011), while others have found no significant difference or even a reversed difference (Hargittai & Hsieh, 2012; Van Laar et al., 2020). A possible explanation for these inconsistent findings is that gender may vary in its impact on different dimensions or subskills of 21st-CDSs.

Personality element has also been studied about 21st-CDSs. The consistent thought, feeling, and behaviour patterns that set individuals apart from one another are referred to as personalities (McCrae & Costa, 2003). The Big Five model, which consists of five dimensions (agreeableness, extraversion, conscientiousness, openness to experience, and neuroticism), is one of the most popular personality assessment tools (Goldberg, 1990). Each trait represents a spectrum of behaviours and preferences, and people can vary in how high or low they score on each dimension. Some personality dimensions in the Big Five model have been shown to influence the development of 21st-CDSs. For instance, individuals open to experience tend to have better information problem-solving skills (Brand-Gruwel et al., 2009), online communication skills, and online collaborating skills (Correa et al., 2010). More conscientious people tend to have better skills in information literacy and online etiquette (Correa et al., 2010). More extroverted people tend to have better skills in communicating online and collaborating online (Correa et al., 2010). Agreeableness is negatively associated with communicating online and collaborating online (Correa et al., 2010). Neuroticisms also tend to have a negative association with information literacy and online etiquette skills (Correa et al., 2010).

Self-efficacy has been investigated in 21st-CDSs. Self-efficacy refers to confidence in one's capability to carry out a task or achieve a specific goal (Bandura et al., 1999). Empirical studies have found that self-efficacy is positively associated with the level of 21st-CDSs. Computer self-efficacy, which is the conviction in one's capability to use computers, has been found to be positively associated with problem-solving skills (Brand-Gruwel et al., 2009), ICT literacy skills (Compeau & Higgins, 1995), and online communication skills (Eastin & LaRose, 2006). Internet self-efficacy, the conviction in one's ability to use the Internet, is positively associated with information literacy skills (Joo et al., 2000), media literacy skills (Huang & Liaw, 2005), and online collaboration skills.

Motivation is another element that has been researched regarding 21st-CDSs. The psychological mechanisms that start, guide, and maintain behaviour towards a specific goal are called motivation (Ryan & Deci, 2000). 21st-CDS level and motivation are positively correlated; for instance, it has been discovered that intrinsic motivation, the interest and enjoyment derived from a task, is positively associated with information problem-solving skills, information literacy skills, and digital content creation skills (Brand-Gruwel et al., 2009; Joo et al., 2000). Information literacy and online communication abilities have been positively connected with extrinsic motivation, the external rewards or pressures that drive behaviour (Eastin & LaRose, 2006; Joo et al., 2000).

2.3.2. Educational background

Educational background describes people's formal and informal learning experiences throughout their lives, which may impact how well they can use 21st-CDSs. The education level, field of study, ICT education, and lifelong learning are a few of the educational aspects researched about 21st-CDSs.

One of the elements that is most researched in the literature on 21st-CDSs is the educational level. Higher education levels are often linked to higher levels of 21st-CDSs because they give people more opportunities and resources to use and access ICTs for learning and growth. This premise has received substantial empirical backing, with research showing a positive correlation between educational attainment and 21st-CDSs (Van Deursen & Van Dijk, 2011, 2014; Van Laar et al., 2020). However, some studies have also suggested that the relationship between educational level and 21st-CDSs may depend on other factors, such as the quality

and relevance of education, the type and frequency of ICT use, and the individual differences among learners (Van Deursen & Van Dijk, 2019).

Another element that has been examined regarding 21st-CDSs is the field of study. According to the general presumption, distinct disciplines may call for various levels and kinds of 21st-CDSs depending on their nature and subject matter. A range of findings on the connection between the study field and the 21st-CDSs empirical investigations have been produced. According to several research, there are substantial discrepancies between the levels of 21st-CDSs in various disciplines of study (Brand-Gruwel et al., 2009; Joo et al., 2000), while others have found no significant differences or even opposite differences (Van Deursen & Van Dijk, 2011; Van Laar et al., 2020). These contradictory results could be that the field of study may interact with other factors, such as the curriculum design, pedagogical method, and ICT integration, to influence the degree of 21st-CDSs (Van Deursen & Van Dijk, 2019).

ICT education factor has been investigated for 21st-CDSs. ICT education refers to the formal and informal learning activities that aim to develop the knowledge and skills related to ICTs. Studies found a positive association between ICT education and 21st-CDSs (Brand-Gruwel et al., 2009; Joo et al., 2000; Van Laar et al., 2020). Nevertheless, some researchers have also suggested that the relationship between ICT education and 21st-CDSs may depend on the quality and effectiveness of ICT education, such as the content, duration, frequency, and mode of delivery (Van Deursen & Van Dijk, 2019).

Lifelong learning factor has been examined in 21st-CDSs. Lifelong learning refers to the continuing and self-motivated quest for knowledge and skills for personal or professional purposes. Empirical studies found that lifelong learning is positively associated with the level of 21st-CDSs (Van Deursen & Van Dijk, 2011; Van Laar et al., 2020). A possible explanation for this finding is that lifelong learning fosters a positive attitude and behaviour towards learning and development, which improves the capability and motivation to acquire and use 21st-CDSs (Van Deursen & Van Dijk, 2019).

2.3.3. Work experience

Work experience refers to the practical and professional activities that individuals have performed in their current or previous jobs that may affect their level of 21st-CDSs. Some work-related factors studied about 21st-CDSs include work sector, work role, work task, work environment, and work training.

The work sector is one of the considerations investigated in 21st-CDSs. The work sector refers to the broad category of economic activity that an organisation or an individual belongs to, such as agriculture, industry, or services. Empirical studies have shown mixed results regarding the relationship between the work sector and 21st-CDSs. Some studies found significant differences between the work sector level of 21st-CDSs (Van Deursen & Van Dijk, 2011, 2014), while others have found no significant differences or even opposite differences (Hargittai & Hsieh, 2012; Van Laar et al., 2020). A possible explanation for these inconsistent findings is that the work sector may interact with other factors, for instance, the organisational culture, the technological infrastructure, and individual characteristics, to influence the level of 21st-CDSs (Van Deursen & Van Dijk, 2019).

Work role factor has been investigated about 21st-CDSs. Work role refers to an individual's specific position or function within an organisation or a team, such as a manager, accountant, engineer, or teacher. Empirical studies have generally found a positive association between work roles and 21st-CDSs, indicating that higher-level or more complex work roles require higher levels or more diverse types of 21st-CDSs (Van Deursen & Van Dijk, 2011, 2014; Van Laar et al., 2020). However, some studies have also suggested that the relationship between work roles and 21st-CDSs may depend on the nature and content of the work role and the workers' individual preferences and abilities (Van Deursen & Van Dijk, 2019).

Work task factor has been examined about 21st-CDSs. Work task refers to an individual's specific activity or assignment as part of their work role, such as preparing a report, conducting a meeting, or solving a problem. Empirical studies have found that work task is positively associated with the level of 21st-CDSs, indicating that more frequent or more intensive use of ICTs for work tasks enhances the development and application of 21st-CDSs (Brand-Gruwel et al., 2009; Van Deursen & Van Dijk, 2011; Van Laar et al., 2020). However, some studies have also suggested that the relationship between work tasks and 21st-CDSs may depend on

the quality and diversity of the work task, as well as the feedback and support provided by the work environment (Van Deursen & Van Dijk, 2019).

21st-CDSs have been examined about the work environment factor. Work environment refers to the physical and social conditions that surround and influence an individual's work performance, such as the availability and accessibility of ICTs, the organisational culture and climate, the leadership style and support, and the team composition and collaboration. Empirical studies found that work environment is positively associated with the level of 21st-CDSs, indicating that a more conducive and supportive work environment facilitates the acquisition and use of 21st-CDSs (Brand-Gruwel et al., 2009; Joo et al., 2000; Van Laar et al., 2020). Nonetheless, some researchers have also suggested that the relationship between the work environment and 21st-CDSs may depend on the alignment and integration of the work environment with the individual goals and needs of the workers (Van Deursen & Van Dijk, 2019).

Work training factor has also been investigated about 21st-CDSs. Work training refers to the formal and informal learning opportunities provided by an organisation or a team to enhance the knowledge and skills of its workers, such as workshops, seminars, courses, mentoring, or coaching. Empirical studies found that work training is positively associated with the level of 21st-CDSs, indicating that more frequent or more effective work training improves the competence and confidence of workers in using ICTs for their work tasks (Brand-Gruwel et al., 2009; Joo et al., 2000; Van Laar et al., 2020). Nevertheless, some researchers have also suggested that the relationship between work training and 21st-CDSs may depend on the content, duration, frequency, and mode of delivery of the work training, as well as the individual differences and preferences of the workers (Van Deursen & Van Dijk, 2019).

2.3.4. Resources and Appropriation Theory

The study applies views from resources and appropriation theory as a theoretical lens to categorise factors (Van Dijk, 2005). The theory links variations in society's access to technology and allocation of resources, which individual groups and social positions describe. The study emphasises the positional category of education and the usual personal categories of age and gender (Scheerder et al., 2017). Mental, social, cultural, temporal, and material resources are among the

resources that are considered. A fundamental requirement for using skills will be the availability of material and temporal resources; without them, skills cannot be acquired. More factors that account for disparities in people's abilities are mental, cultural, and social resources (Van Laar et al., 2019).

The research has applied the Digital Divide theory, a specific application of the Resources and Appropriation theory, to the domain of ICTs. The Digital Divide theory describes the unequal distribution of ICTs in society. It refers to the discrepancies in both usage and access of the computers and Internet between different groups of people, such as those in developed and developing countries, those with different socioeconomic backgrounds, and those with different levels of political engagement. The theory suggests that these differences can reinforce social inequalities and create a gap in knowledge and opportunities between those with access to and use ICTs and those without (Van Deursen & Van Dijk, 2014).

Age, gender, education, work, ethnicity and location or country are the main factors that impact digital disparity in all stages. The groups that had more advantages in using digital technologies in the last 20 years were the young, the highly educated and employed, often men, the dominant ethnic groups in a country and the urban dwellers and people in developed countries. The groups that had fewer advantages were the old, the poorly educated and unemployed, often women, the marginalised ethnic groups in a country and the rural dwellers and people in developing countries. The digital gaps between these groups have increased from 1995 to 2010 (Van Dijk, 2020).

The percentage of people with no less than one device to go online and Internet access (smartphone, computer) varies significantly between developing and developed countries. In developing countries, only about 40 to 42 percent have Internet access, while in developed countries, about 70 to 98 percent have access. The world average is now 50 percent of people have Internet access. However, the difference between developing and developed countries in Internet access has grown from 29% in 2000 to 40% in 2018 (Van Dijk, 2020).

The digital divide theory, therefore, iterates that the difference in circumstance will yield different results, as such studies carried out in developed countries cannot be generalised to be the same in developing countries. Most of the literature available on the levels of 21st-CDSs and the factors influencing them were conducted in

developed countries; therefore, there is a literature gap regarding developing countries.

2.4. Knowledge workers and accounting profession

The concept of knowledge workers was created by Drucker (1959) to describe a new class of workers who use their knowledge as their primary resource for producing goods and services (Drucker, 1959). According to Drucker (1959), knowledge workers are characterised by their high level of education, autonomy, creativity, and continuous learning. Examples of knowledge workers include professionals, managers, researchers, educators, consultants, and analysts.

The accounting profession is one field classified as knowledge work, as it requires applying specialised skills and knowledge to provide financial information and advice to various stakeholders. Accounting professionals perform various tasks, including auditing, taxation, management accounting, financial reporting, corporate governance, risk management, and business consulting. The accounting profession has been significantly affected by the rapid development and diffusion of ICTs in recent decades. ICTs have enabled accounting professionals to access, process, analyse, and communicate large amounts of financial data more efficiently and effectively (Curtis & Payne, 2008). ICTs have also created new opportunities for accounting professionals to offer valuable services to their clients, for instance, business intelligence, data analytics, cybersecurity, sustainability reporting, and integrated reporting (PwC, 2017).

However, ICTs have also presented significant challenges for accounting professionals. ICTs have increased the uncertainty and complexity of the accounting environment, requiring accounting professionals to cope with changing regulations, standards, and stakeholder expectations. ICTs have also increased the competition and threats for accounting professionals, as some of their traditional tasks can be automated or outsourced to lower-cost providers or software (Brynjolfsson & McAfee, 2014; Frey & Osborne, 2017)

Therefore, accounting professionals need to improve and update their 21st-CDSs to adapt to their profession's evolving demands and challenges. Accounting professionals must possess technical, ethical, professional, digital and business skills to effectively perform their roles and be valuable to their organisations and

society. The relevant digital competencies for accounting professionals include data analysis, data visualisation, data management, data security, cloud computing, artificial intelligence, blockchain, and digital communication.

2.5. The evolution of workplace automation and its future

For the last 200 years, many people have repeated claims and predictions that new technology and automation will eliminate many middle-class jobs (Autor, 2015). Examples of these fears include a group of textile artisans who participated in the early 19th-century Luddite movement, which sought to destroy some of the machines to oppose the automation of the textile production process.

In 1964, considering the significant fears regarding joblessness and automation in the 1950s and early 1960s, President Lyndon B. Johnson appointed a "Blue-Ribbon National Commission on Technology, Automation, and Economic Progress" to investigate the period's productivity issue, especially the issue that throughput was increasing so quickly that it could outpace the demand for labour (Autor, 2015). The commission resolved that employment was not threatened by automation.

Such worries are currently regaining momentum. For instance, in their extensively talked about book, MIT researchers Erik Brynjolfsson and Andrew McAfee (2014) painted an alarming picture of the possible impact of automation on employment. They believe this is the worst period for people with ordinary skills and abilities. However, they forecast this will be the best period for workers with specialised ICT talents to generate and capture value (Autor, 2015).

There is evidence that technical development and automation that have been taking place in the past 200 years have not rendered human labour obsolete. As is often intended, automation does replace labour; however, automation works in conjunction with labour, increase output in ways that increase labour demand, and interacts with changes in the working force. Technology advancements do change the types of jobs that are accessible and the remuneration for those professions (Autor, 2015). Thus, the requirement is to comprehend the level and the factors that impact the 21st-CDSs.

2.6. Conclusion

The literature review examined the factors influencing the level of 21st-CDSs of the knowledge workers in the accounting profession in South Africa. The review has shown that various individual, organisational, and environmental factors impact the expansion and utilisation of digital skills amongst accountants. These influences include personal characteristics, motivation, attitudes, self-efficacy, learning styles, training, support, culture, leadership, infrastructure, policies, regulations, standards, and market demands. The review has also identified some benefits and challenges of digital skills for accountants, such as improved efficiency, quality, innovation, collaboration, communication, decision-making, competitiveness, employability, ethical issues, security risks, information overload, and skill obsolescence.

However, the literature review has also exposed gaps and limitations in the existing research. There is a lack of empirical studies that measure and compare the level of digital skills among accountants in different contexts and sectors. There is also a scarcity of studies exploring digital skills' impact on the performance and outcomes of accountants and their clients. Furthermore, there is a need for more research that investigates the best practices and strategies for developing and enhancing digital skills among accountants in South Africa. Additionally, there is a lack of agreement and clarity on the definition and dimensions of digital skills for accountants and how they relate to other competencies and standards.

Therefore, this study proposes that there is a need for a comprehensive and valid framework or model that defines and measures the level of digital skills for knowledge workers (such as accounting professionals) in an emerging economy (for instance, South Africa), as the literature review identified the knowledge gap in this area. There is a need for more practical research that identifies and evaluates the effective methods and interventions for developing and improving digital skills among accountants in South Africa. Furthermore, there is a need for more collaborative research that involves multiple stakeholders and perspectives in solving the challenges and issues related to digital skills for accountants in South Africa.

The main research question of this study is: “What are the factors influencing the level of 21st-CDSs of the knowledge workers in the accounting profession in South Africa?” The literature review has provided a synopsis of the existing knowledge

and research on this topic. However, it has also revealed many unanswered questions and unresolved problems that require further investigation. Therefore, this study aimed to fill some of these gaps by conducting quantitative research methods for data collection and analysis. The study contributes to advancing theory and practice in accounting education and profession in South Africa.

The theoretical and empirical literature also informs the research topic on 21st-CDSs, which has emerged as a multidisciplinary and evolving area of investigation in the past two decades. The literature has provided various definitions, frameworks, and models of 21st-CDSs and examined the factors that impact their development and use among different populations and contexts. However, the literature also has some gaps and limitations that need to be addressed, for instance, the lack of agreement and clarity on the idea and measurement of 21st-CDSs, the scarcity and inconsistency of empirical studies on 21st-CDSs among knowledge workers in general and accounting professionals, and the neglect and underrepresentation of emerging economy, for instance, South Africa in the global discourse and research on 21st-CDSs.

This chapter has given a thorough synopsis of the literature on the 21st-CDSs of knowledge workers topic, focusing on the South African accounting profession. The main concepts, theories, and models related to the study topic have been discussed in this chapter, as well as the gaps and limitations in the current knowledge base. The literature review chapter informed the formulation of research questions and hypotheses. The research questions and hypotheses are outlined and described in the next chapter.

3. CHAPTER 3: RESEARCH QUESTIONS

3.1. The purpose of the research

The research aimed to assess the levels of 21st-CDSs in South Africa's knowledge workers, focusing on the accounting profession. The research, furthermore, aimed to identify the elements that influence a person's skill level to comprehend disparities in the degree of these skills among workers. The research answers the question: Why are certain working accounting professionals more proficient in 21st-CDSs than others?

To achieve its goal, this research was designed around two research questions. Research Question 1 explores the level of 21st-CDSs of knowledge professionals working within the accounting profession in South Africa. Research Question 2 explores the factors that impact the level of 21st-CDSs of the knowledge worker.

1. *What is the level of 21st-CDSs of knowledge professionals working within the accounting profession in South Africa?*
2. *What factors impact the level of 21st-CDSs of the knowledge worker?*

Research Question 1 targeted to uncover the level of 21st-CDSs in South African accounting professionals. Van Laar et al. (2017) synthesised and conceptualised 21st-CDSs in an organised literature review geared towards the knowledge worker, identifying information, critical thinking, creativity, collaboration, communication, and problem-solving skills as essential to complete a wide range of work-related tasks. These broad skills are critical in digital contexts (Van Laar et al., 2019).

Research Question 2 aimed to identify the factors that influence the levels of 21st-CDSs in South African accounting professionals. Even though ICTs are frequently utilised at work, not all workers possess the necessary skills to benefit from the variety of activities and educational opportunities that ICTs may offer. This study aimed to pinpoint the underlying reasons for probable skill discrepancy. This will be answered by testing the hypotheses listed in paragraph 3.2 below.

3.2. Research hypotheses

The study will examine the hypotheses below adapted from Van Laar et al. (2019).
H1: Age negatively impacted the level of 21st-CDSs.

H2: Women have lower levels of 21st-CDSs than men.

H3: Perceived ease of use positively impacted the level of 21st-CDSs.

H4: ICT attitude positively impacted the level of 21st-CDSs.

H5: Level of education positively influences the level of 21st-CDSs.

H6: Personal initiative positively impacted the level of 21st-CDSs.

H7: Avoidance goal orientation negatively impacts the level of 21st-CDSs.

H8: Performance goal orientation positively impacts the level of 21st-CDSs.

H9: Learning goal orientation positively impacts the level of 21st-CDSs.

H10: Self-directed learning positively impacts the level of 21st-CDSs.

H11: ICT self-regulation contributes positively to the level of 21st-CDSs.

The conceptual framework for the study is shown in Figure 1 below.

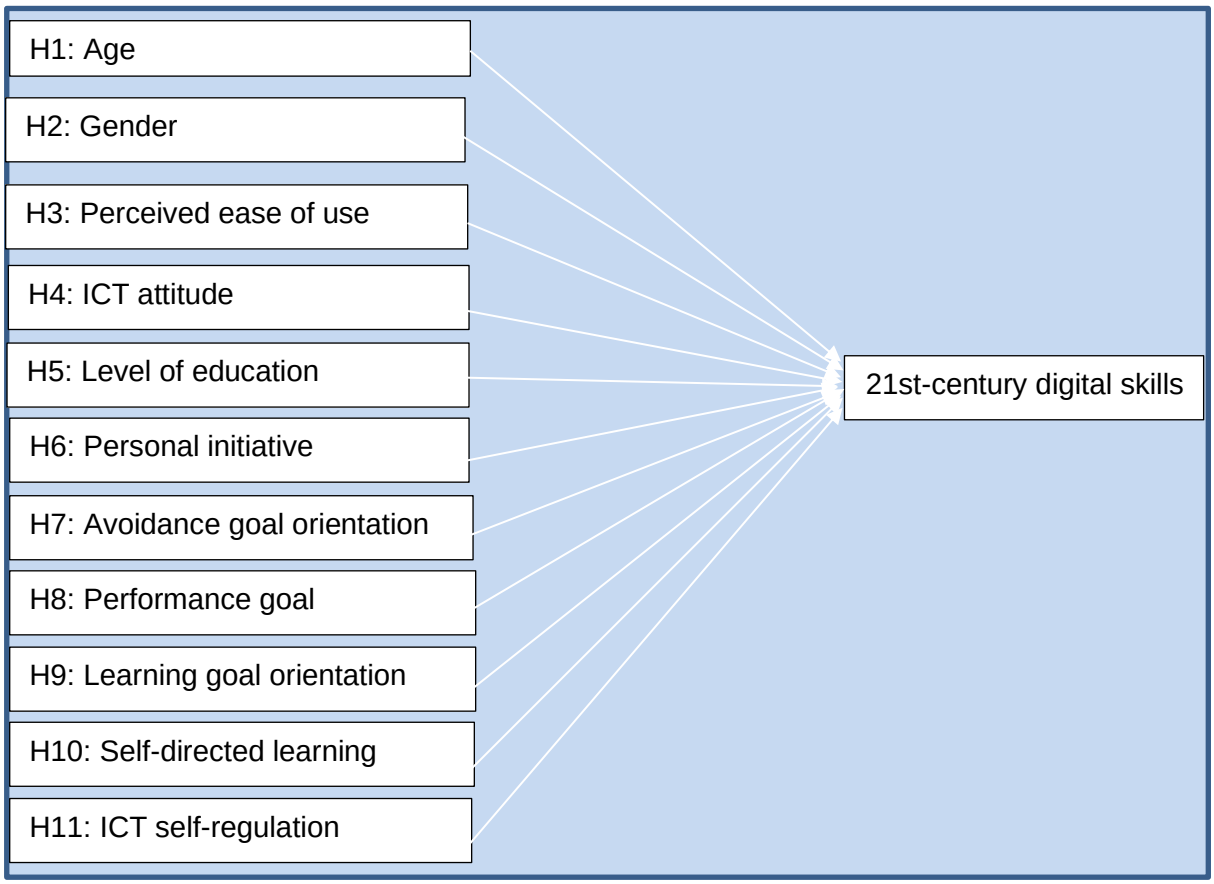

Figure 1: Conceptual model

The next chapter will explain the research methodology applied to answer the research questions and test the hypotheses.

4. CHAPTER 4: RESEARCH METHODOLOGY AND DESIGN

4.1. Introduction

This research aimed to measure the level of 21st-CDSs of knowledge workers in South Africa, focusing on the accounting profession. It also sought to identify the factors that affect a person's skill level and understand the differences in these skills among workers. The study reviewed recent literature on the future of work and predicted widespread changes in jobs across different industries. It also estimated the likelihood of the impact of job automation in the accounting profession, considering the insights from robotics, machine learning and artificial intelligence. Information, collaboration, critical thinking, communication, creativity, and problem-solving are examined as digital competences.

This chapter explains and justifies the methods utilised to respond to the research questions. This chapter also discusses the research methodology limitations.

4.2. Choice of research design

4.2.1. Philosophy

The research philosophy was based on the positivist paradigm, which assumes that reality is objective, observable, and measurable. Positivism holds that information can be derived from empirical observation and testing of hypotheses using scientific methods and that generalisable laws and principles can be discovered through deductive reasoning and hypothesis testing. The positivist paradigm was appropriate for this research because it aimed to identify the relationships between variables and tested the hypotheses using quantitative data and statistical analysis. The study aimed to test existing theories and hypotheses. The study also follows the principles of validity, reliability, and generalisability to ensure the quality and accuracy of the research findings. The study considers the social realities as genuine, and this research will be generalisable, replicable, and scientific (Büchi et al., 2020; Saunders & Lewis, 2018). Positivism also implies that there is a single truth that can be discovered through rigorous and systematic inquiry. Reality is objective and singular; thus, there are absolute truths to be discovered. The study aimed to test defined constructs being the level of 21st-CDSs and factors influencing 21st-CDSs and was based on available resources and appropriation theory. The study will be neutral, unbiased, and independent and undertaken for free. The study used a highly

structured methodology that will be replicable. The study adopts a deductive approach, where it starts from existing theories and literature to formulate hypotheses and then tests them using data collected from a large and representative sample. This followed a deductive process; thus, the study will be based on the positivism philosophy (Alharahsheh & Pius, 2020; Saunders & Lewis, 2018; Van Laar et al., 2019).

4.2.2. Approach

The deductive research approach was utilised for this study, which involves testing theory and hypothesis with data. It starts with a theory and hypothesis, which are then tested by collecting and analysing data. The research evaluated the resources and appropriation theory and the technology organisation environment framework proposition. It explained the relationships between the level of 21st-CDSs and factors that influence 21st-CDSs. A research design was developed, and data collection methods were based on the theory and hypothesis. The study used surveys and questionnaires as data collection methods to gather data from 121 participants. The research utilised a highly structured methodology that is replicable. The goal of this approach was to confirm or reject the hypothesis. The study adopted a descriptive design, taking measurements as they were without manipulating any variables. Therefore, the study followed a deductive approach suitable for quantitative methodology and tested for influences (Alharahsheh & Pius, 2020; Saunders & Lewis, 2018). The study then used statistical tests to assess the significance of relationships among variables.

4.2.3. Methodological choices

The research followed the mono method and applied a single data-gathering technique, thus, a questionnaire technique for collecting data (Büchi et al., 2020). Questionnaires are a common and widely used tool in quantitative research, as they enable the collection of standardised and comparable data from many participants in an economical and time-efficient manner. The principles that must be considered for the study to use the quantitative technique are being structured, and a substantial number of participants should be measured. This methodological choice was aligned with previous similar research (Van Laar et al., 2019). The questionnaire approach is popular because it provides highly representative data of the entire population and more generalisable data (Queirós et al., 2017).

4.2.4. Purpose of research design

The study helped to close a knowledge gap in an unexplored area in developing economies like South Africa (Frey & Osborne, 2017; Moll & Yigitbasioglu, 2019; Van Laar et al., 2019). The study accurately described the levels of 21st-CDSs and the factors that influenced the 21st-CDSs (Papadopoulos et al., 2022; Van Laar et al., 2019). This involved collecting quantifiable and measurable data using a questionnaire (Saunders & Lewis, 2018). The study evaluated the factors that influence the 21st-CDSs (independent variables) for their impact on the level of 21st-CDSs (dependent variable).

4.2.5. Strategy

The survey approach was followed for this research in collecting quantitative data in a standardised format and structured way from a sizeable population, in line with the broader adopted deductive approach and positivism philosophy (Büchi et al., 2020; Truant et al., 2021). This strategy was suitable for descriptive research (Saunders & Lewis, 2018). In line with prior studies, this was done using a Google online questionnaire tool; thus, it followed a self-completed or self-administered questionnaire technique (Büchi et al., 2020; Van Laar et al., 2019). The survey approach was cost-effective, generalisable, and easy to administrate.

4.2.6. Time horizon

This was a cross-sectional study as it was designed to collect data at one period in time from participants from multiple groups. The cross-sectional time horizon is suitable for a survey approach that describes the current situation or status of a population or a variable. This research tested the relationship between the level of 21st-CDSs among knowledge professionals working within the South African accounting profession and the factors that impacted the level of 21st-CDSs of these knowledge workers (Büchi et al., 2020; Saunders & Lewis, 2018). Previous similar studies used the cross-sectional time horizon (Van Laar et al., 2019). Although the cross-sectional time horizon does not capture changes over time, it is simple, convenient, and cost-effective.

4.3. Chosen research methodology

4.3.1. Population

The population for this research was all accounting professionals, including all accountants and Chartered Accountants, both in audit practice and corporate business. The study's targeted population was all accounting professionals in South Africa (Bouvet, 2021; Saunders & Lewis, 2018). According to Adner & Kapoor (2016), to comprehend advancement in a particular technology, it is imperative also to consider advancement in the environment in which the pivotal technology is entrenched (Adner & Kapoor, 2016); thus, this study focused on the South African accounting profession.

4.3.2. Unit of analysis

The research measured and compared the levels of 21st-CDSs among different workers in the accounting profession, as well as understanding the factors that influence their skill level. The study analysed the individual's level of 21st-CDSs; thus, the individual accounting professional was this study's unit of analysis (Bouvet, 2021; Oberländer et al., 2020). Previous studies have identified suitable professional participants in each sector (Van Laar et al., 2019).

4.3.3. Sampling method and size

The volunteer sampling method was used for this study, as the potential sample members are difficult to identify (Saunders & Lewis, 2018). Volunteer sampling is a non-probability sampling method where participants self-select or volunteer themselves to participate in a study, and it is commonly used when the researcher requires participants with specific characteristics or experiences or when it is difficult to access the population of interest. The population of accounting professionals in South Africa was unknown, so the researchers used non-probability sampling to select the participants. This was consistent with Saunders and Lewis (2018), who recommended non-probability sampling as the best option when no sampling frame is available. There is no list that contains the precise number of accountants working in South Africa; the 56 200-membership listing given by the South African Institute of Chartered Accountants (SAICA, 2022) only includes its members, and so represents a portion of all accountants working in South Africa (Bouvet, 2021; Etikan

et al., 2016). The other accounting professions, such as ACCA and CIMA, do not have South Africa membership number statistics. Collecting data from all accounting professionals was not feasible because of the limitations of time and financial constraints. Some elements of the snowballing sampling technique were also used as it was challenging to reach enough individuals in the accounting profession (Berndt, 2020; Etikan et al., 2016; Saunders & Lewis, 2018).

A Google survey link was created and circulated to over 450 potential respondents. The study targeted to reach 150 responses, 34% of the potential respondents that would have received the survey, in line with similar studies, and this will be enough data for statistical analysis (Lund, 2023; Truant et al., 2021). The study used various methods to recruit volunteers, such as online platforms, referrals, and personal networks. To ensure the appropriateness and accuracy of the data, the study rejected respondents based on their age (not allowing respondents below 18 years of age to participate), profession (accepting respondents from participants in the accounting field only), and the nation (restricting participants to South African residents only) in which they work. The online survey was conducted from 3 August 2023 to 30 September 2023 among accounting professionals working within South Africa. Data was collected from a sample of 121 South African accounting professionals who met the inclusion criteria.

This study attracted 121 participants without incentivising them, while similar studies incentivised panel members and the online survey, potentially leading to larger samples. (Van Laar et al., 2018, 2019).

4.3.4. Measurement instrument

The study followed the mono method, using a questionnaire technique for collecting data using close-ended questions (Queirós et al., 2017). The study used a questionnaire method for data gathering. The questionnaire was designed based on the existing literature on the level of 21st-CDSs and factors that influence 21st-CDSs by adapting questionnaires from previous research done by Van Laar et al. (2019) and modifying them to measure the appropriate variables aligned to this study.

A 21st-CDSs measuring tool created by Van Laar et al. (2018) was used for this study as the measuring instrument. The tool measured how frequently different skill-

associated actions connected to the 21st-CDSs criteria occurred. The evaluations of these variables were done using a five-point Likert-type scale. Frequency items are a good proxy for actual digital abilities since they are a direct signal of behaviour (Van Deursen et al., 2012). The scales ranged from 1 for "never" to 5 for "always". To measure the factors influencing the 21st-CDSs, the study adapted a questionnaire from Van Laar et al. (2019), pp. 100-102. The scales ranged from 1 for "Totally disagree" to 5 for "Totally agree".

4.3.5. Data gathering process

Following the Ethics Clearance approval on 21 July 2023, the data-gathering process began with administering the questionnaire to South African accounting professionals. The study used an online self-administered questionnaire for data gathering from South African accounting professionals. The online survey was conducted from 3 August 2023 to 30 September 2023. As demonstrated in the previous section, the questionnaire approach was the appropriate tool for gathering information related to the issue being researched (Truant et al., 2021; Van Deursen et al., 2012; Van Laar et al., 2019). The study, therefore, followed a quantitative methodology and used a questionnaire for data gathering. The questionnaire was adapted from past studies and checked if the questions were appropriate to answer the research question (Van Deursen et al., 2012; Van Laar et al., 2018, 2019). A Google online self-completed questionnaire was used to reach a large enough sample size. This required setting up the online survey tool, creating the hyperlink to the questionnaire and sending the link to potential respondents via WhatsApp, e-mail, LinkedIn, and other social media platforms. To ensure that respondents were in the accounting industries in South Africa, screening questions were used in the online survey.

Before sending out the survey, some acquaintances were requested to pre-test the questionnaire and critique the survey. The survey was adjusted based on their suggestions. They measured the time it took to complete the survey since long surveys resulted in more dropouts. Their feedback was that the survey took about 15 to 20 minutes on average to finish. Once the questionnaire was ready, it was sent by e-mail, LinkedIn, and other social media platforms to over 450 accountants. Two weeks after the surveys were distributed, a follow-up message was sent to potential responders with a hyperlink thanking those who had finished and urging

others to do the same (Saunders & Lewis, 2018).

The data was collected and stored on Google Online using Google Forms. The Google report was stored on Google Drive, and a digital excel copy (downloaded from Google Forms) was submitted to GIBS as part of the final research submission. It will be kept for at least ten (10) years. Backup files are kept on the cloud, computer, and personal drive.

4.3.6. Analysis approach

The research followed a quantitative methodology. The data gathered from the completed questionnaire was downloaded into excel. The study used IBM SPSS software to perform data analysis. This included performing descriptive statistics to summarise and present the basic features of the data, such as measuring central tendency, such as the mean, and measure of dispersion, such as range, variance, standard deviation and coefficient of variation (Truant et al., 2021; Van Laar et al., 2018, 2019; Wegner, 2020). The tool measured how frequently different skill-associated actions connected to the 21st-CDSs criteria occurred. The mean value will be a good proxy for actual digital abilities since they directly signal behaviour (Van Deursen et al., 2012). Thus, the mean value estimates the level of 21st-CDSs.

In addition to the descriptive statistics, the study also performed inferential statistics testing for prediction using regression (Saunders & Lewis, 2018; Van Laar et al., 2018, 2019; Wegner, 2020). Adner & Kapoor (2016), in a similar study, “Innovation ecosystems and the pace of Substitution: Re-examining technology S-Curves”, used regression analysis (Adner & Kapoor, 2016). Multiple linear regression was used at the 95% confidence level to test for significant factors influencing the level of 21st-CDSs (van Laar et al., 2019). Multiple linear regression is a statistical method that predicts the value of an outcome variable using several predictor variables (Wegner, 2020). Multiple linear regression aims to estimate the coefficients of each predictor variable that best fit the data and to model the linear relationship between the predictor variables and the outcome variable. Multiple linear regression also allows for hypothesis testing and confidence intervals for the coefficients, which can indicate the significance and direction of the effects of each variable on the response variable (Wegner, 2020). Multiple linear regression was chosen for this study because it can handle multiple predictor variables, account for the possible correlation among them, and provide a measure of the model's overall

fit (Van Laar et al., 2018, 2019). Multiple linear regression also has some assumptions that need to be checked before applying it, such as linearity, normality, homoscedasticity, and independence.

4.3.7. Quality controls

Quality control is essential to the research process, as it ensures the reliability and validity of the data gathered and analysed. Quality control involves checking the accuracy and consistency of the instruments used for data collection and the procedures followed for data analysis.

This study followed a quantitative methodology. Before distributing the questionnaire to the primary respondents, a pre-test was conducted on a smaller group to ensure the survey was clear, relevant, and comprehensive. The pre-test feedback assisted in making necessary revisions and improvements to the questionnaire. In ensuring reliability, the study used data-gathering methods and analysis that produced consistent findings and avoided subject error, observer error, subject bias, and observer bias (Taherdoost, 2016; Truant et al., 2021; Van Laar et al., 2018, 2019). The online tool had quality control checks that ensured all questions were answered using the “required option” in the online questionnaire.

The Cronbach’s alpha coefficient was determined for each construct in the questionnaire to measure its internal consistency and reliability. The Cronbach’s alpha coefficient is a statistic that ranges from 0 to 1 and indicates how well the items in a construct measure the same underlying concept. A higher value of Cronbach’s alpha indicates higher reliability of the construct. This study considered a Cronbach’s alpha coefficient of at least 0.65 acceptable for each construct (Bland & Altman, 1997; Brouthers et al., 2003; Taherdoost, 2016; Van Laar et al., 2019). Although reliability is essential for studies, it is inadequate without validity, which is covered below.

Eliminating any elements that pose a danger to the study's validity is essential to the design of the research strategy since doing so would invalidate the study's findings. Validity is the measurement of what is meant to be measured and includes construct, content, face, and predictive validity (Taherdoost, 2016). Internal validity means how well the link is proven and the results reflect what they are intended to assess. External validity describes how far the results may be generalised

(Saunders & Lewis, 2018). The instrument used was tested for validity and reliability using a two-fold approach. First, to investigate the factor structure, a test survey was done. Secondly, a complete survey was performed on a sample within the accounting profession to assess the reliability of their skill factors (Van Laar et al., 2018). The data collected from the questionnaire was downloaded into a spreadsheet and checked for errors or missing values. No outliers or extreme values were identified in the data. The data was also screened for any violations of the assumptions of the statistical techniques used for data analysis.

Furthermore, to increase the validity and reliability of the findings, the research used the data triangulation principle, using different data collection methods, for instance, surveys, observations, and document analysis, to get a complete comprehension of the factors impacting the level of 21st-CDSs of the knowledge workers in the South African accounting profession. Using multiple data sources, the researchers could confirm their findings and reduce the possibility of bias when using a single method (Saunders & Lewis, 2018).

The multiple linear regression method was utilised to test the hypotheses and identify the significant factors influencing the 21st-CDSs. The multiple linear regression analysis results were verified using various diagnostic tests, such as checking the residuals' normality, linearity, homoscedasticity, and independence and detecting multicollinearity or influential observations.

4.3.8. Limitations

The use of volunteer sampling has some drawbacks, such as the fact that participants are likely to differ from those who do not volunteer and are therefore not representative of the general population because they primarily volunteer because they have strong feelings or opinions about the research topic and find it to be necessary or exciting (Berndt, 2020; Saunders & Lewis, 2018). Furthermore, the sampling method may have low response rates, measurement errors, and social desirability bias. The study used an online survey, which might be biased towards the accounting professionals who are online; this might be a group which have high levels of 21st-CDSs.

Using surveys for research has certain limitations; one is that the data acquired is not likely to be as detailed as data gathered using other research methodologies.

The method fails to record respondents' feelings, behaviour, or emotional changes. Comprehensiveness is bound to be limited; thus, having many questions is not a good idea. It is challenging to create an excellent questionnaire (Saunders & Lewis, 2018). Furthermore, the survey's design and the answers' precision significantly influence how reliable the data is (Queirós et al., 2017).

The cross-sectional time horizon has limitations, such as the inability to capture changes or trends over time, the difficulty of establishing causal relationships, and the possibility of confounding factors. A cross-sectional time horizon suffers from selection bias, as the sample might not represent the population of interest (Taris et al., 2021).

The mono method design has the advantage of simplicity, consistency, and efficiency, as it avoids the complexity and challenges of combining different methods. However, it also has some limitations, such as the risk of bias, error, or misinterpretation due to the reliance on a single source of evidence. A mono method design does not capture the depth and breadth of the research problem or phenomenon, as it misses crucial aspects that are not measurable or observable by the chosen method. This study, which used a quantitative survey, did not reveal the respondents' underlying meanings, motivations, or emotions. Furthermore, a mono method design does not allow for triangulation and integration of different perspectives, methods, or data sources that can enhance the research's credibility, richness, and complexity (Manzoor, 2021).

This study focused on some aspects of factors affecting 21st-CDSs, focusing only on the accounting profession and providing evidence from a single country (Truant et al., 2021). Other factors that may not be measurable may be influencing accounting skills. This study limited the factors to quantifiable factors modelled with digitalisation to measure their relationship with the skills (Bouvet, 2021).

The self-reported method was employed to assess the levels of 21st-CDSs. The self-reported data might result in overstated or undervalued skills; they may not accurately reflect an individual's ability levels (Talja, 2005; Van Laar et al., 2019).

The assumption of linearity between independent variables and dependent variables indicates that if the correlations between them are not linear, the multiple regression model will be invalid at describing the association among the

independent variables and dependent variables. However, regression methods can only identify associations; they can never be sure of their truthfulness or the underlying cause of the connection (Saunders & Lewis, 2018; Wegner, 2020).

4.4. Conclusion

Chapter 4 covered methodology choices, research design, and their alignment with the academic literature on the methods utilised to perform the research. The research adopted a mono method design and followed the quantitative approach, using a survey as the instrument for data collection. The survey questions were validated by experts and pilot-tested by a small sample of respondents. The study used volunteer sampling as the sampling technique. The volunteers were recruited through online platforms, for instance, social media, email, and websites. The study followed a cross-sectional design, which collected and analysed data at a single point in time. This chapter also discussed the limitations of the chosen methodologies. The data gathered from the survey was analysed using descriptive and inferential statistics. The data analysis methods were chosen based on the data's type and level of measurement and the research questions and hypotheses. The data analysis methods included frequency distribution, mean, standard deviation, correlation, regression, ANOVA, and chi-square test. The next chapter presents the data analysis results.

5. CHAPTER 5: RESULTS

5.1. Introduction

This chapter presents the data analysis results that were conducted to answer the research question and objectives of this research. The research aimed to determine the levels of 21st-CDSs in South African highly skilled professionals, focusing on the accounting profession. The study, furthermore, aimed to identify the elements that influence a person's skill level to comprehend disparities in the degree of these skills among workers. The analysis utilised SPSS software and consisted of descriptive and inferential statistical analysis. The following sections report the results of each objective in detail and provide relevant tables and graphs to illustrate and support the findings.

5.2. Characteristics of the data set

The data was obtained using an online survey administered to 121 South African accounting professionals. Data from 121 respondents met the criteria of the accounting profession population in South Africa. The survey was attempted by 128 respondents; however, seven of the respondents could not continue with the survey as they were outside South Africa, and no further information was collected from them. The survey consisted of questions measuring the respondents' level of 21st-CDSs, the factors influencing a person's skill level and demographic characteristics. The 21st-CDSs were measured using a 5-point Likert scale that ranged from 1 (never) to 5 (always). The factors that impact a person's skill level were measured using a 5-point Likert scale that ranged from 1 (totally disagree) to 5 (totally agree). The demographic variables included gender, age, and education level. The data does not have missing values, as all questions were compulsory. The data was also checked for outliers and normality before performing the analysis.

The mean age of respondents was 39 years, with a standard deviation of 7 years. Most participants were male (54%), followed by female (46%). The respondents belonged to different professional bodies, for instance, SAICA (South African Institute of Chartered Accountants), CIMA (Chartered Institute of Management Accountants), ACCA (Association of Chartered Certified Accountants), and SAIPA (South African Institute of Professional Accountants). Table 2 illustrates the summary of the main characteristics of the sample.

Table 2: The characteristics of the sample

	N	%
Gender		
Male	65	53.7%
Female	56	46.3%
Age		
18 - 30	13	10.7%
31 - 45	85	70.2%
36 - 60	22	18.2%
60+	1	0.8%
Professional Body		
SAICA	64	52.9%
CIMA	17	14.0%
ACCA	10	8.3%
SIPA	7	5.8%
Other	10	8.3%
None	13	10.7%
Occupation Type		
Permanent contract - Paid employment	99	81.8%
Temporary contract - Paid employment	18	14.9%
Temporary agency worker	0	0.0%
Self-employed	3	2.5%
Unemployed	1	0.8%
Function Level		
Junior	33	27.3%
Mid-Level Management	58	47.9%
Senior Management	30	24.8%
Industry		
Financial services	50	41.3%
Auditing and/or accounting firm	33	27.3%
Manufacturing	10	8.3%
Retail	3	2.5%
Government and Public Sector	21	17.4%
Non-profit Organisations	2	1.7%
Other	2	1.7%

The most common occupation type among the respondents was permanent contract - paid employment (82%), followed by temporary contract - paid employment (15%), self-employed (2%), and other (1%). The respondents worked at different function levels, such as junior (27%), mid-level management (48%), and senior management (25%). The respondents also came from different industries,

such as financial services (41%), auditing (27%), manufacturing (8%), public sector (17%), retail (3%), and others (4%).

5.3. Validity and reliability testing of Construct

5.3.1. Validity

Bivariate correlation analysis was performed to assess the association between each item and the total score of its corresponding construct on the constructs that measured the accounting professionals' levels of 21st-CDSs and factors influencing these 21st-CDSs to assess the validity of the survey instrument. The correlation matrix summary of the items and the construct scores are shown in Table 3.

Table 3: Item Pearson correlation to Construct total and significant

Construct	Pearson Correlation		Significant
	Lowest	Highest	
Level - Information management	0.748	0.829	<0.001
Level - Information evaluation	0.785	0.862	<0.001
Level - Communication: expressiveness	0.826	0.886	<0.001
Level - Communication: contact-building	0.875	0.927	<0.001
Level - Communication: networking	0.791	0.876	<0.001
Level - Communication: content-sharing	0.863	0.904	<0.001
Level - Creativity	0.740	0.835	<0.001
Level - Collaboration	0.748	0.872	<0.001
Level - Critical thinking	0.597	0.835	<0.001
Level - Problem solving	0.808	0.915	<0.001
Factors - Self-directed learning	0.757	0.837	<0.001
Factors - ICT self-regulation	0.680	0.763	<0.001
Factors - ICT attitude	0.684	0.857	<0.001
Factors - Perceived ease of use	0.693	0.789	<0.001
Factors - Learning goal orientation	0.747	0.837	<0.001
Factors - Avoidance approach goal orientation	0.777	0.892	<0.001
Factors - Performance approach goal orientation	0.626	0.852	<0.001
Factors - Personal initiative	0.783	0.889	<0.001

All the correlations were significant at $p < 0.01$ level (2-tailed), indicating that the

constructs were related to each other in a meaningful way (Table 3). This indicates that the items measured the same underlying concept and had high internal consistency. The correlation coefficients range, suggesting moderate to strong associations among the constructs. There was no evidence of a linear relationship for this construct in the sample data. The Bivariate correlation analysis results supported the validity of the constructs and demonstrated their relevance for measuring the level of 21st-CDSs and the factors that influence the 21st-CDSs. All variables have at least one correlation above 0.3.

5.3.2. Reliability

Table 4 provides the results of Cronbach's alpha reliability analysis of the levels of 21st-CDS and the factors influencing levels of 21st-CDS.

Table 4: Construct Cronbach's Alpha

Construct	Cronbach's Alpha
Level - Information management	0.671
Level - Information evaluation	0.770
Level - Communication: expressiveness	0.801
Level - Communication: contact-building	0.887
Level - Communication: Networking	0.930
Level - Communication: content-sharing	0.857
Level - Critical thinking	0.927
Level - Collaboration	0.951
Level - Creativity	0.885
Level - Problem solving	0.929
Factors - Self-directed learning	0.803
Factors - ICT self-regulation	0.780
Factors - ICT attitude	0.648
Factors - Perceived ease of use	0.805
Factors - Learning goal orientation	0.854
Factors - Avoidance approach goal orientation	0.869
Factors - Performance approach goal orientation	0.778
Factors - Personal initiative	0.855

A Cronbach's alpha analysis, as illustrated in Table 4, was performed utilising SPSS software to evaluate the reliability of the survey instrument. Cronbach's alpha is a measure of internal consistency, or how closely related a set of items are as a group. It ranges from 0 to 1, with higher values indicating higher reliability. A common rule of thumb is that an alpha of 0.65 or higher is acceptable for most purposes (Bland & Altman, 1997; Brouthers et al., 2003). The factors' internal consistency suggested a reliable factor solution. The range of Cronbach's alpha values was above the 0.65 threshold (Bland & Altman, 1997; Brouthers et al., 2003), signifying a high level of internal consistency.

5.4. Descriptive statistics

The descriptive statistics test was performed to obtain the central tendency and variability of the variables. The descriptive statistics test results are shown in Table 5 and Table 6 below. The table displays each variable's mean and standard deviation and the construct Cronbach's alpha. There were no missing or invalid observations for each variable.

5.4.1. Descriptive statistics: Level of 21st-CDSs

Items were graded on a 5-point Likert scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5= always. Table 5 provides the reliability, the means, and the standard deviations (SD) of the levels of 21st-CDS.

Table 5: Mean level of 21st- CDSs per construct

	Mean	SD
Level - Information management (α = 0.67)	3.95	0.71
Level - Information evaluation (α = 0.77)	3.62	0.85
Level - Communication: expressiveness (α = 0.80)	3.78	0.66
Level - Communication: contact-building (α = 0.89)	2.57	0.96
Level - Communication: networking (α = 0.93)	2.74	0.89
Level - Communication: content-sharing (α = 0.86)	2.09	0.94
Level - Collaboration (α = 0.95)	3.31	0.99
Level - Critical thinking (α = 0.93)	3.65	0.61
Level - Creativity (α = 0.89)	3.24	0.72
Level - Problem solving (α = 0.93)	3.35	0.72

The mean level per construct ranges from 2.09 to 3.95 out of 5. The detailed results per item are shown in Appendix D, Table 10.

5.4.2. Descriptive statistics: Factors impacting the level of 21st-CDSs

Items were graded on a 5-point Likert scale: 1 = totally disagree, 2 = disagree, 3 = disagree/agree, 4 = agree, 5 = totally agree. Table 6 provides the reliability, the means, and the standard deviations (SD) of the factors influencing levels of 21st-CDS.

Table 6: Mean of factor impacting the level of 21st- CDSs per construct

	Mean	SD
Factors - ICT attitude (α = 0.65)	3.73	0.80
Factors - Perceived ease of use (α = 0.81)	4.07	0.54
Factors - ICT self-regulation (α = 0.78)	3.32	0.64
Factors - Self-directed learning (α = 0.80)	3.98	0.48
Factors - Learning goal orientation (α = 0.85)	4.25	0.53
Factors - Performance approach goal orientation (α = 0.78)	3.25	0.79
Factors - Avoidance approach goal orientation (α = 0.87)	3.88	0.89
Factors - Personal initiative (α = 0.86)	3.84	0.61

The mean factor impact per construct ranges from 2.09 to 3.95 out of 5. The detailed results per item are shown in Appendix D, Table 11.

5.5. Factor analysis

The factor analysis method was applied to condense many variables into a smaller set of artificial variables that capture most of the variation in the original variables. The study sample size was 121, below the 200 threshold recommended for confirmatory factor analysis (Harrington, 2008). Exploratory factor analysis (EFA) was used to identify the underlying structure of a set of variables by grouping them into factors. An EFA was conducted on all items in the questionnaire as per the construct grouping in Table 5 and Table 6 (as well as in Table 10 and Table 11). The summary of the EFA results is shown in Table 7.

Table 7: Exploratory factor analysis summary of results

Construct	Kaiser-Meyer-Olkin	Bartlett's test of sphericity	Total variance explained: Eigenvalue 1	PCA Components extracted
Level - Information management	0.667	<0.001	62.07%	1
Level - Information evaluation	0.674	<0.001	69.35%	1
Level - Communication: expressiveness	0.669	<0.001	72.47%	1
Level - Communication: contact-building	0.727	<0.001	81.60%	1
Level - Communication: networking	0.899	<0.001	67.56%	1
Level - Communication: content-sharing	0.728	<0.001	78.00%	1
Level - Collaboration	0.912	<0.001	72.06%	1
Level - Critical thinking	0.935	<0.001	56.93%	1
Level - Creativity	0.857	<0.001	63.70%	1
Level - Problem solving	0.883	<0.001	73.90%	1
Factors - ICT attitude	0.527	<0.001	59.45%	1
Factors - Perceived ease of use	0.796	<0.001	57.34%	1
Factors - ICT self-regulation	0.766	<0.001	53.38%	1
Factors - Self-directed learning	0.785	<0.001	64.04%	1
Factors - Learning goal orientation	0.836	<0.001	63.57%	1
Factors - Performance approach goal orientation	0.750	<0.001	62.67%	1
Factors - Avoidance approach goal orientation	0.761	<0.001	71.94%	1
Factors - Personal initiative	0.799	<0.001	70.43%	1

The factor analysis was appropriate for the data, as this was confirmed by the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. The KMO values for all constructs were above 0.53, which is acceptable. Therefore, the researchers could use the factor analysis to examine the data. The researchers applied the principal component analysis to extract the factors, using the Varimax with Kaiser normalisation rotation method. They chose the number of factors to keep based on the Kaiser criterion, which only keeps factors with eigenvalues above one. The principal component analysis was appropriate, as the Bartlett's test of sphericity showed a significant result with $p<0.001$. According to this criterion, only one factor should be retained for all the constructs. There were no cross-loadings above 0.3, indicating a clear and straightforward factor structure (Stevens, 2012). The EFA results, as shown in Table 7, supported the validity of the questionnaire and provided evidence for its factorial structure.

5.6. Normality, linearity, homoscedasticity, and absence of multicollinearity tests

The linear regression model assumptions, including normality, linearity, homoscedasticity, and absence of multicollinearity, were tested using SPSS's normal PP plot, scatterplot of residuals, and Variance Inflation Factors (VIF). These tests were done for each of the dependent constructs, which are Information evaluation, Information management, Collaboration, Critical thinking, Communication: content-sharing, Communication: networking, Communication: contact-building, Communication: expressiveness, Creativity and Problem-solving. Below are the illustrative test results based on the Information management dependant construct.

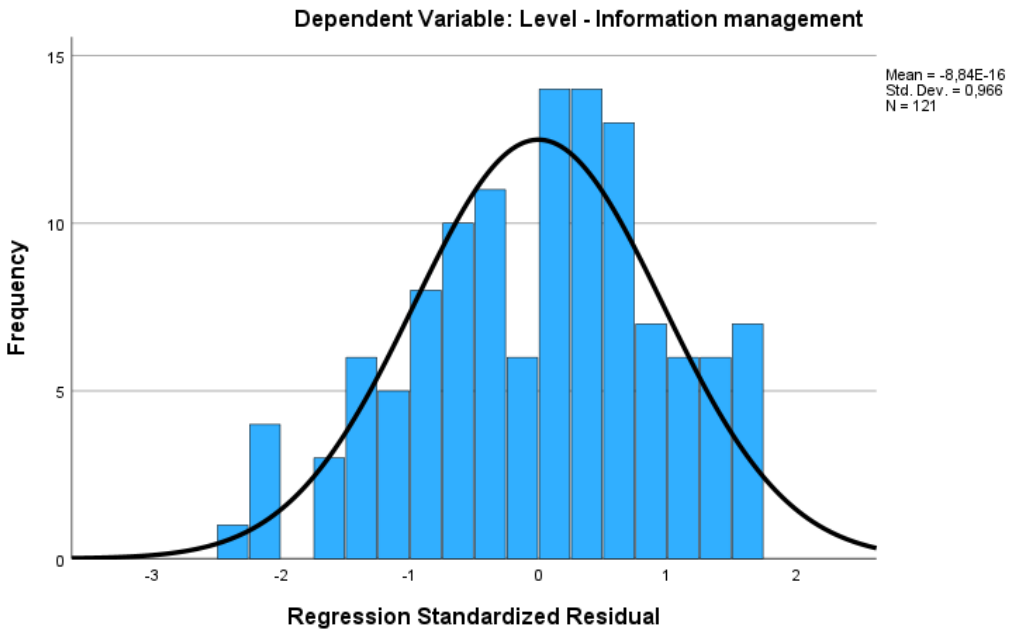

Figure 2: Histogram normal distribution

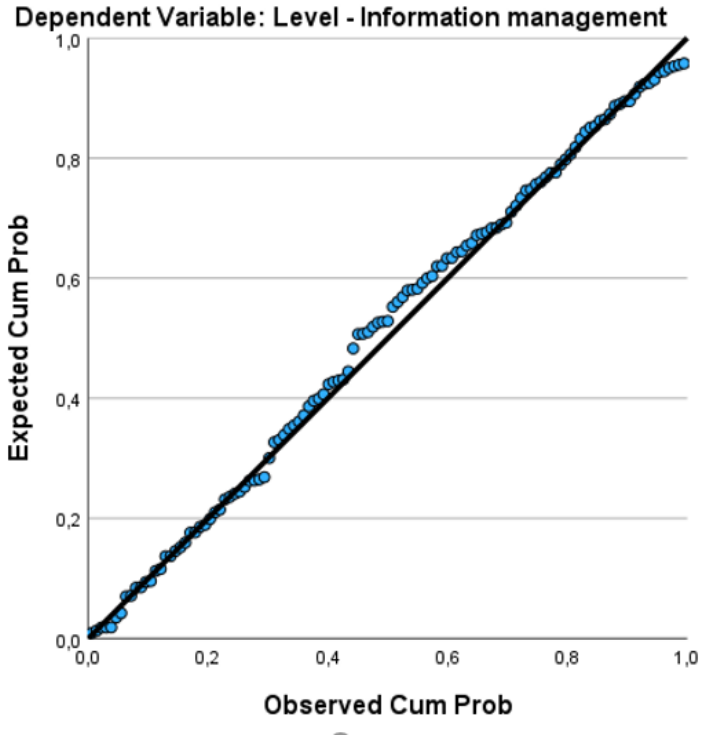

Figure 3: Normal P-P Plot of regression standardised residual

The normal P-P plot of the residuals and the histogram exhibited that they were normally distributed, as the points followed the diagonal line closely (see Figure 2 and Figure 3). Paragraph 14.2 provides further analysis results for the rest of the skills tested.

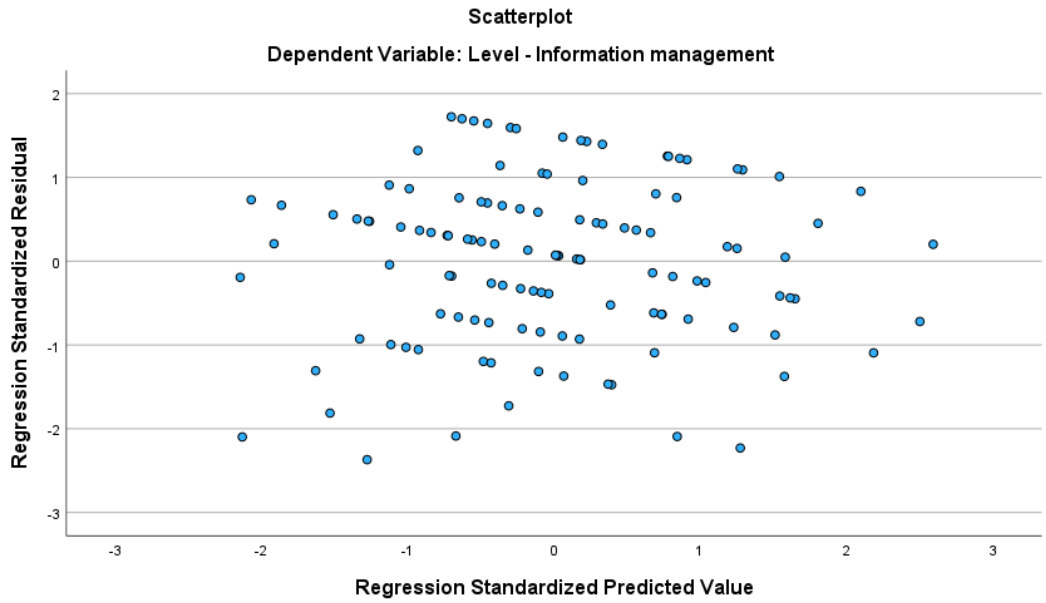

Figure 4: Scatterplot

The scatterplots of the dependent variable and each predictor variable showed a linear relationship (see Figure 4). The scatterplot of the standardised predicted values and the standardised residuals showed no apparent pattern, indicating that the residuals had constant variance at every level of the predictor variables. Paragraph 14.3 provides further analysis results for the rest of the skills tested.

Table 8: Coefficients (VIF)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1,692	,822		2,059	,042		
	Factors - ICT attitude	,045	,096	,051	,475	,636	,695	1,439
	Factors - Perceived ease of use	,262	,160	,198	1,641	,104	,554	1,805
	Factors - ICT self-regulation	,141	,142	,099	,989	,325	,808	1,237
	Factors - Self-directed learning	-,121	,178	-,082	-,680	,498	,552	1,812
	Factors - Learning goal orientation	,003	,171	,002	,019	,985	,498	2,007
	Factors - Performance approach goal orientation	,011	,089	,012	,124	,902	,822	1,217
	Factors - Avoidance approach goal orientation	,081	,090	,101	,896	,372	,634	1,576
	Factors - Personal initiative	,233	,132	,200	1,773	,079	,635	1,575

a. Dependent Variable: Level - Information management

The VIF values for each predictor variable were less than 10, suggesting no multicollinearity among them (see Table 8). The VIF values for each predictor variable in the model ranged from 1 to 2, showing some correlation among the

predictors but not severe enough to cause serious problems and require further attention. Paragraph 14.1 provides further analysis results for the rest of the skills tested.

Therefore, all the assumptions of linear regression were met. The model has no linearity issue, as the residuals are homoscedastic and have a normal distribution and equal variance.

5.7. Results of the Level of 21st-CDSs

The mean and standard deviation test was performed using SPSS software to obtain the summary measures of the central tendency and variability of the level of 21st-CDSs constructs in the data set. The mean is the average value of the construct, and the standard deviation measures how much the values vary from the mean. Figure 5 displays the mean and standard deviation of each level of the 21st-CDSs construct. The results indicate that the respondents had a moderate to high level of 21st-CDSs constructs, with mean values ranging from 2.09 to 3.95. The highest mean score was observed for information management (M = 3.95, SD = 0.71), as shown in Figure 5. The lowest mean value, also with means scores under 3, was observed for communication content-sharing (M = 2.09, SD = 0.94, followed by communication contact-building (M = 2.56, SD = 0.96) and communication networking (M = 2.74, SD = 0.89). The standard deviation values ranged from 0.61 to 0.99, indicating a moderate variation in the responses for each construct. The highest standard deviation value was observed for collaboration (0.99), followed by Communication: contact-building (0.96) and Communication: content-sharing (0.94). The lowest standard deviation value was observed for Critical thinking (0.61), followed by Communication: expressiveness (0.66) and Information management (0.71).

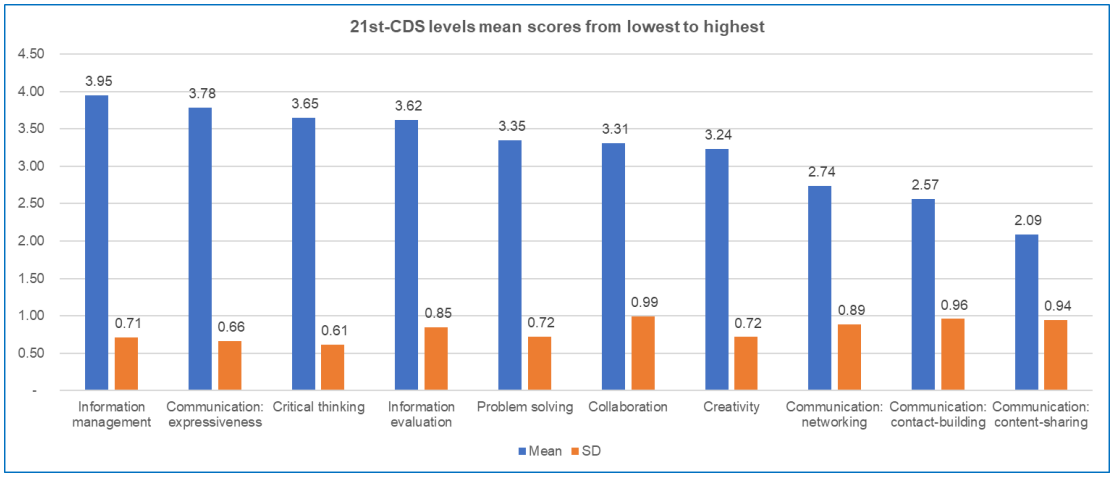

Figure 5: 21st-CDS levels mean scores from lowest to highest

5.8. Results of the factors influencing 21st-CDSs

Multiple linear regression analysis was done to examine if factors influencing 21st-CDSs significantly predicted the level of 21st-CDSs among accounting professionals in South Africa. The test was done using SPSS (IBM Statistics), and Table 9 summarises the results. The VIF values for each predictor variable in the model ranged from 1 to 2, indicating a moderate level of multicollinearity among the predictors but not enough to warrant any corrective action.

The R-squared value was used to check the fit of the multiple linear regression model, which shows how much of the variation in the dependent variable is explained by the independent variables. Table 9 shows the results for the sample. The independent variables explain the lowest proportion of variance for information management (12%) and the highest for creativity skills (25%). The findings indicate that various sets of factors individually contribute to the degree of each 21st-CDS.

Another fitness of the model performed was an ANOVA test, which tests whether the regression model is significantly better than a model with no predictors. A significant p-value (usually less than 0.05) indicates that the regression model is significantly better than the null model. Table 9 shows the results for the sample. The ANOVA test results were insignificant for only two skills dependent variables (Information management and information evaluation). The ANOVA test results for the rest of the skills had a significant p-value, which indicates that the regression model was significantly better than the null model.

The multiple linear regression model results show a moderate fit to the data used, as it explains a significant but not very large proportion of the variance in the level of 21st-CDSs among accounting professionals in South Africa.

Information management

All the predictor variables tested did not significantly predict the level of information management (21st-CDS), as the results showed $p > 0.05$ varying from 0.08 to 0.91. The multiple linear regression model results show a moderate fit to the data used, as it explains an insignificant ($p = 0.23$) and not very large proportion (12%) of the variance in the information management (21st-CDS) level among accounting professionals in South Africa. None of the 11 Hypotheses tested were supported.

Information evaluation

All the predictor variables tested did not significantly predict the level of information evaluation (21st-CDS), as the results showed $p > 0.05$ varying from 0.15 to 0.85. The multiple linear regression model results show a moderate fit to the data used, as it explains an insignificant ($p = 0.21$) and not very large proportion (12%) of the variance in the information evaluation (21st-CDS) level among accounting professionals in South Africa. None of the 11 Hypotheses tested were supported.

Communication: expressiveness

All the predictor variables tested did not significantly predict the level of Communication: expressiveness (21st-CDS), as the results showed $p > 0.05$ varying from 0.10 to 0.88. The multiple linear regression model results show a moderate fit to the data used, as it explains a significant ($p = 0.01$) but not very large proportion (19%) of the variance in the Communication: expressiveness (21st-CDS) level among accounting professionals in South Africa. None of the 11 Hypotheses tested were supported.

Table 9: Regression analysis to predict 21st-CDSs

	LIM	LIE	LCE	LCCB	LCN	LCCS	LCo	LCT	LCr	LPS
Predictor variable test										
H1: Age	0.066	-0.019	-0.088	-0.088	-0.167	-0.257*	-0.302*	-0.123	-0.208*	-0.197*
H2: Gender	-0.058	0.019	-0.142	0.271*	0.032	0.050	-0.062	0.001	-0.126	-0.161
H3: Factors - Perceived ease of use	0.179	0.126	0.134	0.090	-0.073	-0.148	0.075	0.206	0.113	0.223
H4: Factors - ICT attitude	-0.031	0.051	0.181	-0.009	0.128	-0.002	0.080	0.118	0.086	0.084
H5: Qualification	-0.093	-0.132	-0.020	-0.070	-0.119	-0.065	-0.020	-0.110	-0.046	0.005
H6: Factors - Personal initiative	0.200	-0.073	-0.041	0.041	0.112	0.057	-0.062	0.218*	0.242*	0.116
H7: Factors - Avoidance approach goal orientation	-0.126	0.107	-0.054	-0.030	0.030	-0.020	0.091	0.018	-0.042	-0.086
H8: Factors - Performance approach goal orientation	0.038	0.124	0.113	0.056	0.165	0.177	0.117	0.154	0.090	0.126
H9: Factors - Learning goal orientation	0.014	0.036	0.019	-0.114	-0.199	-0.299*	0.006	0.151	0.042	0.036
H10: Factors - Self-directed learning	-0.105	0.080	0.168	0.282*	0.227	0.266*	0.226	-0.225	0.070	-0.056
H11: Factors - ICT self-regulation	0.120	0.122	0.076	0.055	0.093	0.150	0.060	-0.076	0.076	0.040
Model fitness test										
R^2	0.117	0.120	0.193	0.160	0.159	0.218	0.234	0.224	0.252	0.197
F	1.316	1.347	2.374	1.889	1.878	2.755	3.029	2.860	3.333	2.427
Model Sig.	0.225	0.209	0.011	0.048	0.05	0.003	0.001	0.002	<.001	0.01

$*p < .05$

Table 9 summarises standardised regression coefficients. Annexure E in paragraph 13 illustrates regression results using creativity skill. LIM = Level - Information Management, LIE = Level - Information Evaluation, LCE = Level - LCT = Level - Critical Thinking, LCCS = Level - Communication content-sharing, Communication Expressiveness, LCCB = Communication Building, LCN= Level - Communication Networking, LCo = Collaboration, LCr = Creativity, LPS = Level - Problem-Solving.

Communication: contact-building

It was found that gender significantly predicted the level of Communication: contact-building (21st-CDS) (β = 0.27, p = 0.006). This means that holding other variables constant, females had a higher level of Communication contact-building than males. It was also found that Self-directed learning level significantly predicted the level of Communication: contact-building (β = 0.28, p = 0.025). This means that holding other variables constant, a higher Self-directed learning level was associated with a higher level of Communication: contact-building. The multiple linear regression model results show a moderate fit to the data used, as it explains a significant (p = 0.05) but not very large proportion (16%) of the variance in the Communication: contact-building (21st-CDS) level among accounting professionals in South Africa. Hypotheses 2 and 10 were supported, and the other 9 Hypotheses tested were not supported.

Communication: networking

All the predictor variables tested did not significantly predict the level of Communication: networking (21st-CDS) as the results showed p > 0.05 varying from 0.07 to 0.79. The multiple linear regression model results show a moderate fit to the data used, as it explains a significant (p = 0.05) but not very large proportion (16%) of the variance in the Communication: contact-building (21st-CDS) level among accounting professionals in South Africa. None of the 11 Hypotheses tested were supported.

Communication: content-sharing

Age significantly predicted the level of Communication: content-sharing (21st-CDS) (β = -0.26, p = 0.007). This means that holding other variables constant age has a negative association with the level of Communication: content-sharing. It was also found that Self-directed learning significantly predicted the level of Communication: content-sharing (β = 0.27, p = .038). This means that holding other variables constant, a higher Self-directed learning level was associated with a higher level of Communication: content-sharing. It was also found that Learning goal orientation level significantly predicted the level of Communication: content-sharing (β = -0.30, p = .015). This means that holding other variables constant, the learning goal orientation level had a negative association with the level of Communication:

content-sharing. The multiple linear regression model results show a moderate fit to the data used, as it explains a significant (p = 0.003) but not very large proportion (22%) of the variance in the Communication: content-sharing (21st-CDS) level among accounting professionals in South Africa. Hypotheses 1, 9 and 10 were supported, and the other 8 Hypotheses tested were not supported.

Collaboration

Age significantly predicted the level of collaboration (21st-CDS) (β = -0.30, p = 0.001). This means that holding other variables constant age has a negative association with the level of collaboration. The results show a moderate fit of the multiple linear regression model to the data used, as it explains a significant (p = 0.001) but not very large proportion (23%) of the variance in the collaboration (21st-CDS) level among accounting professionals in South Africa. Hypothesis 1 was supported, and the other ten hypotheses tested were not supported.

Critical thinking

It was found that Personal initiative significantly predicted the level of critical thinking (21st-CDS) (β = 0.22, p = 0.044). This means that holding other variables constant, a higher Personal initiative level was associated with a higher level of critical thinking. The results show a moderate fit of the multiple linear regression model to the data used, as it explains a significant (p = 0.002) but not very large proportion (22%) of the variance in the critical thinking (21st-CDS) level among accounting professionals in South Africa. Hypothesis 6 was supported, and the other 10 Hypotheses tested were not supported.

Creativity

Age significantly predicted the level of Creativity (21st-CDS) (β = -0.21, p = 0.024). This means that holding other variables constant, age has a negative association with the level of Creativity. It was also found that Personal initiative significantly predicted the level of Creativity (21st-CDS) (β = 0.24, p = 0.023). This means that holding other variables constant, a higher Personal initiative level was related to a higher level of Creativity. The multiple linear regression model results show a moderate fit to the data used, as it explains a significant (p = 0.001) but not very large proportion (25%) of the variance in the Creativity (21st-CDS) level among accounting professionals in South Africa. Hypotheses 1 and 10 were supported,

and the other nine hypotheses tested were not supported.

Problem solving

Age significantly predicted the level of Problem-solving (21st-CDS) (β = -0.20, p = 0.039). This means that holding other variables constant age has a negative association with the level of Problem-solving. The multiple linear regression model results show a moderate fit to the data used, as it explains a significant (p = 0.01) but not very large proportion (20%) of the variance in the Problem-solving (21st-CDS) level among accounting professionals in South Africa. Hypothesis 1 was supported, and the other 10 Hypotheses tested were not supported.

5.9. Conclusion

This chapter reported the data analysis results that were conducted to answer this study's research question and objectives. The research aimed to assess the levels of 21st-CDSs in South African highly skilled professionals, focusing on the accounting profession. The research also aimed to establish the factors that impact a person's skill level to comprehend disparities in the degree of these skills among workers. Descriptive statistics, factor analysis, correlation analysis, reliability analysis and multiple regression analysis were performed on the data using the SPSS programme.

The results indicated that the participants had a moderate to a high level of 21st-CDSs, with information management being the highest and communication content sharing being the lowest. The results also indicated that the level of 21st-CDSs observed in the accounting professionals in South Africa was generally significantly influenced by age, gender, self-directed orientation, learning goal orientation, personal initiative and education level, but not by age and work experience.

This study gave valuable insights into the current state and determinants of 21st-CDSs among accounting professionals in South Africa. The results also contributed to the existing literature on 21st-CDSs and their implications for the accounting profession. An in-depth discussion of the results is provided in the next chapter, together with some recommendations for future research.

6. DISCUSSION OF RESULTS

6.1. Introduction

The main findings of the data analysis that were conducted to answer the research question and aims of this research are discussed and evaluated in this chapter. The research aimed to assess the levels of 21st-CDSs in South Africa's knowledge workers, focusing on the accounting profession. The research also aimed to establish the elements that impact a person's skill level to comprehend disparities in the degree of these skills among workers. Descriptive statistics and inferential statistics were performed on the data using the SPSS programme. This chapter discusses the main findings and the implications of the findings.

The 21st-century economy will pose new challenges for workers, as it is influenced by global competition, the Internet, and technology. Workers need digital skills to use ICT effectively and create and share knowledge in the digital era. Knowledge workers are in high demand as they deal with information and ideas instead of services or goods (Kefela, 2010). Skills are also a lifelong learning process (Punie, 2007). There is extensive literature on how technology affects the job market and how it changes in different countries that are rich and developed (Caines et al., 2017; Lewin & McNicol, 2015; Van Dijk, 2005; Van Laar et al., 2017, 2018, 2019, 2020). However, most of these studies focus on the United States (US) and other similar countries, and they do not pay much attention to the countries that are poor and developing. The gap between the rich and the poor regarding access to and use of technology significantly impacts numerous aspects of life, for instance, economic growth, education, health, and social well-being (Van Deursen & Van Dijk, 2014). The reasons why some countries adopt technology faster than others are complex and depend on many factors, for instance, infrastructure, income, government policies, and culture. The effects of this gap are also diverse and affect various areas of society, for instance, the economy, education, health, and social inclusion (Van Deursen & Van Dijk, 2014). It would be incorrect to assume that a study done in the US and other developed economies will be generalisable to developing countries. The literature has a knowledge gap in understanding the South African 21st-CDSs levels and the factors influencing them. This study aimed to close this gap by offering empirical evidence to improve the understanding of these skill levels and the determinants of the levels in South Africa.

6.2. Discussion of the essential findings and the implications

6.2.1. Research Question 1

What is the level of 21st-CDSs of knowledge professionals working within the accounting profession in South Africa?

Research Question 1 aimed to establish the level of 21st-CDSs in the South African accounting professionals. The 21st-CDSs identified as essential to completing a range of job-related assignments tested in this study are information, creativity, critical thinking, collaboration, communication, and problem-solving skills (Van Laar et al., 2017, 2018, 2019). The research utilised a quantitative survey method to collect data from 121 accounting professionals working in various sectors and regions. These broad skills are critical in digital contexts (Van Laar et al., 2019).

Level of 21st-CDSs results discussion

The participants' results indicate a moderate to high level of 21st-CDSs, with mean values ranging from 2.09 to 3.95 out of 5. The highest mean score (most vital skill) was observed for information management (M = 3.95, SD = 0.71), as shown in Figure 5. The lowest mean value (weakest skill) also with means scores under 3 was observed for communication content-sharing (M = 2.09, SD = 0.94, followed by communication contact-building (M = 2.56, SD = 0.96) and communication networking (M = 2.74, SD = 0.89). This indicates that accounting professionals have some basic competence in using digital technologies for work-related tasks but also have room for improvement. Additionally, the results showed significant variations in the six skills' average scores, suggesting that the accounting professionals did not have a balanced profile of 21st-CDSs.

The findings show that the level of 21st-CDSs differs substantially; however, employees need to acquire 21st-CDSs to adapt to and succeed in this changing world (Van Laar et al., 2017). The results of workers in the accounting profession results show that their 21st-CDSs are mediocre. This is a concern, as these skills are essential for the workers in this sector. Communication is the weakest skill in the accounting profession, given that the lowest scores were observed. It is somehow expected that accounting professionals will have low scores for communication as accounting is a numbers game more than a descriptive and communicative sector. However, this poses a severe challenge as professionals must communicate and

network effectively to remain relevant in the business world (Van Laar et al., 2019). Moreover, this moderate score is also concerning for other professionals in South Africa, as this sample was mostly made up of a well-educated group, and 21st-CDSs are becoming increasingly important for all workers.

This research and the study by Van Laar et al. (2019) both aimed to measure and understand the 21st-CDSs of working professionals in different sectors and contexts. Even though the results are not exact, there are some notable similarities in the results, as both cases followed the same skill strength sequencing, starting with the strongest skill being information management and the weakest being communication content sharing (Figure 6).

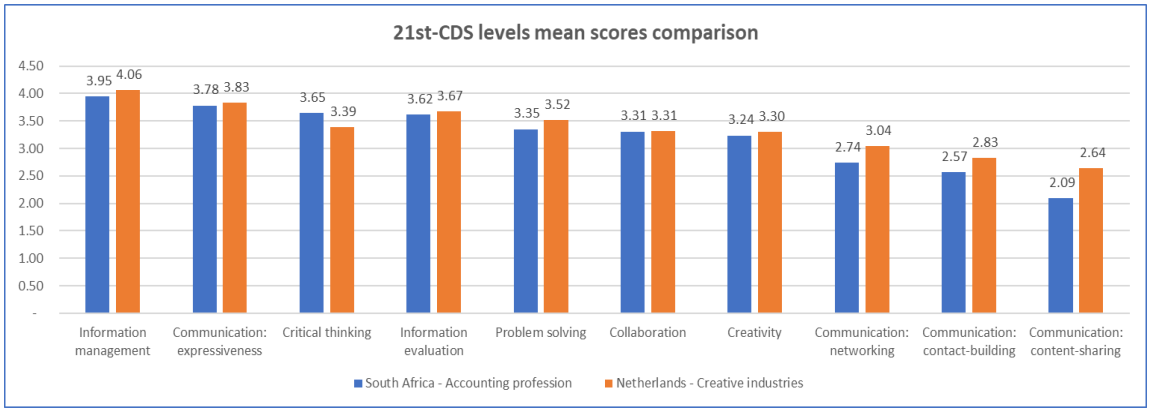

Figure 6: 21st-CDS levels comparison between South Africa - Accounting profession and the Netherlands - Creative Industries

This research and the study by Van Laar et al. (2019) aimed to measure and understand the 21st-CDSs of working professionals in different sectors and contexts using a quantitative survey method. However, the two studies have some notable differences regarding their samples. This study used a volunteer sample of 121 accounting professionals who responded to an online survey invitation. In contrast, the study by Van Laar et al. (2019) contacted potential respondents by email, and a sample of 1,222 specialists participating in creative work processes participated. Van Laar et al. (2019) compensated participants, giving members of the panel little reward for participating, and most of the respondents were given a 10 EUR reward for completing an online survey. As depicted in Figure 6, the result indicates that the South African accounting professionals achieved lower scores than those of the Netherlands Creative Industries study. South African accounting professionals achieved a higher score in only one of the skills, critical thinking.

Furthermore, this finding supports the digital divide theory (Van Dijk, 2020), which iterates that the difference in circumstance will yield different results, as such studies carried out in developed countries cannot be generalised to be the same in developing countries. These differences suggest that 21st-CDSs are not a uniform or static concept but rather a dynamic and context-specific one that requires different approaches and interventions depending on the sector, occupation, and role of the workers. Therefore, future research should consider the diversity and complexity of 21st-CDSs and explore more variables and methods to capture a more comprehensive picture of the factors influencing 21st-CDSs development.

Level of 21st-CDSs results implications

The findings of this study contribute to the literature on 21st-CDSs by providing empirical evidence from a specific occupational group in a developing country context. For practice, this research gave helpful comprehension of the 21st-CDSs for accounting professionals, employers, educators, and policymakers interested in enhancing the digital skill level of the workforce. This study suggests that accounting professionals must develop their communication, creativity, collaboration, and problem-solving skills to cope with the challenges and opportunities of the digital era.

Accounting professionals in South Africa need to build new abilities and learn new information regarding the utilisation of digital technologies to continue delivering benefits for the firm (Gulin et al., 2019). This points to research question 2 of this study, which aimed to establish the factors that influence the levels of 21st-CDSs in the South African accounting professionals.

6.2.2. Research Question 2

What factors impact the level of 21st-CDSs of the knowledge worker?

Research Question 2 aimed to establish the factors that impact the levels of 21st-CDSs in South African accounting professionals. Not all employees have the skills to use the various activities and learning opportunities that ICTs offer, even though ICTs are widely used at work. This study aimed to pinpoint the root reasons for probable skill discrepancy. The multiple linear regression analysis was utilised to evaluate the impact of the 11 independent variables: age, gender, qualification, performance-approach goal orientation, avoidance approach goal orientation, ICT self-regulation, ICT attitude, self-directed learning, perceived ease of use, learning

goal orientation, and personal initiative. The dependent variables were each of the skills as observed in Figure 5, which included information evaluation, information management, critical thinking, collaboration, communication: expressiveness, communication: content-sharing, communication: contact-building, communication: networking, creativity and problem-solving.

The results showed that variables had different effects on each of the six skills, suggesting that these variables influenced some skills more than others. The results showed that gender, age, self-directed learning, learning goal orientation and personal initiative partially had a significant impact on the 21st-CDSs score, indicating that these variables enhanced the digital skill level of the accounting professionals (Table 9). This means that higher levels of self-directed learning, learning goal orientation, and personal initiative, as well as being female and being younger, were related to higher levels of 21st-CDSs among the accounting professionals. The findings demonstrate that gender and age might predict not just essential technical skills but also skills in using digital resources. However, qualification, ICT attitude, ICT self-regulation, performance-approach goal orientation, perceived ease of use, and avoidance approach goal orientation had no significant impact on the 21st-CDSs score, indicating that these variables did not affect the digital skill level of the accounting professionals in South Africa.

Factor - Age

The multiple linear regression model results exhibited that age had a negative significant effect on the 21st-CDSs score, indicating that older respondents had lower levels of 21st-CDSs than younger respondents. Age significantly impacted collaboration, creativity, problem-solving, and communication: content-sharing. Age refers to the chronological age of the respondents, measured in years. This finding contradicts previous studies that found a positive association between age and digital skills (Heerwegh et al., 2016; Van Laar et al., 2017). These studies suggested that older people have more experience and motivation to learn and use digital technologies, especially for work-related purposes. However, this finding is consistent with other studies that have found a negative association among age and digital skills (Hargittai, 2010; Van Deursen & Van Dijk, 2015). These studies argued that younger people have more exposure and familiarity with digital technologies, especially for leisure and social purposes. They also suggested that older people

face more barriers and challenges to acquiring and updating digital skills, such as lack of access, training, support, and confidence. Therefore, age is a critical factor that impacts the South African accounting professionals' level of 21st-CDSs.

The finding that age was a significant predictor of 21st-CDSs, with younger respondents having higher levels of 21st-CDSs than older respondents, supports the existing literature that suggests that younger people have more exposure and familiarity with digital technologies, especially for leisure and social purposes skills (Hargittai, 2010; Van Deursen & Van Dijk, 2015). This finding also challenges the existing literature that suggests that older people have more experience and motivation to learn and use digital technologies, especially for work-related purposes (Heerwegh et al., 2016; Van Laar et al., 2017). This finding also implies that age is not a static or linear factor but a dynamic and nonlinear factor that changes over time and across contexts. Therefore, future research should explore the changes and variations in age differences in digital skills over time and across contexts.

This finding suggests that younger accounting professionals have more skills and readiness to use digital technologies for solving complex and novel problems. Therefore, the accounting profession should provide more opportunities and challenges for younger accounting professionals to apply their digital skills in innovative and creative ways. For the education sector, this finding suggests that older accounting students have more barriers and challenges to learning digital skills for their future careers. Therefore, the education sector should provide more access and training for older accounting students to acquire and update their digital skills.

Factor - Gender

Gender was one of the independent variables that predicted the level of 21st-CDSs of South African accounting professionals. The multiple linear regression model results showed that gender had a positive significant influence on the 21st-CDSs score, indicating that female respondents had higher levels of 21st-CDSs than male respondents. Gender had a significant impact on communication: contact-building. This finding is consistent with some earlier research that has found a positive association between gender and digital skills, especially for content-related skills, for instance, information seeking, collaboration, and communication (Heerwegh et al., 2016; Van Laar et al., 2017). These studies suggested that female users have more motivation and interest to learn and use digital technologies for various

purposes, such as education, work, health, and socialisation. They also suggested that female users have more self-efficacy and confidence in their digital skills, which may enhance their performance and satisfaction.

However, this finding contradicts other studies that have found a negative relationship between gender and digital skills, especially for technical skills such as programming, gaming, and troubleshooting (Hargittai, 2010; Van Deursen & Van Dijk, 2015). These studies argued that male users have more exposure and familiarity with digital technologies, especially for leisure and entertainment. They also argued that male users face fewer barriers and challenges to acquiring and updating digital skills, such as lack of access, training, support, and stereotypes. Therefore, gender is a critical factor that impacts the level of 21st-CDSs of the South African accounting professionals.

The finding challenges the existing literature that suggests that male users have more exposure and familiarity with digital technologies, especially for technical skills such as programming, gaming, and troubleshooting (Hargittai, 2010; Van Deursen & Van Dijk, 2015). This finding also supports the literature that suggests that female users have more motivation and interest to learn and use digital technologies for various purposes, such as education, work, health, and socialisation (Heerwegh et al., 2016; Van Laar et al., 2017).

This finding also implies that gender is not a fixed or binary factor but a dynamic and multidimensional factor that interacts with other factors such as age, culture, context, and domain. Therefore, future research should explore the nuances and complexities of gender differences in digital skills across different settings and situations. This finding suggests that female accounting professionals have more potential and readiness to adapt to the changing demands and opportunities of the digital era. Therefore, the accounting profession should recognise and reward the contributions and achievements of female accounting professionals in using digital technologies to enhance their performance and productivity. For the education sector, this finding suggests that female accounting students have more interest and confidence in learning digital skills for their future careers. Therefore, the education sector should provide more support and guidance for female accounting students in developing their digital skills and competencies.

Factor - Self-directed learning

Self-directed learning was one of the independent variables that predicted the level of 21st-CDSs of the South African accounting professionals as it had a significant impact on communication: contact-building and communication: content-sharing. Self-directed learning means the ability and willingness of learners to take charge of their education processes and outcomes, with or without the guidance of others. The multiple linear regression model results showed that self-directed learning had a positive significant impact on the 21st-CDSs score, indicating that higher levels of self-directed learning were related to higher levels of 21st-CDSs. This finding is consistent with earlier research that has emphasised the importance of self-directed learning for developing 21st-CDSs in various contexts and domains (Van Laar et al., 2018, 2019). Self-directed learning enables learners to acclimatise to changing situations, gain new skills and knowledge, and solve problems creatively. It fosters self-regulation, personal motivation, and lifelong learning, which are essential for the 21st century and beyond. The finding supports the existing literature that suggests that self-directed learning is a critical factor for developing 21st-CDSs in various contexts and domains (Van Laar et al., 2018, 2019).

This finding also implies that self-directed learning is an individual and a social factor that depends on the interaction between learners and their environment. Therefore, future research should explore how self-directed learning can be facilitated and supported by social and environmental factors, such as the feedback, guidance, or resources learners receive or access from others. For the accounting profession, this finding suggests that self-directed learning is a vital factor for accounting professionals to adapt to changing situations, acquire new knowledge and skills, and solve problems creatively and collaboratively. Therefore, the accounting profession should encourage and enable accounting professionals to participate in self-directed learning activities, for instance, setting their own learning goals, choosing their learning strategies, and evaluating their learning outcomes. For the education sector, this finding suggests that self-directed learning is a crucial skill for accounting students to prepare for their future careers. Therefore, the education sector should foster and promote self-directed learning among accounting students by giving them more autonomy, flexibility, and choice in their learning processes and outcomes.

Factor - Learning goal orientation

Learning goal orientation was another independent variable that predicted the level of 21st-CDSs of the South African accounting professionals as it had a significant impact on communication: content-sharing. Learning goal orientation concerns the motivation to learn new skills, gain knowledge, and improve one's competence (Ames & Archer, 1988; Van Laar et al., 2019). The multiple linear regression model results revealed that Learning goal orientation had a positive significant impact on the 21st-CDSs score, meaning that higher levels of learning goal orientation were related to higher levels of 21st-CDSs. This finding is consistent with previous research that has emphasised the role of learning goal orientation for developing 21st-CDSs in different contexts and domains (Ames & Archer, 1988; Chonsalasin & Khampirat, 2022; Van Laar et al., 2019). Learning goal orientation enables learners to implement a mastery-oriented method of learning, which involves seeking challenges, using effective strategies, persisting in the face of difficulties, and fostering a progressive mindset, which is the belief that one's capabilities can be enhanced through feedback and effort. These are all essential skills for the 21st century and beyond.

The finding supports the existing literature that suggests that learning goal orientation is a critical factor for developing 21st-CDSs in different contexts and domains (Ames & Archer, 1988; Chonsalasin & Khampirat, 2022; Van Laar et al., 2019). This finding also implies that learning goal orientation is not only a cognitive factor but also an affective factor that influences the enjoyment, satisfaction, and confidence that learners experience or express related to using digital technologies. Therefore, future research should explore how learning goal orientation can be influenced and enhanced by affective factors, such as the emotions, attitudes, or beliefs that learners have or develop related to using digital technologies.

For the accounting profession, this finding suggests that learning goal orientation is an essential factor for accounting professionals to adopt a mastery-oriented approach to learning, which involves seeking challenges, using effective strategies, and persisting in the face of difficulties. Therefore, the accounting profession should motivate and inspire accounting professionals to pursue learning goals that are challenging, meaningful, and relevant to their work tasks and contexts. For the education sector, this finding suggests that learning goal orientation is an essential

factor for accounting students to develop a growth mindset, which can improve one's capabilities through feedback and effort. The education sector should provide more feedback and guidance for accounting students to set and achieve learning goals that are specific, measurable, attainable, realistic, and timely.

Factor - Personal initiative

Personal initiative was another independent variable that predicted the level of 21st-CDSs of the South African accounting professionals as it had a significant impact on critical thinking and creativity. Personal initiative is a work-related attitude that makes an individual act proactively and self-directed towards their work goals and tasks and persist in overcoming difficulties and challenges (Frese & Fay, 2001). It means that they can do more than what their tasks require and that they can take the initiative (Den Hartog & Belschak, 2007; Frese et al., 1997). Multiple linear regression model results indicated a positive significant influence of personal initiative on the 21st-CDSs score, meaning that higher levels of personal initiative were related to higher levels of 21st-CDSs. The initiative concept appears intriguing, given that modern learning theories describe learning as an active process and share a core argument with the initiative idea (Hetzner et al., 2012). This finding is consistent with earlier studies that have emphasised the role of personal initiative for developing 21st-CDSs in various contexts and domains (Frese et al., 1997; Frese & Fay, 2001). Personal initiative enables individuals to adapt to changing situations, obtain recent knowledge and skills, and solve problems creatively. Moreover, it fosters personal motivation, self-regulation, and lifelong learning, which are essential for the 21st century.

The finding supports the existing literature that suggests that personal initiative is a critical factor for developing 21st-CDSs in various contexts and domains (Frese et al., 1997; Frese & Fay, 2001; Van Laar et al., 2019). This finding also implies that personal initiative is not only a behavioural factor but also a motivational factor that influences the personal motivation, self-regulation, and lifelong learning that learners have or demonstrate related to using digital technologies. Therefore, future research should explore how personal initiative could be impacted and enhanced by motivational factors, such as the intrinsic or extrinsic rewards or incentives that learners receive or expect related to using digital technologies.

This finding suggests that personal initiative is critical for accounting professionals to take a proactive approach to work goals and tasks and persevere in overcoming obstacles and disappointments. Therefore, the accounting profession should recognise and reward the contributions and achievements of accounting professionals who show personal initiative in using digital technologies to enhance their performance and productivity. For the education sector, this finding suggests that personal initiative is a crucial skill for accounting students to prepare for their future careers. Therefore, the education sector should provide more opportunities and challenges for accounting students to apply their personal initiative in innovative and creative ways.

Other factors considered

The independent variables also researched were qualification, ICT self-regulation, ICT attitude, performance-approach goal orientation, perceived ease of use, and avoidance approach goal orientation, which were not found to impact the 21st-CDSs score in this study significantly. This means that these factors did not impact the level of 21st-CDSs of South African accounting professionals. However, this finding may not be consistent with other studies that have explored the association among these factors and 21st-CDSs in different contexts and domains. This section will compare and contrast the results with existing literature on these factors.

Factor - Qualification

Qualification refers to the education level or training attained by a person. The study targeted accounting professionals who, based on the results, most of the participants had at least a first degree, while the majority had a degree and a professional qualification. Thus, the sample was from a well-educated population. One might expect higher qualifications to be associated with higher 21st-CDSs, as more education or training could provide more opportunities to learn and use digital technologies. However, the study did not find a significant association between qualification and 21st-CDSs. This could be because qualification is a general indicator of education or training and does not necessarily reflect the specific content or quality of the learning experiences related to digital skills (Van Laar et al., 2019). Moreover, qualifications may not capture the informal or self-directed learning that accounting professionals may participate in to update their digital skills. Qualification may not accurately predict 21st-CDSs. However, some studies show

a positive correlation between qualifications and digital skills, such as Van Deursen et al. (2011), who examined the digital skills of Dutch citizens across different domains (information, communication, content creation, and safety). However, they also acknowledged that qualification was only one of the factors that influenced digital skills and that other factors, for instance, gender, age, income, and internet use, also played a role.

Factor - ICT attitude

ICT attitude refers to a person's positive or negative feelings or beliefs toward using digital technologies. The expectation might be that a positive ICT attitude would be associated with higher 21st-CDSs, as a positive attitude could motivate a person to learn and use digital technologies more frequently and effectively. However, the study did not find a significant association between ICT attitude and 21st-CDSs. This could be because ICT attitude is a subjective and affective factor and does not necessarily reflect the objective and cognitive aspects of digital skills. Moreover, ICT attitude may not account for the situational or contextual factors that impact the use of digital technologies, for instance, the availability, accessibility, affordability, and appropriateness of the technologies for different purposes and tasks. Therefore, ICT attitude may not be a sufficient or relevant predictor of 21st-CDSs. In contrast, some studies have found a positive relationship between ICT attitude and digital skills (Teo, 2009; Van Laar et al., 2019). They found that computer attitudes had a direct effect on computer self-efficacy, which in turn had an indirect effect on computer skills.

Factor - Perceived ease of use

A person’s belief about how easy or hard it is to use digital technologies is called perceived ease of use. The expectation might be that higher perceived ease of use would be related to higher 21st-CDSs, as perceived ease of use could reduce the barriers or challenges to learning and using digital technologies. However, the study did show a significant association between perceived ease of use and 21st-CDSs. This could be because perceived ease of use is a subjective and personal factor and does not necessarily reflect the actual or objective ease or difficulty of using digital technologies. Moreover, perceived ease of use may not consider the complexity or diversity of digital tasks or problems that require different levels or types of digital skills. In contrast, some studies have found a positive association

between perceived ease of use and 21st-CDSs (Van Laar et al., 2018, 2019, 2020). They found that perceived ease of use directly impacted perceived usefulness, which directly impacted behavioural intention.

Factor - ICT self-regulation

ICT self-regulation refers to the capability and willingness of a person to monitor and control his or her learning processes and outcomes related to using digital technologies. One might expect that higher ICT self-regulation would be associated with higher 21st-CDSs, as ICT self-regulation could enable a person to plan, execute, evaluate, and improve digital learning activities. However, the study did not find a significant association between ICT self-regulation and 21st-CDSs. This could be because ICT self-regulation is a metacognitive and behavioural factor and does not necessarily reflect the knowledge or skills that a person has or acquires related to using digital technologies. Moreover, ICT self-regulation may not capture the social or environmental factors that support or hinder the digital learning processes and outcomes, such as the feedback, guidance, or resources a person receives or accesses from others. In contrast, some studies have found a positive relationship between ICT self-regulation and digital skills (Van Laar et al., 2017, 2019). Van Laar et al. (2017) study revealed that digital skills, especially the ability to use and communicate information, improved significantly when applied to self-regulated learning strategies.

Factor - performance-approach goal orientation

The multiple regression analysis results showed that performance-approach goal orientation was not a significant predictor of 21st-CDSs, indicating that these skill levels were not affected by the extent to which the participants pursued favourable judgments of their competence. This finding is surprising, as performance-approach goal orientation has been found to be positively associated with academic accomplishment and motivation in previous studies (Van Laar et al., 2019, 2020). The expectation might be that higher performance approach goal orientation would be related to higher 21st-CDSs, as performance approach goal orientation could foster a mastery-oriented approach to learning, which involves seeking challenges, using effective strategies, and persisting in the face of difficulties. This finding could be because performance approach goal orientation is a cognitive and motivational factor and does not necessarily reflect the actual or potential performance or

achievement that a person demonstrates or attains when using digital technologies. Moreover, performance approach goal orientation may not account for the affective or emotional aspects of learning, such as the enjoyment, satisfaction, or confidence that a person experiences or expresses related to using digital technologies.

However, this result agrees with some recent research that did not find a significant link between how much people aimed to outperform others and their 21st-CDSs (Kim et al., 2021).

Factor - avoidance approach goal orientation

The multiple regression analysis showed that avoidance approach goal orientation was not a significant predictor of 21st-CDSs. The expectation might be that lower avoidance approach goal orientation would be associated with higher 21st-CDSs, as avoidance approach goal orientation could hinder a progressive mindset, which is the belief that one's capabilities can be enhanced through feedback and effort. This could be because avoidance approach goal orientation is a cognitive and motivational factor and does not necessarily reflect the actual or potential learning or improvement that a person achieves or seeks related to using digital technologies. Moreover, the avoidance approach goal orientation may not consider the situational or contextual factors that impact the use of digital technologies, for instance, the availability, accessibility, affordability, and appropriateness of the technologies for different purposes and tasks. In contrast, some research has found a negative association between avoidance approach goal orientation and digital skills (Van Laar et al., 2018, 2019). They found that avoidance goals had a negative effect on cognitive processes such as memory recall and problem-solving.

6.3. Conclusion

The primary purpose of this research was to investigate the level of 21st-CDSs and to identify the factors that impact the level of 21st-CDSs of the accounting professionals in South Africa. This study has provided insights into the factors that impact the level of 21st-CDSs of the South African accounting professionals. The study's results revealed that gender, age, self-directed learning, learning goal orientation, and personal initiative were significant predictors of the levels of 21st-CDSs of South African accounting professionals. This finding supports the existing literature that suggests that this is a crucial factor for developing 21st-CDSs in

various contexts and domains (Frese et al., 1997; Frese & Fay, 2001; Van Laar et al., 2019).

However, qualification, ICT self-regulation, ICT attitude, performance approach goal orientation, perceived ease of use, and avoidance approach goal orientation were not significant predictors of 21st-CDSs. The research has also discussed the implications of these findings. This suggests that these factors are not significant predictors of 21st-CDSs in the sample of accounting professionals in South Africa. However, this finding may differ from other studies that have found significant relationships between these factors and 21st-CDSs in different samples, domains, and contexts. This could be explained by the Digital Divide theory (Van Deursen & Van Dijk, 2014; Van Dijk, 2005, 2020).

The Digital Divide theory describes the unequal distribution of ICTs in society. It refers to the variances in both usage and access of the Internet and computers among different groups of people, such as those in developed and developing countries, those with different socioeconomic backgrounds, and those with different levels of political engagement. The theory suggests that these differences can reinforce social inequalities and create a gap in knowledge and opportunities among those with access to and use ICTs and those without (Van Deursen & Van Dijk, 2011, 2014; Van Dijk, 2005).

7. CONCLUSION

7.1. Introduction

The research aimed to assess the levels of 21st-CDSs in South Africa's knowledge workers, focusing on the accounting profession. The research also aimed to identify the elements that influence a person’s skill level to comprehend disparities in the degree of these skills among workers.

In order to answer the research questions, Chapter 2 provides a detailed literature review on 21st-century decision support systems (21st-CDSs) and their relevance to the accounting profession. The formulation of research questions and hypotheses is outlined in Chapter 3, while the methodology used in the research, including research design, data collection, data analysis, and ethical considerations, is explained in Chapter 4. The study's results are presented in Chapter 5, while the implications and discussion of the results are detailed in Chapter 6. Finally, Chapter 7 concludes the paper with a summary of the main findings, contributions, limitations, and suggestions for future research.

Numerous firms actively implement, install, and employ newly accepted technologies to enhance their information flow, data sharing, internal business operations and better their rivals. The capacity to adapt to shifting conditions is one of the most crucial survival strategies. The contemporary corporate climate is fiercely competitive, heavily consumer-driven, and becoming increasingly digital. Businesses and the accounting profession must adapt their operations to always match the environment around them if they want to prosper. Failure to do so will probably lead to a company's and the accounting profession's eventual demise (Bharadwaj et al., 2013). Unfortunately, that is simply the nature of business. It all comes down to taking the necessary actions to stand out from the crowd.

Developments in technology unavoidably alter information gathering and analysis for control tasks and management. With the widespread dissemination of information and cutting-edge technology tools for data gathering and analysis, there are fundamental modifications in the function of financial data. The finance functions are now dealing with difficulties and conflicts throughout organisational contexts. The execution of financial activities may be transformed by constant technological development, which presents a continual problem. Substantial data, information,

and technological advances have led to a fundamental change in accounting across many organisations (Bhimani & Willcocks, 2014).

As the accounting industry operates in a human-driven ecosystem, it is governed by "laws of nature." One of the most fundamental of these "laws" is that for a thing to survive, it must be compatible with its surroundings. Existence will depend on the capability to adapt to modifications in this habitat (Bharadwaj, 2000; Bhimani & Willcocks, 2014). It is either adapt or die in the wild, and it is the same in business and the accounting profession (Trahms et al., 2013).

7.2. Contribution of the study

The study explored the 21st-CDSs of the accounting profession in South Africa, which face gaps and challenges in learning and using these skills. These skills are crucial for the SDGs, especially those related to work, industry, inequality, consumption, and peace. The study also suggests ways to improve the 21st-CDSs of the accounting profession, considering their specific needs, opportunities, and choices. This will enhance the quality and relevance of their financial information and advice to various stakeholders, such as businesses, governments, civil society, and individuals. The study also added to the national debates on building a knowledge-based economy in South Africa, a crucial National Development Plan 2030 goal.

The accounting profession is undergoing rapid and profound changes in the 21st century, driven by the advancement and diffusion of ICT. The 21st century has brought many changes and challenges to the accounting profession, such as globalisation, digitalisation, automation, and increased competition. To meet the needs and expectations of their clients and stakeholders, accounting professionals must be able to deal with the diverse, complex, and uncertain situations that arise in the business world. Accounting professionals need a range of skills to use ICT efficiently and effectively, to work and communicate with diverse people, to analyse and create solutions for complex problems, and to add value to their clients and stakeholders in the uncertain and dynamic business environment. These competencies are often referred to as 21st-CDSs (Van Laar et al., 2017). They are made up of information skills, critical thinking skills, communication skills, creativity skills, collaboration skills, and problem-solving skills. These skills are essential for

workers in various domains and sectors, especially in the accounting profession, where ICT is pivotal in creating and disseminating information (Van Laar et al., 2017).

However, earlier research has signalled a gap between the demand for the 21st-CDSs and what is available in the accounting profession (Voogt & Roblin, 2012). This gap may negatively affect the quality and relevance of accounting services and accounting professionals' employability and career development. Understanding the current level of 21st-CDSs among accounting professionals and the factors that influence their development and enhancement is crucial.

Furthermore, academic studies have scrutinised the impact of technological advancement on the employment market and created detailed models for technological change in developed countries (Caines et al., 2017; Lewin & McNicol, 2015; Van Dijk, 2005; Van Laar et al., 2017, 2018, 2019, 2020). These studies have focused on the United States (US) and other developed countries; they hardly focus on or incorporate the developing countries. The digital divide affects economic development, education, healthcare, and social well-being, the gap between those who have and use technology and those who do not. (Van Deursen & Van Dijk, 2014). The differential technology adoption between developed and developing countries is influenced by multiple factors, including infrastructure, socioeconomic conditions, government policies, and cultural dynamics. The consequences of the technology gap are wide-ranging and affect various aspects of society, including healthcare, education, economy, and social inclusion (Van Deursen & Van Dijk, 2014). Thus, there is a need to study the level of 21st-CDSs and the factors that affect the level of 21st-CDSs of accounting professionals in a developing country. This study aimed to close this gap by investigating the level of 21st-CDSs and the factors that affect the level of 21st-CDSs of the South African accounting professionals. South Africa is a developing economy with a diverse and dynamic accounting sector that faces various social, economic, and environmental challenges. Understanding its context will close the knowledge gap, which is detailed above.

Researchers, policymakers, and practitioners have widely recognised the importance of 21st-CDSs for 21st century employees. Several studies have shown that 21st-CDSs are associated with positive outcomes such as higher productivity, employability, innovation, and lifelong learning. Moreover, 21st-CDSs are expected

to become more essential as technology advances and the nature of work changes. Despite the importance of 21st-CDSs for workforces in the 21st century, there is a shortage of empirical evidence on the level of these skills among different groups of workers and the factors that influence the level of these skills (Scheerder et al., 2017; Van Laar et al., 2017). Earlier research has focused on measuring and developing 21st-CDSs among students or young people (Voogt & Roblin, 2012) while neglecting the needs and challenges of working professionals who also require these skills to perform tasks and advance their careers. Moreover, previous studies have primarily focused on developed countries, and there is no empirical evidence on developing countries (Van Laar et al., 2018, 2019).

Therefore, there was a need for more empirical research on the level of 21st-CDSs among working professionals and the factors that influenced the level of these skills in a developing economy such as South Africa. Such research can provide valuable insights for practitioners and policymakers who aim to improve the digital capability and competitiveness of the workforce in the 21st century. This study focuses on the South African accounting profession, a vital sector contributing to the country's economic development and social welfare (Van Laar et al., 2017). Accounting professionals are expected to have high levels of 21st-CDSs as they deal with complex financial information, communicate with various stakeholders, collaborate with colleagues and clients, think critically and creatively about accounting issues, and solve problems in diverse situations. However, there was a lack of empirical data on the level of 21st-CDSs among accounting professionals in South Africa and the factors that influence their skill level. This research objectives were to examine (1) the level of 21st-CDSs among accounting professionals in South Africa and (2) the factors that affect the level of these skills.

Specific questions that the study answered

RQ1: What is the level of 21st-CDSs among accounting professionals in South Africa?

RQ2: What factors influence the level of 21st-CDSs among accounting professionals in South Africa?

How these questions were answered

A survey was conducted among accounting professionals who work in different sectors and organisations in South Africa to answer these research questions. The study used a validated tool Van Laar et al. (2018) created to measure six types of 21st-CDSs: information, critical thinking, creativity, collaboration, communication, and problem-solving skills. It also collected data on various demographic, socioeconomic, psychological, and contextual factors that may affect the level of these skills. We performed descriptive statistics and multiple regression analyses to analyse the data and test our hypotheses.

7.3. Principal findings: Level of 21st-CDSs

7.3.1. Findings regarding the level of 21st-CDSs

The participants' results indicate a moderate to high level of 21st-CDSs, with mean values ranging from 2.09 to 3.95 out of 5. The highest mean score (strongest skill) was observed for information management (M = 3.95, SD = 0.71), as shown in Figure 5. The lowest mean value (weakest skill) with a means score under 3 was observed for communication content-sharing (M = 2.09, SD = 0.94). This indicates that accounting professionals have some basic competence in using digital technologies for work-related tasks but also have room for improvement. The results also exposed considerable variations in the mean scores of the six skills, suggesting that the accounting professionals did not have a balanced profile of 21st-CDSs. The findings show that the level of 21st-CDSs differs substantially; however, employees need to acquire 21st-CDSs to adapt to and succeed in this changing world (Van Laar et al., 2017). The results show that the 21st-CDSs of the workers in the accounting profession are mediocre. This is a concern, as these skills are essential for the workers in this sector. Communication is the weakest skill in the accounting profession, given that the lowest scores were observed. However, this poses a severe challenge as professionals must communicate and network effectively to remain relevant in the business world (Van Laar et al., 2019). Moreover, this moderate score is also concerning for other professionals in South Africa, as this sample was mostly from a well-educated group, and 21st-CDSs are becoming increasingly important for all workers.

7.3.2. Implications of the level of 21st-CDSs findings to current scholarly debate

The findings of this research add to the literature on 21st-CDSs by providing empirical evidence from a specific occupational group in a developing country context. This study examines how well accountants in South Africa, a developing country with many digital challenges and opportunities, have developed the skills needed for the 21st century. There was a lack of research on the levels of 21st-CDSs in emerging economies; therefore, this research will contribute to the existing library of knowledge on the subject. It adds to the existing literature by measuring and comparing the 21st-century digital skills (21st-CDSs) of accountants in South Africa with those in other countries and previous studies. It also explores the factors that affect the 21st-CDSs of accountants in South Africa. The results of this study have implications for how accounting education, training, and practice can be improved in South Africa and other developing countries.

7.3.3. Implications of the level of 21st-CDSs findings for business

The findings of this research have consequences for businesses in South Africa. First, the findings suggest that accounting professionals in South Africa have a moderate level of 21st-CDSs, which may not be sufficient to meet the demands and expectations of the changing business environment. Therefore, business leaders and managers need to invest more in developing and enhancing the 21st-CDSs of their accounting staff, as these skills are crucial for improving productivity, innovation, and competitiveness.

Furthermore, the findings of this research provide valuable awareness for accounting professionals, employers, educators, and policymakers concerned with enhancing the digital skill level of their workforce. This study suggests that accounting professionals must develop their communication, creativity, collaboration, and problem-solving skills to cope with the challenges and opportunities of the digital era. Accounting professionals in South Africa need to build new abilities and learn new information regarding the utilisation of digital technologies to continue delivering benefits for the firm (Gulin et al., 2019).

7.4. Principal findings: Factors influencing the level of 21st-CDSs

7.4.1. Findings regarding the factors influencing the level of 21st-CDSs

The multiple linear regression analysis was utilised to evaluate the effects of 11 independent variables: gender, age, qualification, avoidance approach goal orientation, ICT self-regulation, ICT attitude, self-directed learning, perceived ease of use, performance approach goal orientation, learning goal orientation, and personal initiative. The dependent variables were each of the skills as observed in Figure 5, which included information evaluation, information management, collaboration, critical thinking, communication: expressiveness, communication: contact-building, communication: content-sharing, communication: networking, creativity and problem-solving.

The results showed that variables had different effects on each of the six skills, suggesting that these variables influenced some skills more than others. The results showed that gender, age, self-directed learning, learning goal orientation and personal initiative partially had a significant impact on the 21st-CDSs score, indicating that these variables enhanced the digital skill level of the accounting professionals (Table 9). This means that higher levels of self-directed learning, learning goal orientation, and personal initiative, as well as being female and younger, were associated with higher levels of 21st-CDSs among accounting professionals. The results show that gender and age can predict fundamental technical and digital content skills. However, qualification, ICT self-regulation, ICT attitude, performance approach goal orientation, perceived ease of use, and avoidance approach goal orientation had no significant impact on the 21st-CDSs score, indicating that these variables did not affect the digital skill level of the accounting professionals in South Africa.

7.4.2. Implications of the factors influencing the level of 21st-CDSs findings to current scholarly debate

The results showed that gender, age, self-directed learning, learning goal orientation and personal initiative partially had a significant impact on the 21st-CDSs score (Table 9); from a theoretical perspective, this finding supports the existing literature that suggests that personal initiative is a critical factor for developing 21st-CDSs in various contexts and domains (Frese et al., 1997; Frese & Fay, 2001; Van Laar et

al., 2019). This finding also implies that personal initiative is not only a behavioural factor but also a motivational factor that influences personal motivation, self-regulation, and lifelong.

However, qualification, ICT self-regulation, ICT attitude, performance approach goal orientation, perceived ease of use, and avoidance approach goal orientation were not significant predictors of 21st-CDSs. This finding differs from other studies that have found significant relationships between these factors and 21st-CDSs in different samples, domains, and contexts. This could be explained by the Digital Divide theory (Van Deursen & Van Dijk, 2014; Van Dijk, 2005, 2020). This, therefore, contribute to the empirical knowledge that factor that influences the level of the 21st-CDSs differs depending on contexts.

7.4.3. Implications of the factors influencing the level of 21st-CDSs findings for business

Gender, age, self-directed learning, learning goal orientation and personal initiative partially had a significant impact on the 21st-CDSs score, which suggests that these skills are vital factors for accounting professionals to adapt to changing situations, acquire new knowledge and skills, and solve problems creatively and collaboratively. Therefore, the accounting profession should encourage and enable accounting professionals to participate in self-directed learning activities, for instance, setting their own learning goals, choosing their learning strategies, and evaluating their learning outcomes. For the education sector, this finding suggests that these factors are crucial for accounting students to prepare for their careers. Therefore, the education sector should foster and promote these among accounting students by giving them more autonomy, flexibility, and choice in their learning processes and outcomes.

No significant associations were found between the level of 21st-CDSs and the qualification, ICT self-regulation, ICT attitude, performance approach goal orientation, perceived ease of use, and avoidance approach goal orientation. This implies that these factors do not strongly influence the level of 21st-CDSs among accounting professionals in South Africa. Therefore, business leaders and managers need to identify and address other factors that could impact the level of 21st-CDSs among their accounting staff.

7.5. Limitations of the research

The research has some limitations that should be acknowledged. The study used volunteer sampling. The volunteers who participated in the survey may not be representative of the entire population of South African accounting professionals, as they may have different characteristics or motivations than those who did not volunteer; for example, they may have volunteered because they had strong opinions or interests in the research topic, or because they found it relevant or appealing (Berndt, 2020; Saunders & Lewis, 2018). This could introduce a selection bias that reduces the generalisability of the findings to other accounting professionals in South Africa. Furthermore, the volunteer sampling method resulted in a low response rate, with only 121 participants out of a potential population of thousands. This could lead to measurement errors and social desirability bias, as the participants may not have answered the survey questions honestly or accurately. Moreover, the response rate in this study was much lower than in similar studies conducted in developed countries, where participants were incentivised to complete the survey. Using an online survey as the data collection instrument could also introduce a bias towards accounting professionals who are more active online, which may not be a representative group of the population in terms of their 21st-CDSs.

The mono method design has the advantage of simplicity, consistency, and efficiency, as it avoids the complexity and challenges of combining different methods. However, it also has some limitations, such as the risk of bias, error, or misinterpretation due to the reliance on a single source of evidence. A mono method design does not capture the depth and breadth of the research problem or phenomenon, as it misses crucial aspects that are not measurable or observable by the chosen method. This study, which used a quantitative survey, did not reveal the respondents' underlying meanings, motivations, or emotions. Furthermore, a mono method design does not allow for triangulation and integration of different perspectives, methods, or data sources that can enhance the research's credibility, richness, and complexity (Manzoor, 2021).

Surveys are a standard research method, but they have some drawbacks that limit the quality and depth of the data collected. One of these drawbacks is that surveys cannot capture the respondents' feelings, behaviours, or emotions, which may be necessary for understanding their perspectives and experiences. Surveys also tend

to be brief and concise, meaning they cannot cover a wide range of topics or questions in detail. Creating a good questionnaire is a difficult task that requires careful design and testing to avoid ambiguity, bias, or confusion (Saunders & Lewis, 2018). Furthermore, The data's reliability depends on how well the survey is designed and how good the responses are (Queirós et al., 2017).

A cross-sectional time horizon is a research method that collects data from a population sample at a single point in time. However, this method has some limitations, such as that cross-sectional data cannot show how the variables of interest change or relate over time, which makes it hard to infer causality or identify trends. Another limitation is that cross-sectional data may be influenced by other factors that are not measured or controlled in the study, which could confound the results and create spurious associations. Furthermore, cross-sectional data may suffer from selection bias, which means that the sample may not be representative of the population in terms of the characteristics or outcomes relevant to the study (Taris et al., 2021).

This study focused on some aspects of factors affecting 21st-CDSs, focusing only on the accounting profession and providing evidence from a single country (Truant et al., 2021). Accounting skills may be affected by other factors that may not be measurable. This study limited the factors to quantifiable factors modelled with digitalisation to measure their relationship with the skills (Bouvet, 2021).

The levels of 21st-CDSs were measured using a self-reported method, which asked the participants to rate their skills on a scale. This method has some limitations, such as that self-reported data may be biased by social desirability, which means that the participants may answer the questions in a way that makes them look good or conform to social norms. Also, self-reported data may be affected by recall difficulties, which means that the participants may not remember their skills or experiences correctly or consistently. Furthermore, self-reported data may be influenced by a misunderstanding of questions, which means that the participants may interpret the questions differently or incorrectly. These limitations could lead to overestimation or underestimation of the skills, and they may not reflect the actual ability levels of the participants (Talja, 2005; Van Laar et al., 2019).

The assumption of linearity between dependent and independent variables indicates that if the correlations between them are not linear, the multiple regression model will be invalid in describing the association between the dependent and independent variables. Regression methods can only identify associations; they can never be sure of their truthfulness or the underlying cause of the connection (Saunders & Lewis, 2018; Wegner, 2020).

7.6. Suggestions for future research

The topic of 21st-CDSs of the knowledge worker is relevant and essential in the context of the South African accounting profession. The study has explored the factors influencing the level of these skills, such as individual characteristics, organisational support, and environmental factors. However, there are still some gaps and limitations that can be investigated in future research.

The research has targeted the South African accounting profession; however, comparing and contrasting the findings from other professions (medical doctors and engineers) and other developing countries would be essential. This would allow for a more comprehensive and global understanding of the 21st-CDSs of the knowledge worker.

The quantitative approach was utilised for this research to measure the level of 21st-CDSs and the factors influencing them. However, a qualitative approach could provide more depth and insight into the experiences and perceptions of the knowledge workers regarding their digital skills development and challenges. A mixed-methods approach could also be used to triangulate and validate the qualitative and quantitative data source results.

The data used in the study came from the knowledge workers' reports self-reported data, which could have some biases. Future research could use more objective and reliable methods to assess the level of 21st-CDSs, such as performance tests, simulations, or observations. Additional research should examine the influence of 21st-CDSs on the outcomes and performance of knowledge workers, such as productivity, quality, innovation, or satisfaction.

The study has identified some factors influencing the level of 21st-CDSs, but there may be other factors that were not considered or measured in this research. Possible factors influencing the 21st-CDSs level, such as motivation, attitude, self-efficacy, or

learning styles, could be investigated in future research. Furthermore, future research could also investigate the interrelationships and interactions among the factors influencing the level of 21st-CDSs, such as how individual characteristics may moderate or mediate the effects of organisational support or environmental factors.

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9. APPENDIX A: CONSISTENCY MATRIX

TITLE: The factors influencing the level of 21st-century digital skills of the knowledge worker: A study of the accounting profession in South Africa

Research questions/propositions/hypotheses	Sections in the literature review	Data collection tools	Analysis technique
Research Question 1: What is the level of 21st-CDSs (critical thinking, information, creativity, collaboration, communication, and problem-solving) among knowledge professionals working within the accounting profession in South Africa?	**2.2 21st-CDSs trends and constructs** (Autor & Dorn, 2013; Bawden, 2008; Bhimani, 2020; Cruz-Jesus et al., 1 C.E.; Frey & Osborne, 2017; Gulin et al., 2019; Lewin & McNicol, 2015; Oberländer et al., 2020; Susskind & Susskind, 2015; Truant et al., 2021; Van Dijk, 2005; Van Laar et al., 2017, 2018, 2019, 2020; Voogt & Roblin, 2012; World Economic Forum, 2020)	**10.3 21st-CDSs level**	Descriptive statistics, Means, standard deviations, and of the 21st-CDSs
Research Question 2: What factors impact the level of 21st-CDSs of the knowledge worker? **Hypothesis:** H1: Age negatively impacted the level of 21st-CDSs. H2: Women have lower levels of 21st-CDSs than men. H3: Perceived ease of use positively impacted the level of 21st-CDSs. H4: ICT attitude positively impacted the level of 21st-CDSs. H5: Level of education positively influences the level of 21st-CDSs. H6: Personal initiative positively impacted the level of 21st-CDSs. H7: Avoidance goal orientation negatively impacts the level of 21st-CDSs. H8: Performance goal orientation positively impacts the level of 21st-CDSs. H9: Learning goal orientation positively impacts the level of 21st-CDSs. H10: Self-directed learning positively impacts the level of 21st-CDSs. H11: ICT self-regulation contributes positively to the level of 21st-CDSs.	**2.3 Theory on factors impacting 21st-CDSs** (Bandura et al., 1999; Brand-Gruwel et al., 2009; Compeau & Higgins, 1995; Correa et al., 2010; Cruz-Jesus et al., 1 C.E.; Eastin & LaRose, 2006; Goldberg, 1990; Hargittai & Shafer, 2006; Huang & Liaw, 2005; Joo et al., 2000; Koehorst et al., 2021; Margolis & Fisher, 2002; McCrae & Costa, 2003; Prensky, 2001; Ryan & Deci, 2000; Van Deursen & Van Dijk, 2011, 2014, 2019; Van Dijk, 2020; Van Laar et al., 2018, 2020)	10.2 Demographic information 10.4 Factors influencing the level of the 21st-CDSs	Multiple linear regression, means, standard deviations, and reliability of the 21st-CDSs

10. APPENDIX B: QUESTIONNAIRE

The research questionnaire was adapted from Van Laar et al. (2019), pp. 100-102.

10.1. Questionnaire cover page

Preamble:

Dear Participant,

I am currently a student at the University of Pretoria's Gordon Institute of Business Science and completing my research in partial fulfilment of an MBA.

I am conducting research on 21st-Century Digital skills levels in South Africa's highly skilled professions. A major expansion in technologies, e.g., robotics, artificial intelligence and machine learning, affects all areas of highly skilled professions, especially the accounting profession. The research purpose is to assess the levels of 21st-Century Digital skills level in South Africa's highly skilled professions, with a specific focus on the accounting profession. The research would want to respond to the query: Why certain working professionals are more proficient in 21st-Century Digital skills level than others?

The questionnaire should take approximately 15 – 20 minutes to complete. Your participation is **voluntary**, and you may withdraw from the process at any time without penalty. Your participation is, however, valuable to us, and we would appreciate your assistance. While **your individual responses will be always kept anonymous and confidential,** the collated results of the study may be published**.**

By completing the survey, you indicate that you voluntarily participate in this research. Thank you for your time and contribution to this research study. Please do not hesitate to address any enquiries about the questionnaire or the research study to:

Researcher:

OR

Research Supervisor:

10.2. Demographic information

Gender

Male

Female

Choose not to say

Age: _____

You should be 18 years or older to participate.

Professional accounting body membership

SAICA

CIMA

ACCA

SAIPA

Other

Which industry are you in?

Financial services

Auditing and accounting firm

Manufacturing

Retail

Government and Public Sector

Non-profit Organisations

other

Employment situation

Paid employment – permanent contract

Paid employment – temporary contract

Temporary agency worker

Self-employed

Function level

Junior

Mid-Level management

Senior management

The country you are operating from

South Africa

Other

10.3. 21st-CDSs level

Items will be asked on a 5-point Likert scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5=(almost) always.

The next statements are about processing information for work-related purposes.

At work, how often …

Information management

1. …do you save useful digital files directly to the right folder
2.…are you consistent in the naming of digital files
3.…do you organise digital files via a hierarchical folder structure

The next statements are about searching for information for work-related purposes.

At work, how often …

Information evaluation

1. …do you check the reliability of a website
2.…do you check the information found on a different website
3.…do you check if the information found is up to date

The next statements are about profiling yourself online for work-related purposes.

At work, how often …

Communication: expressiveness

1. …do you get what you want from interactions on the internet
2.…are you via the internet effective in accomplishing what you want
3.…do you know how to use the internet to express ideas clearly

Communication: contact-building

1. …do new collaborations emerge by approaching online contacts
2.…do you establish online contacts to collaborate with
3.…do you find experts on the internet to start a project with

Communication: networking

1 …. do you spend time and effort in online networking with people from your field
2 …. do you use your online network to benefit from it
3 …. do you use your online network to generate business
4 …. do you build online relationships with people from your field
5 …. does the internet help you approach new professional contacts

6. …do you use your online network to increase brand awareness
7. …do you start a conversation with other professionals via the internet
8. …do you use your online network to achieve policy goals

Communication: content-sharing

1. …do you post new messages on the internet
2.…do you post a blog/article on the internet
3.…do you share information on the internet to start a discussion

The next statements are about sharing information for work-related purposes.

At work, how often …

Collaboration

1. …do you share important information with your team via the internet
2.…do you use the internet to share information that supports the work of others
3.…do you use the internet to share resources that help the team perform tasks
4.…do you use the internet to provide each other with information that progresses work
5. …does the internet help you get support from co-workers
6.…do you communicate via the Internet with co-workers from other disciplines
7. …do you share work-related knowledge via the internet
8.…do you use the internet to give feedback to co-workers
9.…does the internet help you use other professionals' expertise

The next statements are about having online discussions (e.g., e-mail, Skype, online forums) for work-related purposes. At work, how often …

Critical thinking

1. …do you give substantiated arguments or reasoning
2.…do you give proof or examples of arguments you give
3.…do you give a justification for your point of view
4.…are you able to put the discussion into a new perspective
5. …do you ask questions to understand other people's viewpoint
6.…do you consider various arguments to formulate your point of view
7. …do you connect viewpoints to give a new turn to the discussion
8.…do you suggest new related points
9. …do you filter the most important points from discussions
10. …do you generate new input from a discussion

11. …are you open to ideas that challenge some of your held beliefs

12. …do you use the internet to justify your choices

At work, how often …

Creativity

1. …do you give a creative turn to existing processes using the internet

2.…do you use the internet to generate innovative ideas for your field

3.…do you show originality in your work using the internet

4.…do you use the internet to execute your tasks creatively

5. …do you follow trends on the internet to generate original ideas

6.…do you use the internet to evaluate the usability of your ideas

The next statements are about problems at work that you want to solve by using the Internet.

At work, how often …

Problem solving

1. …does the internet help you find the best way to solve the problem

2.…do you solve the problem using the internet

3.…do you come up with solutions to the problem via the internet

4.…does the internet help you find ways to solve problems

5. …are you confronted with a problem that you are sure you can solve using the internet

6…do you decide to use the internet that makes you feel happy afterwards

10.4. Factors influencing the level of the 21st-CDSs

Items will be asked on a 5-point Likert scale: 1 = totally disagree, 2 = disagree, 3 = disagree/agree, 4 = agree, 5 = totally agree

ICT attitude

1. I cannot take part in a conversation about Internet applications

2. I am hesitant to try new internet applications

3. I cannot keep pace with the developments of Internet applications

Perceived ease of use

1. The use of the internet is easy for me

2. I can teach myself the things I need to know about Internet applications

3. If I get problems using the internet, I can usually solve them by myself

4. I can manage myself when using the internet

5. I feel comfortable using the internet

ICT self-regulation

When I work with Internet applications …

1. I can concentrate on one activity for a long time
2. After an interruption, I can easily resume my concentrated style of working
3. I am easily distracted
4. It is easy for me to stay focused
5. I do not allow anything to distract me from my task

Self-directed learning

1. I try to determine the best way to work on the task
2. I check my progress
3. I reflect on the way I perform my work
4. I adapt my planning when needed

Learning goal orientation

1. I look for opportunities to develop new skills and knowledge
2. I think learning and developing skills is important
3. I enjoy challenging tasks that I can learn a lot from
4. I enjoy working in situations where I will need many skills
5. I am willing to take risks to develop my skills

Performance approach goal orientation

1. I am concerned with showing my co-workers that I perform
2. I prefer to work on projects where I can show my abilities to others
3. I enjoy it when others at work are aware of how well I am doing
4. I enjoy showing my accomplishments to co-workers

Avoidance approach goal orientation

1. I avoid learning new skills because I am afraid to appear incompetent
2. I avoid situations where I might perform poorly
3. I avoid taking on tasks if there is a chance that I appear incompetent
4. I would rather not ask questions if I do not understand something because I do not want to appear incompetent

Personal initiative

1. I actively attack problems
2. I take initiative immediately, even when others do not
3. I use opportunities quickly to attain my goals
4. Whenever action needs to be taken, I am often the first that take the initiative

11. APPENDIX C: CODES USED IN THE DATA ANALYSIS

Coding for the Level of 21st-CDSs

Answer	Code
Never	1
Rarely	2
Sometimes	3
Often	4
Always	5

Codes for the factors influencing the Level of 21st-CDSs

Answer	Code
Totally disagree	1
Disagree	2
Neutral	3
Agree	4
Totally agree	5

Gender Codes

Gender	Code
Female	1
Male	2

Occupation position level codes

Level	Code
Junior	1
Mid-Level management	2
Senior management	3

Education codes

Professional qualification	Code
None	1
Professional qualification	2

Constructs abbreviations

Construct	Code
Level - Information management	LIM
Level - Information evaluation	LIE
Level - Communication: expressiveness	LCE
Level - Communication: contact-building	LCCB
Level - Communication: networking	LCN
Level - Communication: content-sharing	LCCS
Level - Collaboration	LCo
Level - Critical thinking	LCT
Level - Creativity	LCr
Level - Problem solving	LPS
Factors - ICT attitude	FIA
Factors - Perceived ease of use	FPEU
Factors - ICT self-regulation	FISR
Factors - Self-directed learning	FSDL
Factors - Learning goal orientation	FLGO
Factors - Performance approach goal orientation	FPAG
Factors - Avoidance approach goal orientation	FAAG
Factors - Personal initiative	FPI

12. APPENDIX D: DETAILED DESCRIPTIVE STATISTICS RESULTS

Descriptive statistics: Level of 21st-CDSs

The instrument used to measure was adapted from Van Laar et al. (2019), pp. 100-102.

Table 10: Mean level of 21st-CDS per item

	Mean	SD
Level - Information management (α = 0.67)	**3.95**	**0.71**
LIM - At work, how often do you save useful digital files directly to the right folder	4.17	0.73
LIM - At work, how often are you consistent in the naming of digital files	4.07	0.85
LIM - At work, how often do you organise digital files via a hierarchical folder structure	3.60	1.13
Level - Information evaluation (α = 0.77)	**3.62**	**0.85**
LIE - At work, how often do you check the credibility/reliability of a website	3.60	0 .15
LIE - At work, how often do you check the information found on a different website	3.50	0.90
LIE - At work, how often do you check if the information found is up to date	3.74	1.02
Level - Communication: expressiveness (α = 0.80)	**3.78**	**0.66**
LCE - At work, how often do you get what you want from interactions on the internet	3.75	0.72
LCE - At work, how often are you via the internet effective in accomplishing what you want	3.79	0.74
LCE - At work, how often do you know how to use the internet to express ideas clearly	3.80	0.88
Level - Communication: contact-building (α = 0.89)	**2.57**	**0.96**
LCCB - At work, how often do new collaborations emerge by approaching online contacts	2.75	1.07
LCCB - At work, how often do you establish online contacts to collaborate with	2.68	1.07
LCCB - At work, how often do you find experts on the internet to start a project with	2.27	1.03
Level - Communication: networking (α = 0.93)	**2.74**	**0.89**
LCN - At work, how often do you spend time and effort in online networking with people from your field	2.75	1.04
LCN - At work, how often do you use your online network to benefit from it	2.86	1.10
LCN - At work, how often do you use your online network to generate business	2.37	1.11
LCN - At work, how often do you build online relationships with people from your field	2.79	1.03
LCN - At work, how often does the internet help you approach new professional contacts	2.80	1.01
LCN - At work, how often do you use your online network to increase brand awareness	2.73	1.15
LCN - At work, how often do you start a conversation with other professionals via the internet	2.71	1.08
LCN - At work, how often do you use your online network to achieve goals	2.91	1.13
Level - Communication: content-sharing (α = 0.86)	**2.09**	**0.94**

LCCS - At work, how often do you post new messages on the internet	2.39	1.13
LCCS - At work, how often do you post a blog/article on the internet	1.74	0.97
LCCS - At work, how often do you share information on the internet to start a discussion	2.14	1.11
Level - Collaboration (α = 0.95)	**3.31**	**0.99**
LCo - At work, how often do you share important information with your team via the internet	3.32	1.24
LCo - At work, how often do you use the internet to share information that supports the work of others	3.23	1.20
LCo - At work, how often do you use the internet to share resources that help the team perform tasks	3.36	1.12
LCo - At work, how often do you use the internet to provide each other with information that progresses work	3.35	1.09
LCo - At work, how often does the internet help you get support from co-workers	3.29	1.09
LCo - At work, how often do you communicate via the internet with co-workers from other disciplines	3.35	1.28
LCo - At work, how often do you share work-related knowledge via the internet	3.39	1.15
LCo - At work, how often do you use the internet to give feedback to co-workers	3.12	1.25
LCo - At work, how often does the internet help you use other professionals' expertise	3.37	1.10
Level - Critical thinking (α = 0.93)	**3.65**	**0.61**
LCT - At work, how often do you give substantiated arguments or reasoning	3.78	0.93
LCT - At work, how often do you give proof or examples of arguments you give	3.68	0.94
LCT - At work, how often do you give a justification for your point of view	3.67	0.92
LCT - At work, how often are you able to put the discussion into a new perspective	3.58	0.76
LCT - At work, how often do you ask questions to understand other people's viewpoint	3.90	0.73
LCT - At work, how often do you consider various arguments to formulate your point of view	3.80	0.77
LCT - At work, how often do you connect viewpoints to give a new turn to the discussion	3.57	0.81
LCT - At work, how often do you suggest new related points	3.53	0.76
LCT - At work, how often do you filter the most important points from discussions	3.74	0.73
LCT - At work, how often do you generate new input from a discussion	3.50	0.74
LCT - At work, how often are you open to ideas that challenge some of your held beliefs	3.74	0.89
LCT - At work, how often do you use the internet to justify your choices	3.31	0.89
Level - Creativity (α = 0.89)	**3.24**	**0.72**
LCr - At work, how often do you give a creative turn to existing processes using the internet	3.25	0.84
LCr - At work, how often do you use the internet to generate innovative ideas for your field	3.33	0.82
LCr - At work, how often do you show originality in your work using the internet	3.09	0.94

LCr - At work, how often do you use the internet to execute your tasks creatively	3.36	0.89
LCr - At work, how often do you follow trends on the internet to generate original ideas	3.15	0.95
LCr - At work, how often do you use the internet to evaluate the usability of your ideas	3.24	0.93
Level - Problem solving (α = 0.93)	**3.35**	**0.72**
LPS - At work, how often does the internet help you find the best way to solve the problem	3.45	0.86
LPS - At work, how often do you solve the problem using the internet	3.34	0.86
LPS - At work, how often do you come up with solutions to the problem via the internet	3.36	0.85
LPS - At work, how often does the internet help you find ways to solve problems	3.42	0.80
LPS - At work, how often are you confronted with a problem that you are sure you can solve using the internet	3.25	0.83
LPS - At work, how often do you decide to use the internet that makes you feel happy afterwards	3.30	0.80

Descriptive statistics: Factors that impact the Level of 21st-CDSs

The instrument used to measure was adapted from Van Laar et al. (2019), pp. 100-102.

Table 11: Mean of factors impacting the level of 21st-CDSs per item

	Mean	SD
Factors - ICT attitude (α = 0.65)	**3.73**	**0.80**
FIA - I cannot take part in a conversation about Internet applications	3.72	0.99
FIA - I am hesitant to try new Internet applications	3.89	1.02
FIA - I cannot keep pace with the developments of Internet applications	3.58	1.12
Factors - Perceived ease of use (α = 0.81)	**4.07**	**0.54**
FPEU - The use of the internet is easy for me	4.29	0.72
FPEU - I can teach myself the things I need to know about Internet applications	4.09	0.74
FPEU - If I get problems using the internet, I can usually solve them by myself	3.62	0.82
FPEU - I can manage myself when using the internet	4.10	0.64
FPEU - I feel comfortable using the internet	4.24	0.66
Factors - ICT self-regulation (α = 0.78)	**3.32**	**0.64**
FISR - When I work with Internet applications, I can concentrate on one activity for a long time	3.22	0.96
FISR - When I work with Internet applications, after an interruption, I can easily resume my concentrated style of working	3.53	0.83
FISR - When I work with Internet applications, I am easily distracted	3.35	0.99
FISR - When I work with Internet applications, it is easy for me to stay focused	3.54	0.82
FISR - When I work with Internet applications, I do not allow anything to distract me from my task	3.07	0.87
Factors - Self-directed learning (α = 0.80)	**3.98**	**0.48**
FSDL - I try to determine the best way to work on a task	4.06	0.57
FSDL - I check my learning progress	3.84	0.72
FSDL - I reflect on the way I perform my work	3.98	0.58
FSDL - I adapt my planning when needed	4.02	0.56
Factors - Learning goal orientation (α = 0.85)	**4.25**	**0.53**
FLGO - I think learning and developing skills is important	4.48	0.66
FLGO - I look for opportunities to develop new skills and knowledge	4.31	0.60
FLGO - I enjoy challenging tasks that I can learn a lot from	4.22	0.66
FLGO - I enjoy working in situations where I will need many skills	4.18	0.68
FLGO - I am willing to take risks to develop my skills	4.08	0.71
Factors - Performance approach goal orientation (α = 0.78)	**3.25**	**0.79**
FPAG - I am concerned with showing my co-workers that I perform	2.91	1.11
FPAG - I prefer to work on projects where I can show my abilities to others	3.60	0.88
FPAG - I enjoy it when others at work are aware of how well I am doing	3.45	1.02
FPAG - I enjoy showing my accomplishments to co-workers	3.05	1.06

Factors - Avoidance approach goal orientation (α = 0.87)	**3.88**	**0.89**
FAAG - I avoid learning new skills because I am afraid to appear incompetent	4.10	1.00
FAAG - I avoid situations where I might perform poorly	3.74	1.09
FAAG - I avoid taking on tasks if there is a chance that I appear incompetent	3.69	1.10
FAAG - I would rather not ask questions if I do not understand something because I do not want to appear incompetent	4.00	1.01
Factors - Personal initiative (α = 0.86)	**3.84**	**0.61**
FPI - I actively attack problems	3.86	0.79
FPI - I take initiative immediately even when others do not	3.90	0.71
FPI - I use opportunities quickly to attain my goals	3.97	0.68
FPI - Whenever action needs to be taken, I am often the first that take the initiative	3.64	0.74

13. APPENDIX E: MULTIPLE LINEAR REGRESSION ANALYSIS RESULTS

An illustration of the multiple linear regression analysis results on one of the skills (creativity)

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Factors - Personal initiative, Factors - Performance approach goal orientation, Which Professional accounting body are you a member to? (select all applicable options), What is your Gender? [Select], Age, Factors - ICT self-regulation, Factors - ICT attitude , Factors - Learning goal orientation, Factors - Avoidance approach goal orientation, Factors - Perceived ease of use, Factors - Self-directed learning[b]	.	Enter

a. Dependent Variable: Level - Creativity

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	,502[a]	,252	,176	,64999	2,333

a. Predictors: (Constant), Factors - Personal initiative, Factors - Performance approach goal orientation, Which Professional accounting body are you a member to? (select all applicable options), What is your Gender? [Select], Age, Factors - ICT self-regulation, Factors - ICT attitude , Factors - Learning goal orientation, Factors - Avoidance approach goal orientation, Factors - Perceived ease of use, Factors - Self-directed learning

b. Dependent Variable: Level - Creativity

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15,490	11	1,408	3,333	<.001[b]
	Residual	46,052	109	,422		
	Total	61,542	120			

a. Dependent Variable: Level - Creativity

b. Predictors: (Constant), Factors - Personal initiative, Factors - Performance approach goal orientation, Which Professional accounting body are you a member to? (select all applicable options), What is your Gender? [Select], Age, Factors - ICT self-regulation, Factors - ICT attitude , Factors - Learning goal orientation, Factors - Avoidance approach goal orientation, Factors - Perceived ease of use, Factors - Self-directed learning

Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	1,375	,834		1,648	,102	-,278	3,028
	What is your Gender? [Select]	-,180	,129	-,126	-1,393	,167	-,437	,076
	Age	-,019	,008	-,208	-2,296	,024	-,036	-,003
	Which Professional accounting body are you a member to? (select all applicable options)	-,088	,162	-,046	-,543	,589	-,410	,234
	Factors - ICT attitude	,077	,094	,086	,824	,412	-,108	,263
	Factors - Perceived ease of use	,150	,146	,113	1,028	,306	-,139	,440
	Factors - ICT self-regulation	,085	,106	,076	,801	,425	-,125	,295
	Factors - Self-directed learning	,103	,173	,070	,598	,551	-,239	,446
	Factors - Learning goal orientation	,057	,160	,042	,354	,724	-,261	,374
	Factors - Performance approach goal orientation	,082	,084	,090	,967	,336	-,086	,249
	Factors - Avoidance approach goal orientation	-,034	,085	-,042	-,398	,692	-,203	,135
	Factors - Personal initiative	,284	,123	,242	2,308	,023	,040	,528

a. Dependent Variable: Level - Creativity

14. APPENDIX F: NORMALITY/LINEARITY TESTING RESULTS

Test for normality, linearity, homoscedasticity, and absence of multicollinearity

14.1. Test for multicollinearity using Coefficients (VIF)

Information evaluation

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	,914	,855		1,069	,287		
	Factors - ICT attitude	,064	,112	,061	,571	,569	,711	1,407
	Factors - Perceived ease of use	,221	,186	,140	1,188	,237	,577	1,734
	Factors - ICT self-regulation	,164	,131	,123	1,252	,213	,823	1,215
	Factors - Self-directed learning	,112	,213	,064	,526	,600	,545	1,836
	Factors - Learning goal orientation	,073	,205	,045	,355	,723	,494	2,024
	Factors - Performance approach goal orientation	,118	,106	,110	1,113	,268	,821	1,217
	Factors - Avoidance approach goal orientation	,082	,107	,086	,769	,444	,638	1,567
	Factors - Personal initiative	-,115	,156	-,083	-,736	,464	,635	1,575

a. Dependent Variable: Level - Information evaluation

Communication Expressiveness

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1,182	,642		1,841	,068		
	Factors - ICT attitude	,146	,084	,176	1,725	,087	,711	1,407
	Factors - Perceived ease of use	,189	,140	,153	1,351	,179	,577	1,734
	Factors - ICT self-regulation	,029	,098	,028	,292	,771	,823	1,215
	Factors - Self-directed learning	,297	,160	,216	1,851	,067	,545	1,836
	Factors - Learning goal orientation	,003	,154	,003	,020	,984	,494	2,024
	Factors - Performance approach goal orientation	,099	,080	,118	1,245	,216	,821	1,217
	Factors - Avoidance approach goal orientation	-,017	,080	-,023	-,215	,830	,638	1,567
	Factors - Personal initiative	-,066	,117	-,061	-,565	,573	,635	1,575

a. Dependent Variable: Level - Communication: expressiveness

Communication: Contract-building

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	,306	,970		,315	,753		
	Factors - ICT attitude	,097	,128	,081	,762	,448	,711	1,407
	Factors - Perceived ease of use	,123	,211	,069	,581	,562	,577	1,734
	Factors - ICT self-regulation	,138	,148	,092	,930	,355	,823	1,215
	Factors - Self-directed learning	,363	,242	,183	1,501	,136	,545	1,836
	Factors - Learning goal orientation	-,142	,232	-,078	-,611	,542	,494	2,024
	Factors - Performance approach goal orientation	,086	,120	,071	,718	,474	,821	1,217
	Factors - Avoidance approach goal orientation	-,105	,121	-,098	-,867	,388	,638	1,567
	Factors - Personal initiative	,059	,177	,038	,332	,740	,635	1,575

a. Dependent Variable: Level - Communication: contact-building

Communication: Networking

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	,756	,882		,857	,393		
	Factors - ICT attitude	,208	,116	,188	1,795	,075	,711	1,407
	Factors - Perceived ease of use	-,100	,192	-,060	-,519	,605	,577	1,734
	Factors - ICT self-regulation	,089	,135	,064	,661	,510	,823	1,215
	Factors - Self-directed learning	,382	,220	,208	1,736	,085	,545	1,836
	Factors - Learning goal orientation	-,319	,211	-,190	-1,510	,134	,494	2,024
	Factors - Performance approach goal orientation	,198	,110	,176	1,805	,074	,821	1,217
	Factors - Avoidance approach goal orientation	,011	,110	,011	,100	,921	,638	1,567
	Factors - Personal initiative	,121	,161	,083	,750	,455	,635	1,575

a. Dependent Variable: Level - Communication: networking

Communication: Content-sharing

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1,694	,919		1,843	,068		
	Factors - ICT attitude	,107	,121	,091	,886	,377	,711	1,407
	Factors - Perceived ease of use	-,249	,200	-,142	-1,248	,215	,577	1,734
	Factors - ICT self-regulation	,154	,141	,105	1,095	,276	,823	1,215
	Factors - Self-directed learning	,482	,229	,247	2,103	,038	,545	1,836
	Factors - Learning goal orientation	-,520	,220	-,291	-2,363	,020	,494	2,024
	Factors - Performance approach goal orientation	,251	,114	,210	2,196	,030	,821	1,217
	Factors - Avoidance approach goal orientation	-,036	,115	-,034	-,314	,754	,638	1,567
	Factors - Personal initiative	,030	,168	,020	,181	,857	,635	1,575

a. Dependent Variable: Level - Communication: content-sharing

Collaboration

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-,468	,970		-,482	,630		
	Factors - ICT attitude	,201	,128	,162	1,574	,118	,711	1,407
	Factors - Perceived ease of use	,162	,211	,088	,768	,444	,577	1,734
	Factors - ICT self-regulation	-,028	,148	-,018	-,190	,850	,823	1,215
	Factors - Self-directed learning	,512	,242	,249	2,116	,037	,545	1,836
	Factors - Learning goal orientation	-,005	,232	-,003	-,020	,984	,494	2,024
	Factors - Performance approach goal orientation	,200	,120	,159	1,659	,100	,821	1,217
	Factors - Avoidance approach goal orientation	,121	,121	,108	,995	,322	,638	1,567
	Factors - Personal initiative	-,175	,177	-,108	-,989	,325	,635	1,575

a. Dependent Variable: Level - Collaboration

Critical thinking

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1,733	,584		2,968	,004		
	Factors - ICT attitude	,120	,077	,157	1,564	,121	,711	1,407
	Factors - Perceived ease of use	,253	,127	,221	1,990	,049	,577	1,734
	Factors - ICT self-regulation	-,097	,089	-,101	-1,087	,279	,823	1,215
	Factors - Self-directed learning	-,295	,146	-,232	-2,028	,045	,545	1,836
	Factors - Learning goal orientation	,181	,140	,156	1,296	,198	,494	2,024
	Factors - Performance approach goal orientation	,124	,073	,159	1,705	,091	,821	1,217
	Factors - Avoidance approach goal orientation	,004	,073	,006	,055	,956	,638	1,567
	Factors - Personal initiative	,196	,107	,195	1,834	,069	,635	1,575

a. Dependent Variable: Level - Critical thinking

Creativity

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	,051	,681		,075	,941		
	Factors - ICT attitude	,110	,090	,124	1,232	,221	,711	1,407
	Factors - Perceived ease of use	,180	,148	,135	1,214	,227	,577	1,734
	Factors - ICT self-regulation	,006	,104	,005	,056	,956	,823	1,215
	Factors - Self-directed learning	,167	,170	,112	,980	,329	,545	1,836
	Factors - Learning goal orientation	,037	,163	,027	,228	,820	,494	2,024
	Factors - Performance approach goal orientation	,101	,085	,112	1,197	,234	,821	1,217
	Factors - Avoidance approach goal orientation	-,012	,085	-,016	-,146	,884	,638	1,567
	Factors - Personal initiative	,240	,125	,205	1,930	,056	,635	1,575

a. Dependent Variable: Level - Creativity

Problem solving

Coefficients[a]

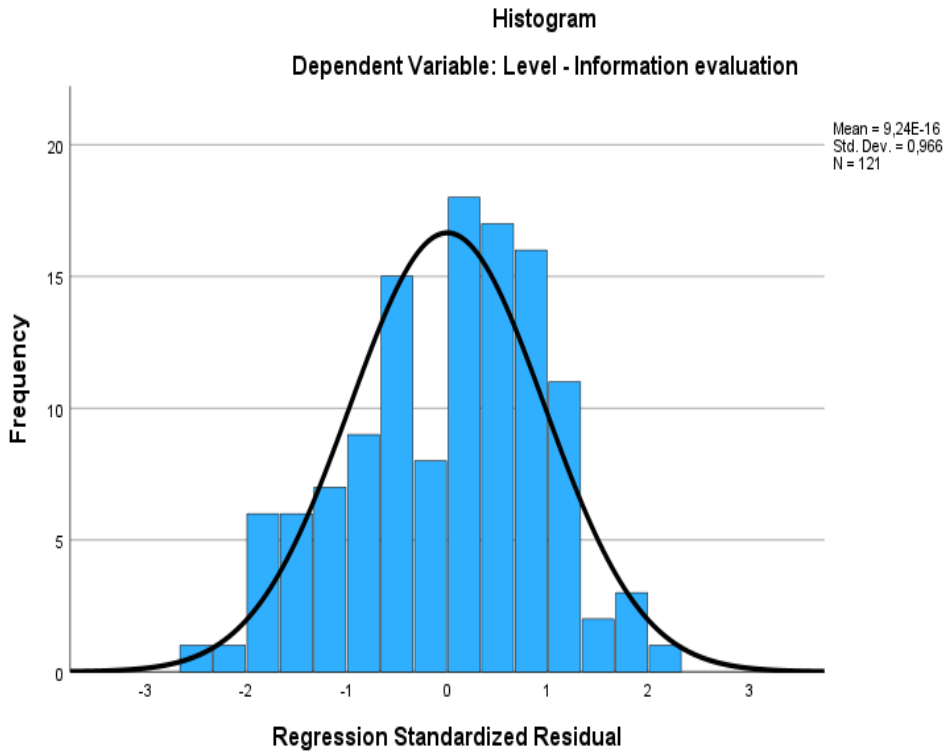
Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1,042	,706		1,475	,143		
	Factors - ICT attitude	,098	,093	,109	1,053	,295	,711	1,407
	Factors - Perceived ease of use	,322	,154	,242	2,098	,038	,577	1,734
	Factors - ICT self-regulation	-,041	,108	-,037	-,379	,705	,823	1,215
	Factors - Self-directed learning	,003	,176	,002	,018	,986	,545	1,836
	Factors - Learning goal orientation	,020	,169	,015	,119	,905	,494	2,024
	Factors - Performance approach goal orientation	,137	,088	,151	1,560	,122	,821	1,217
	Factors - Avoidance approach goal orientation	-,036	,088	-,045	-,409	,683	,638	1,567
	Factors - Personal initiative	,096	,129	,082	,742	,460	,635	1,575

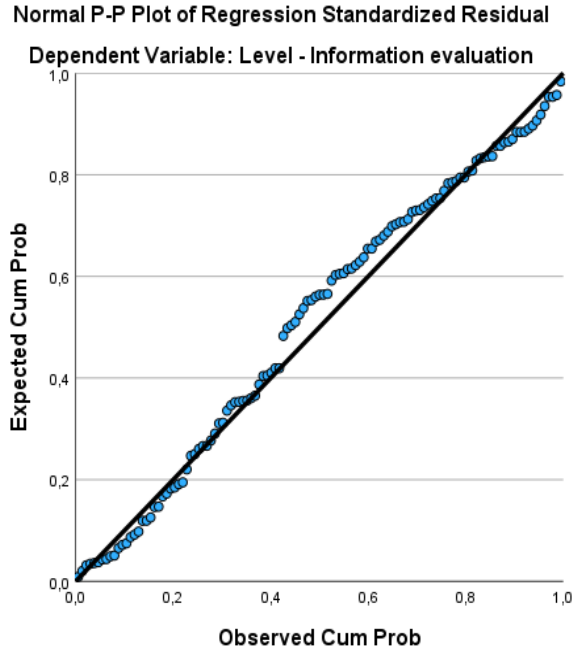
a. Dependent Variable: Level - Problem solving

The VIF values for each predictor variable were less than 10, suggesting no multicollinearity among them. The VIF values for each predictor variable in the model ranged from 1 to 2, which shows that there is some correlation among the predictors, but not severe enough to cause serious problems and to require any further attention.

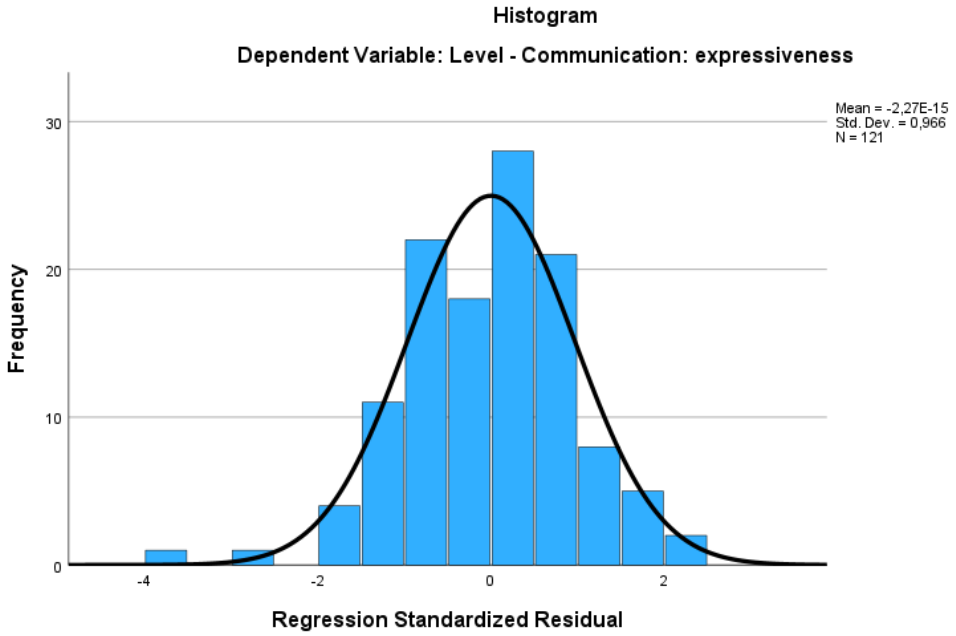
14.2. Test for normality using Histogram and Normal P-P

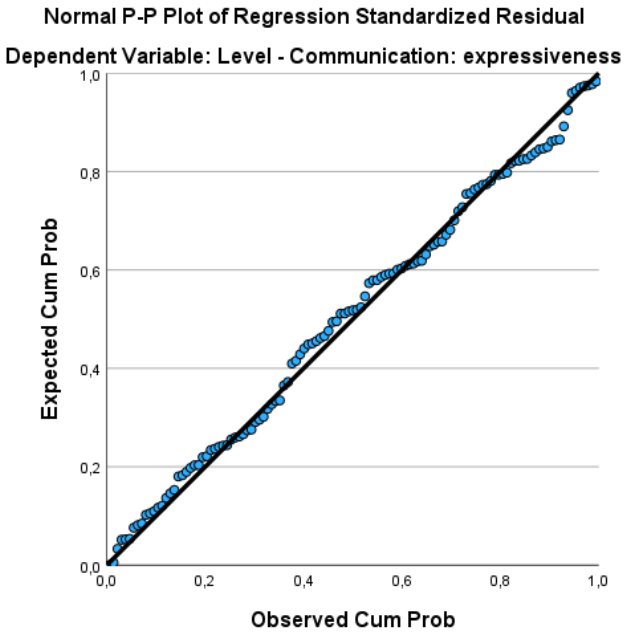
Information evaluation



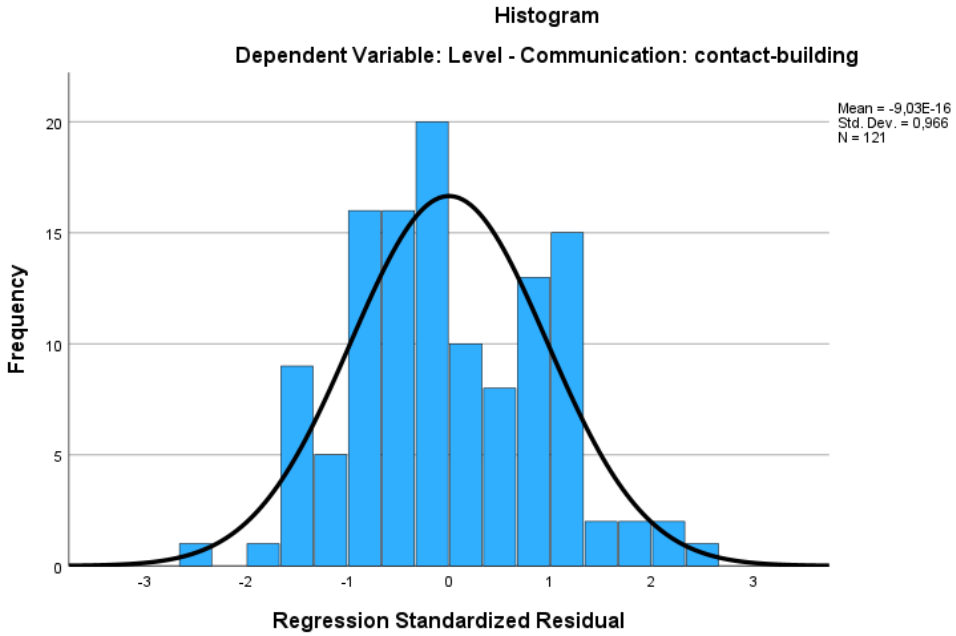


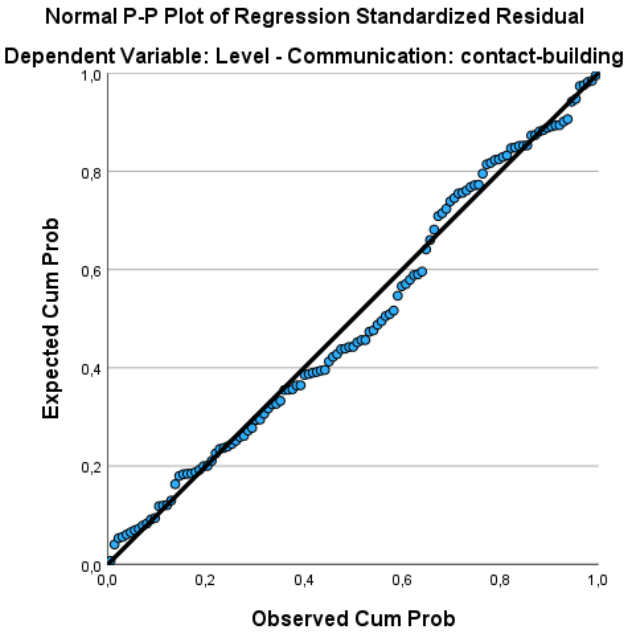
Communication Expressiveness



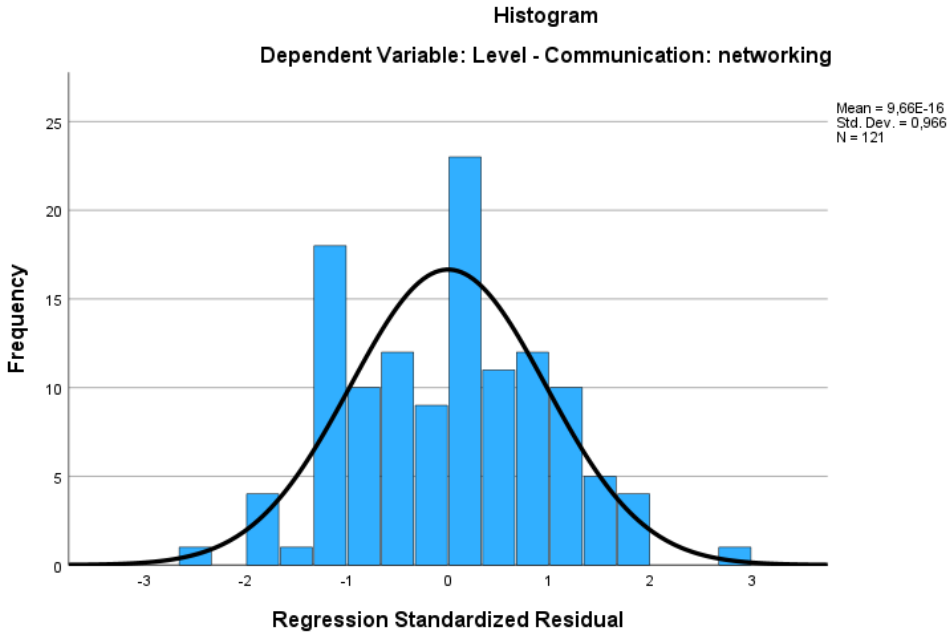


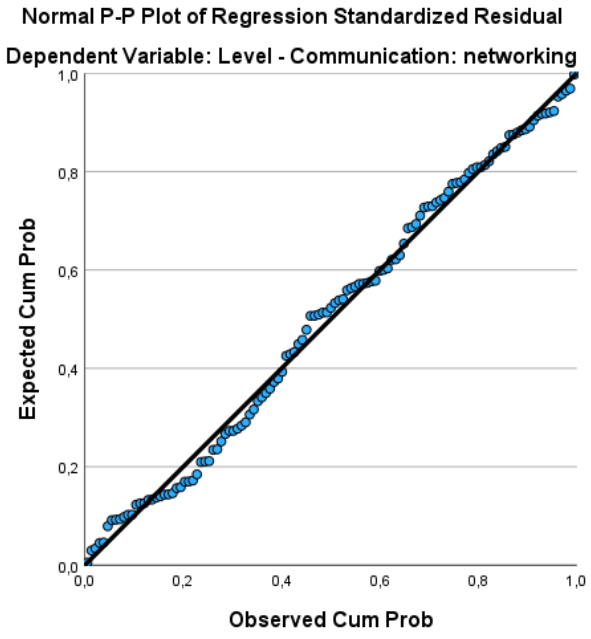
Communication: Contract-building



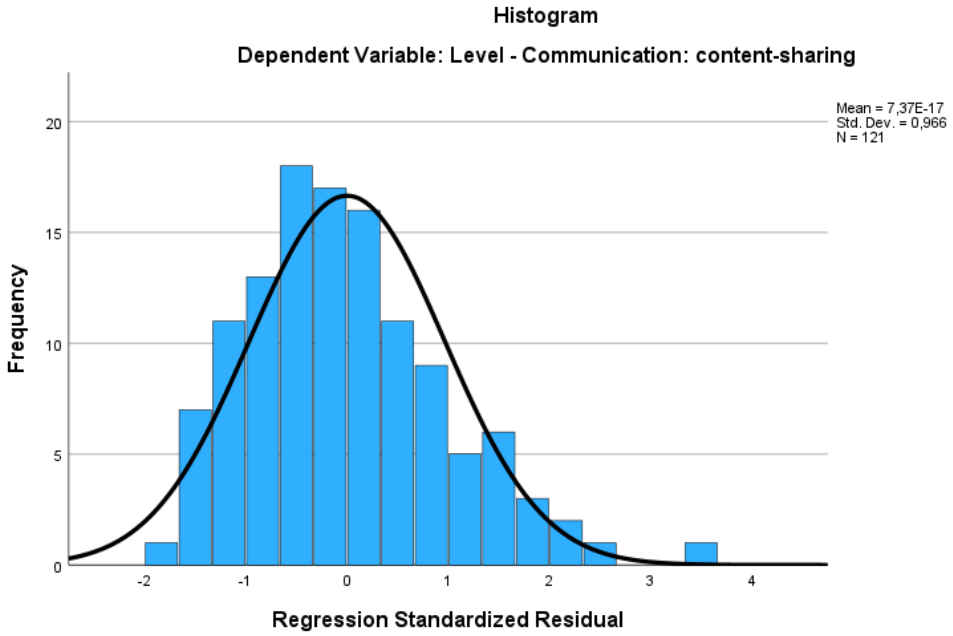


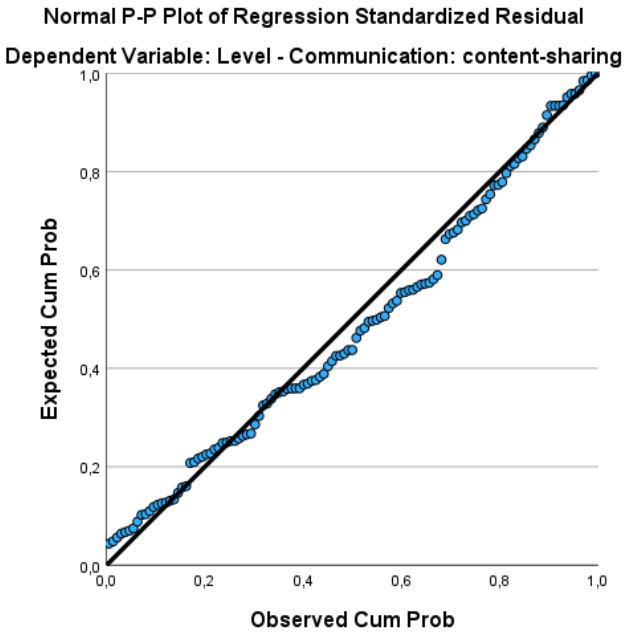
Communication: Networking



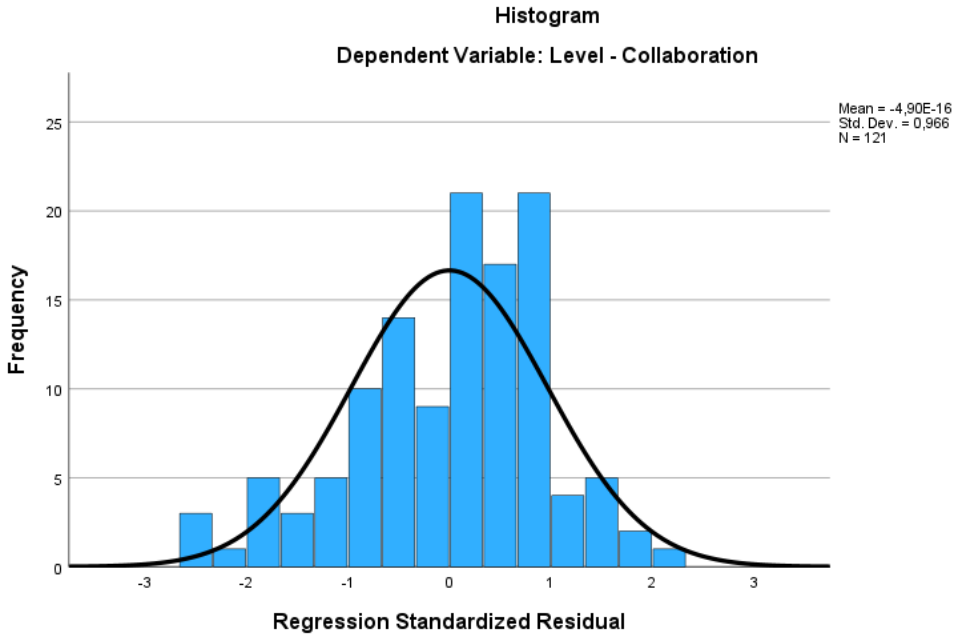


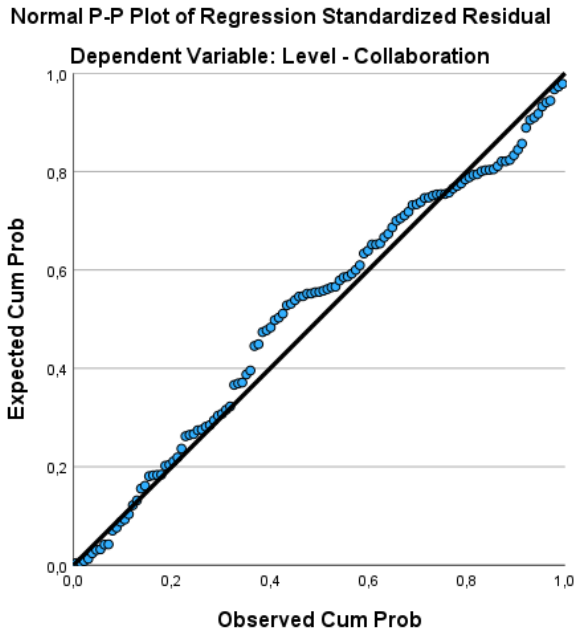
Communication: Content-sharing



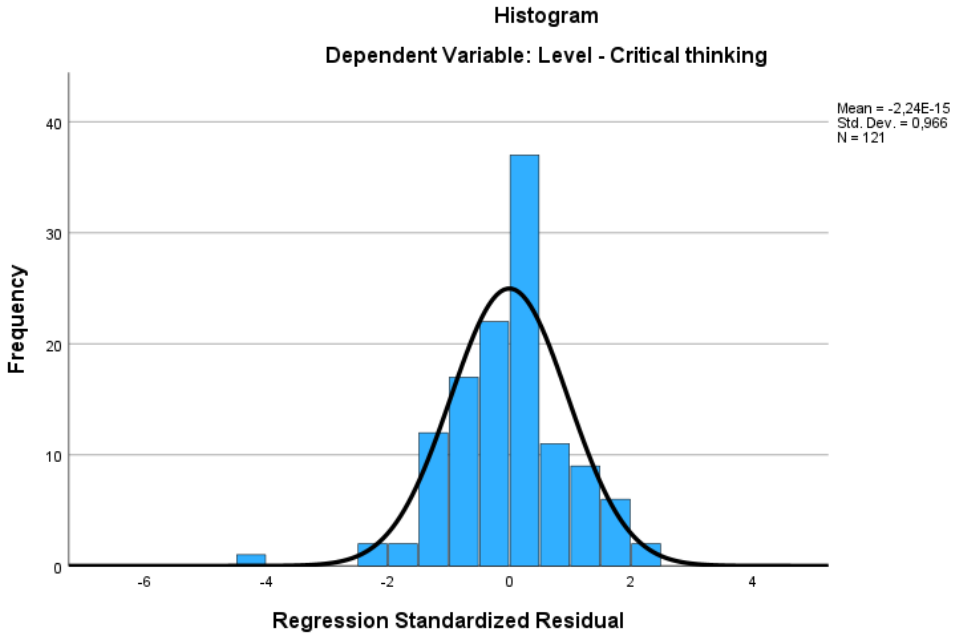


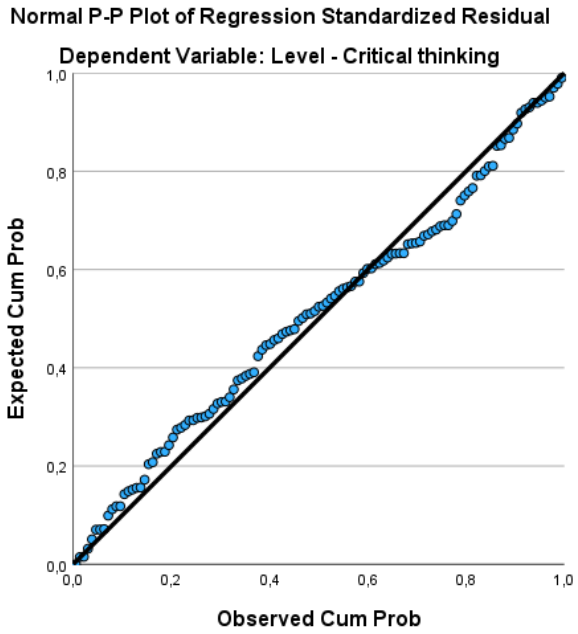
Collaboration



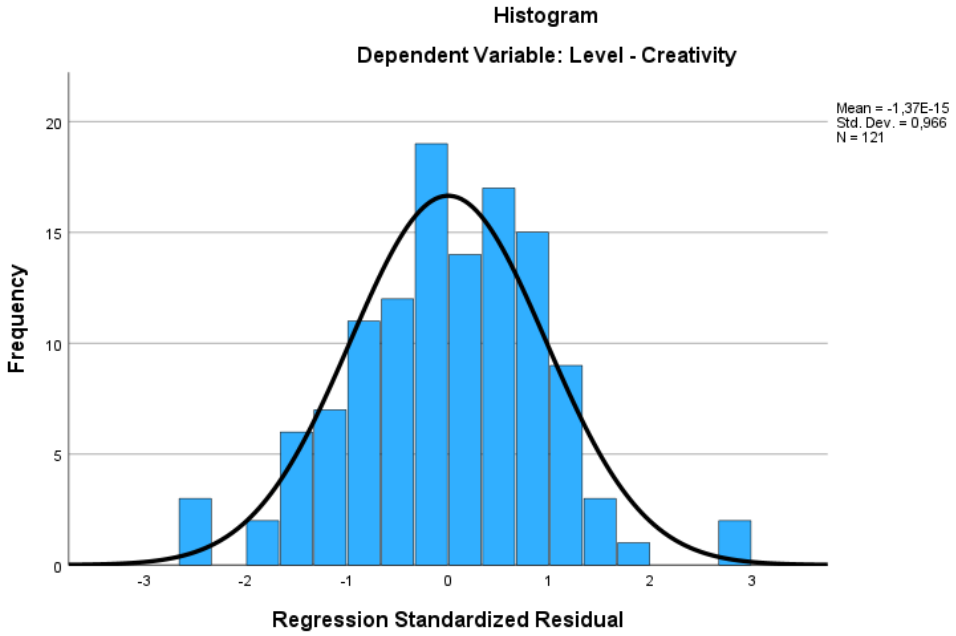


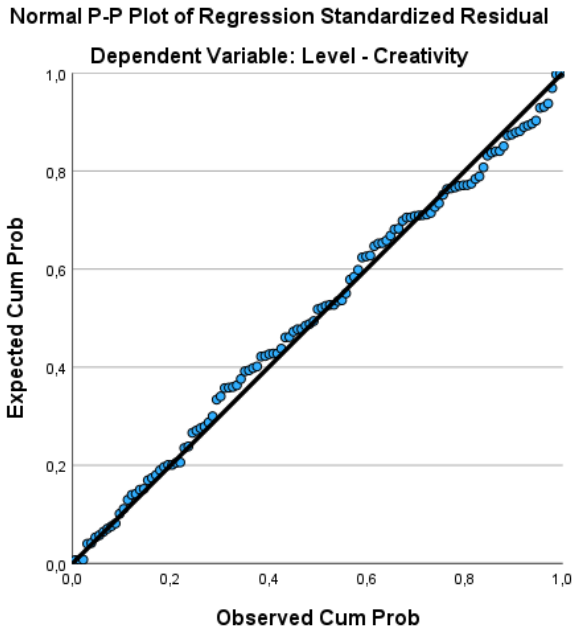
Critical thinking



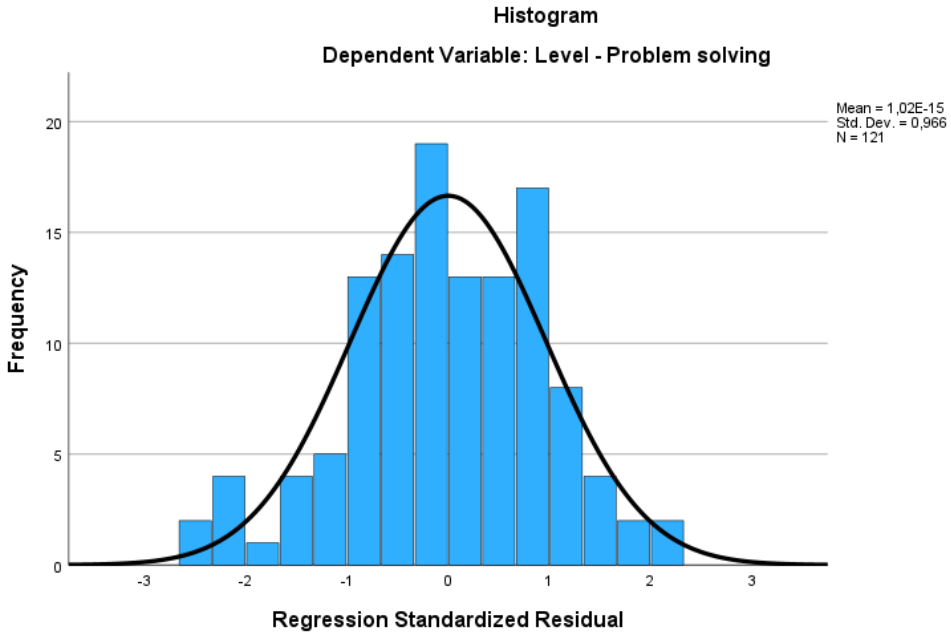


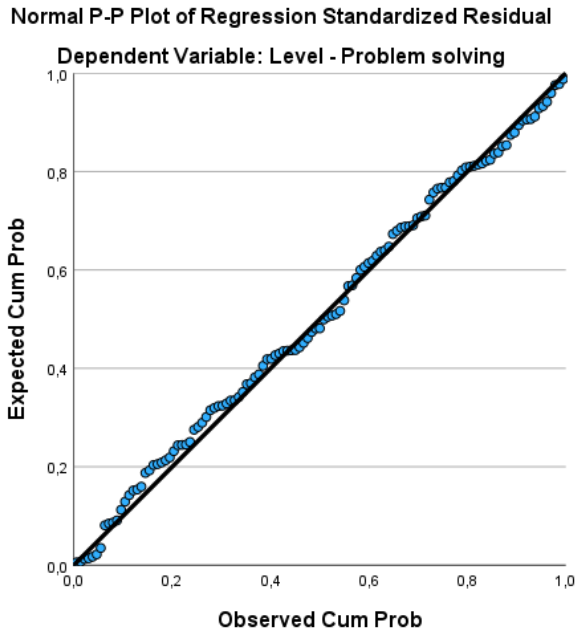
Creativity


Histogram
Dependent Variable: Level - Creativity
Mean = -1,37E-15
Std. Dev. = 0,966
N = 121
Frequency
Regression Standardized Residual


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Level - Creativity
Expected Cum Prob
Observed Cum Prob

Problem solving

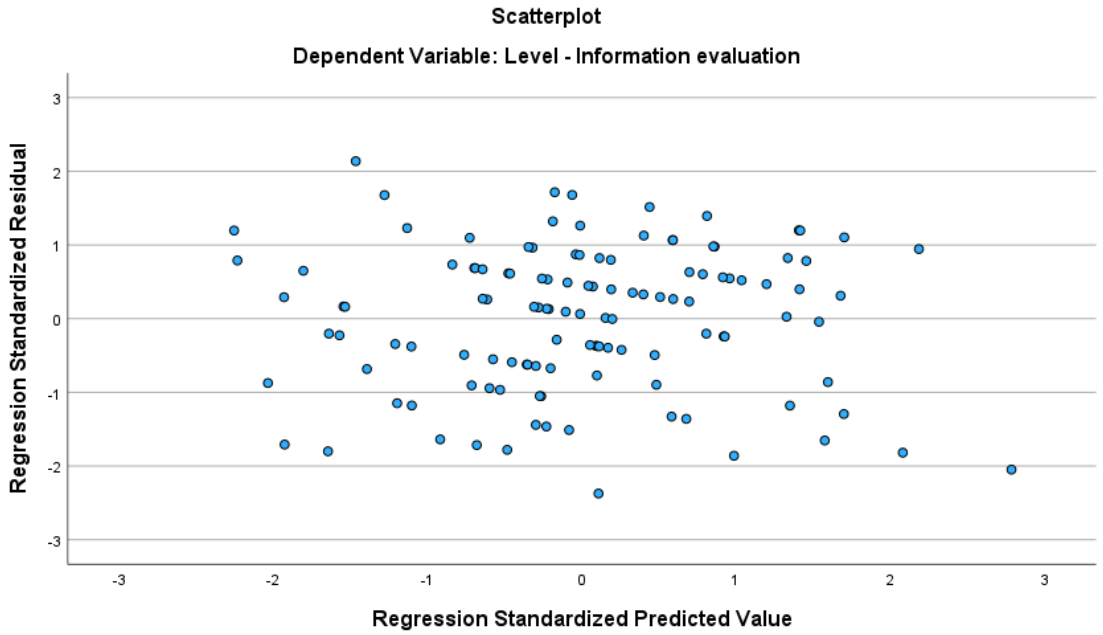




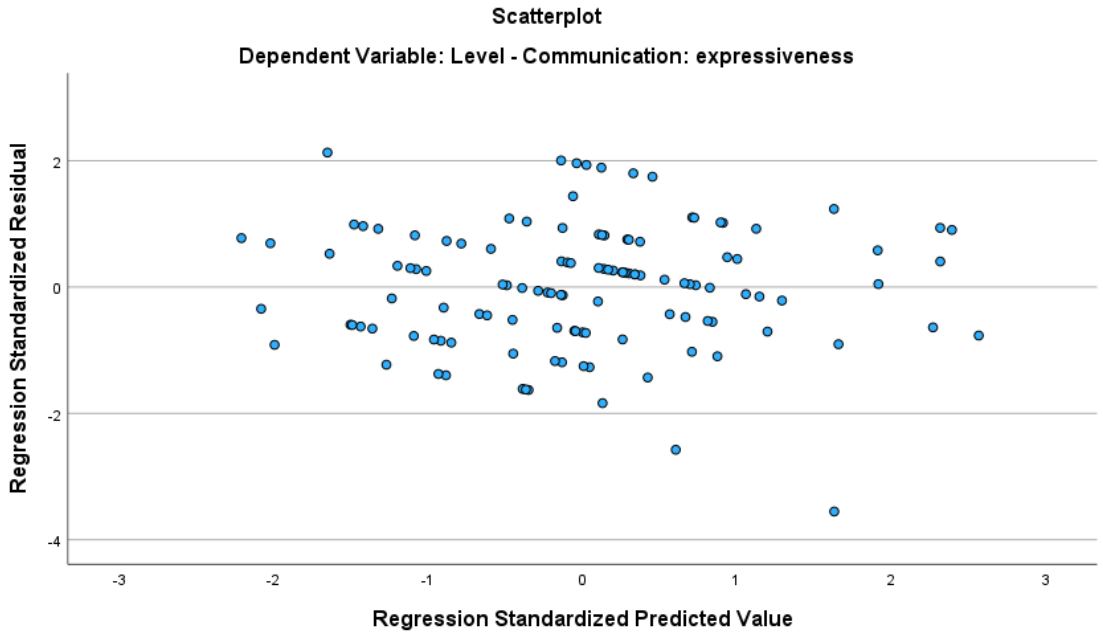
The normal P-P plot of the residuals exhibited that they were normally distributed, as the points followed the diagonal line closely.

14.3. Test for linearity homoscedasticity using scatterplots

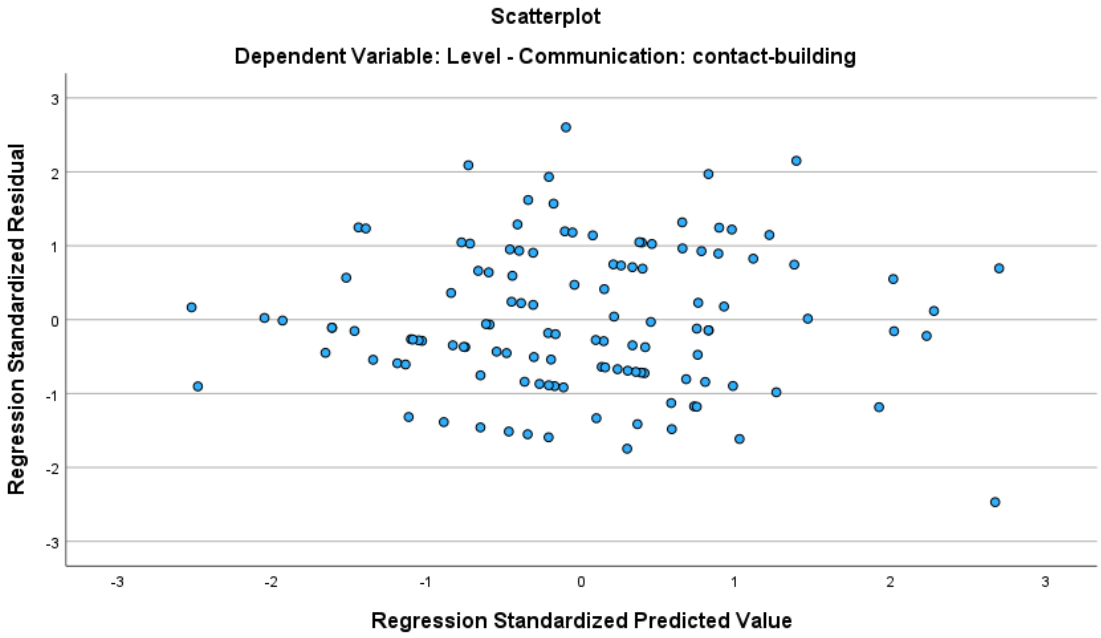
Information evaluation



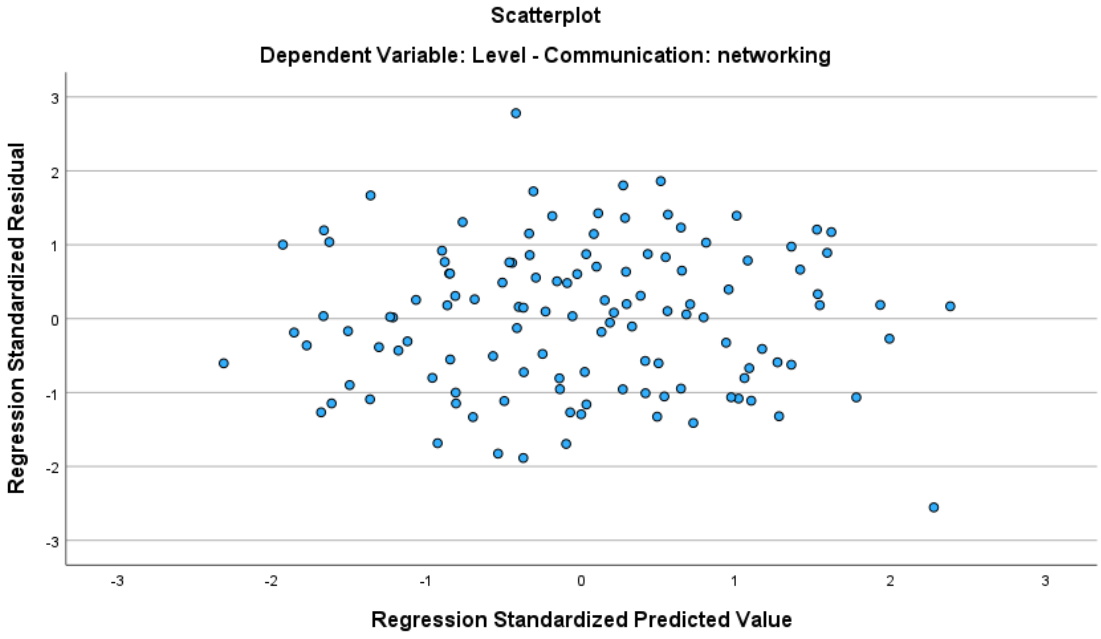
Communication Expressiveness



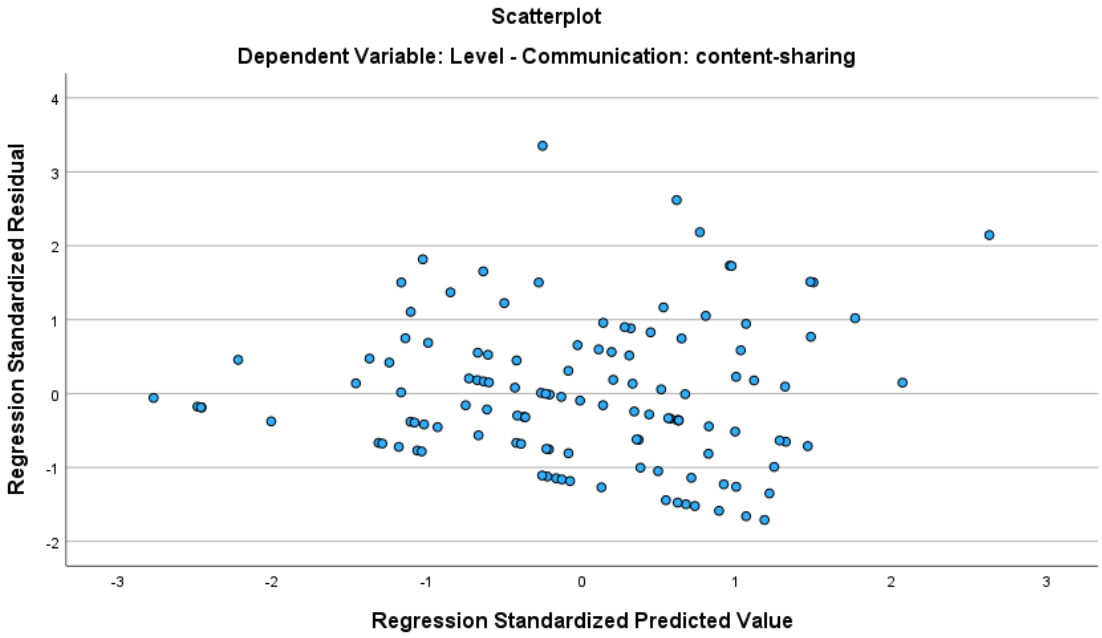
Communication: Contract-building



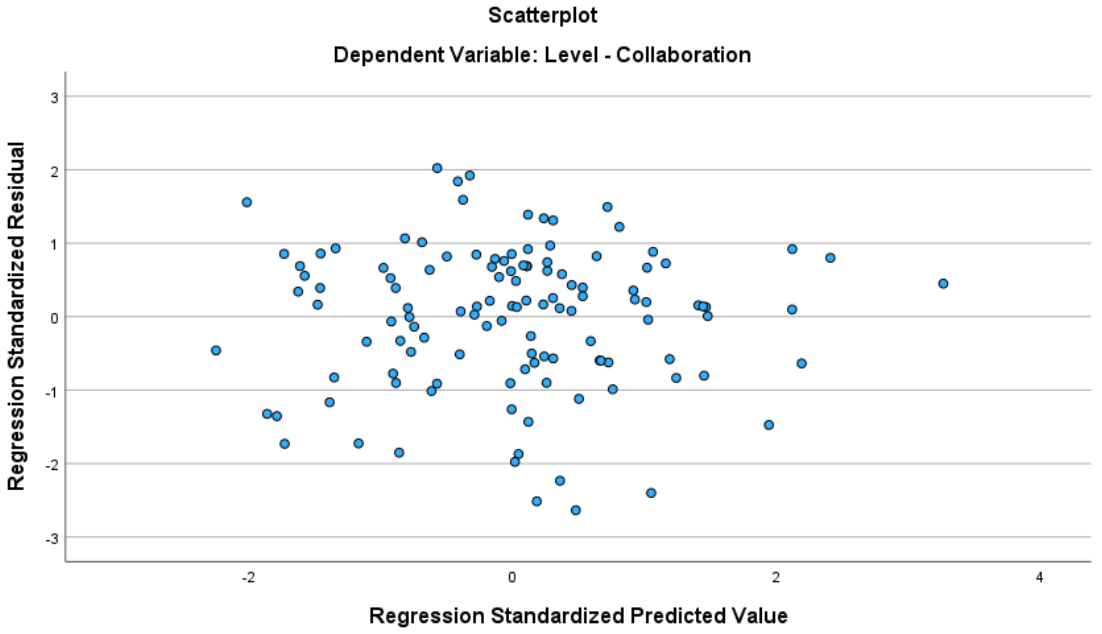
Communication: Networking



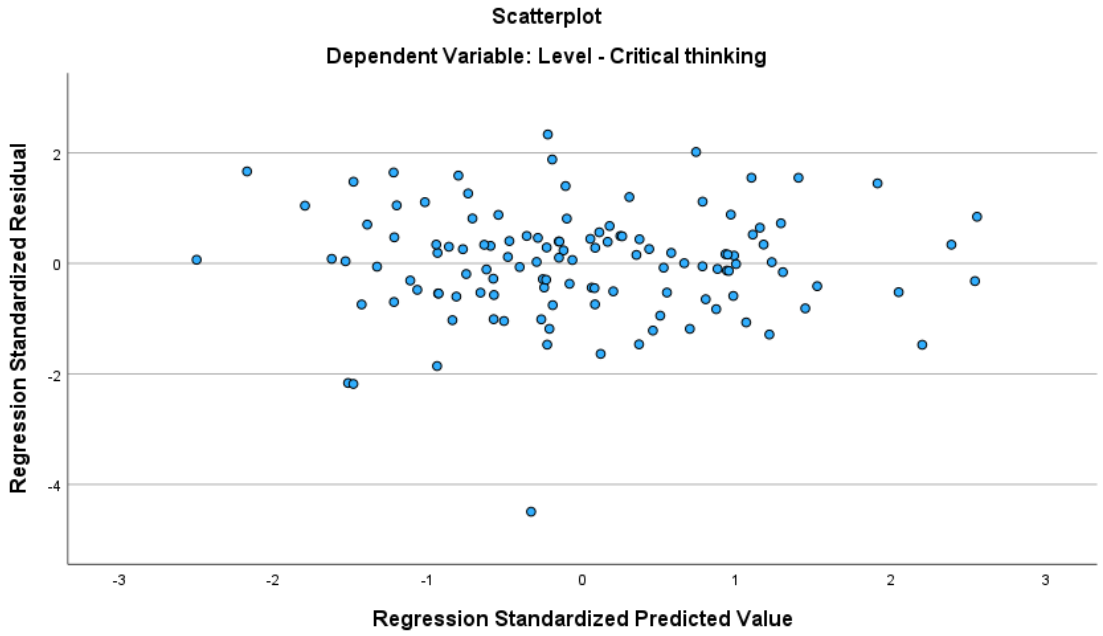
Communication: Content-sharing



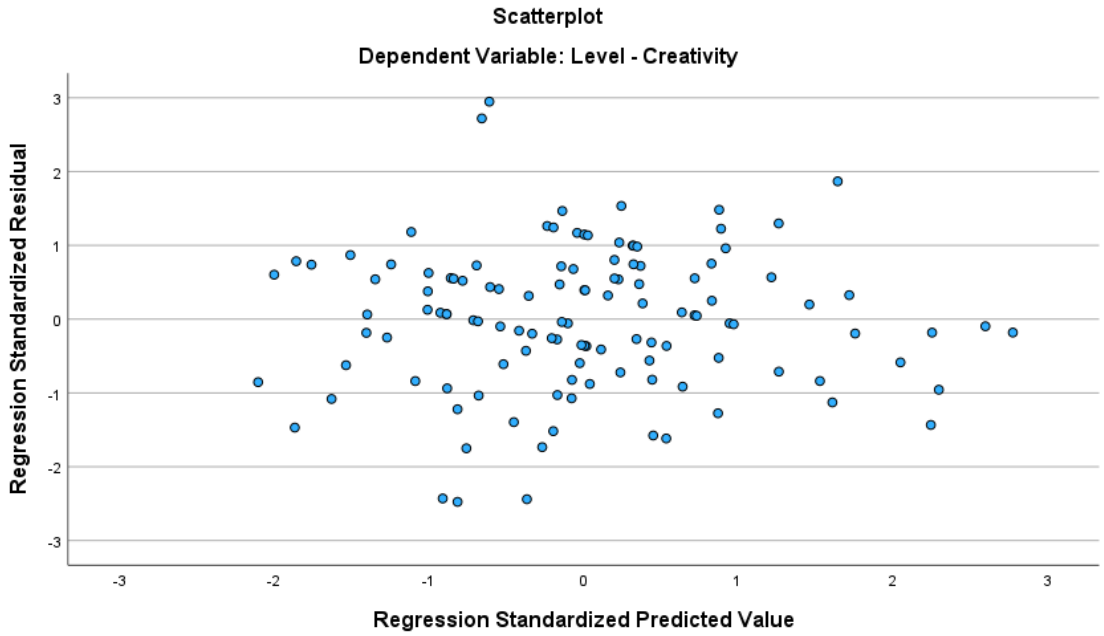
Collaboration



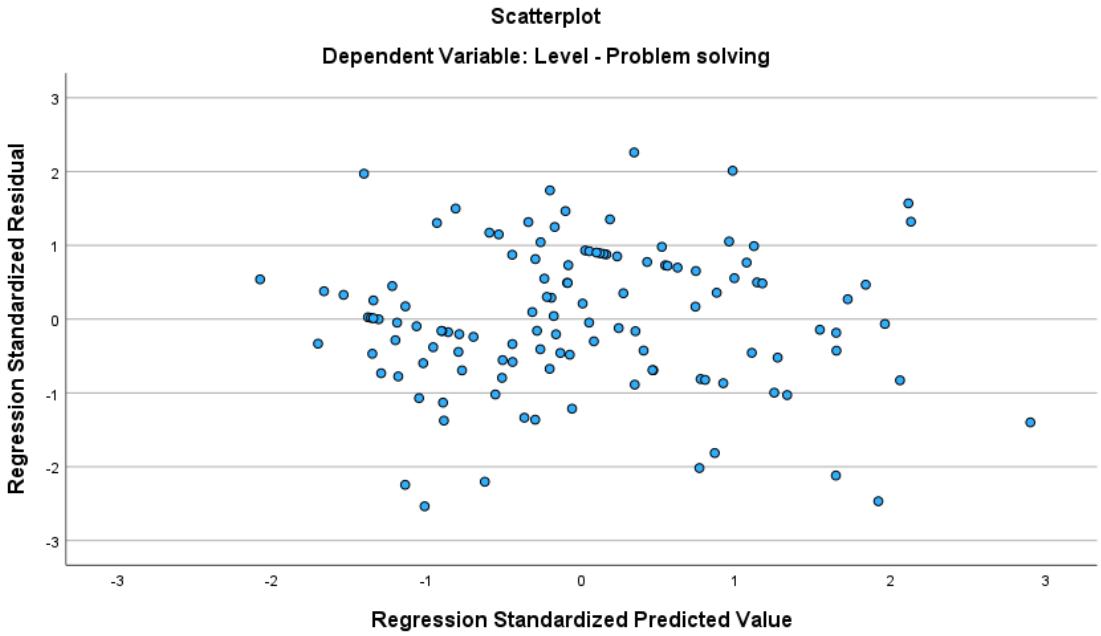
Critical thinking



Creativity



Problem solving



The scatterplots of the dependent variable and each predictor variable showed a linear relationship. The scatterplot of the standardised predicted values and the standardised residuals showed no apparent pattern, indicating that the residuals had constant variance at every level of the predictor variables.