EMPLOYABILITY OF DEVELOPMENT STUDIES GRADUATES UNDER THE FOURTH INDUSTRIAL REVOLUTION

by

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EMPLOYABILITY OF DEVELOPMENT STUDIES GRADUATES UNDER THE FOURTH INDUSTRIAL REVOLUTION

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DEDICATIONS

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ABSTRACT

The Fourth Industrial Revolution (4IR) will not only affect the economic and educational spheres but also the social fibre of our communities. This calls for a concerted effort to ensure that the country and its people are ready to exploit the opportunities that the 4IR has brought. This paper aims to highlight the employability of Development Studies students who graduated from the University of Johannesburg (UJ) between 2019 and 2021 in the middle of the 4IR.

The study adopted an explanatory sequential design, which combines quantitative and qualitative research methodologies. Web-based questionnaires and interviews were conducted, which revealed that participants felt underprepared for the workplace, lacking an understanding of 4IR and the necessary employability skills required by the 4IR. Some participants acknowledged that while 4IR is transformative, it still requires human input and intelligence, raising a human-machine interface debate. Descriptive statistical analysis was used to analyse quantitative data, and thematic analysis was used to analyse qualitative data. The study revealed that it is evident that for any country to make a smooth landing as far as 4IR is concerned, all stakeholders (educational institutions, industry, government, students, the SETAs, training providers, and the Quality Council for Trades and Occupations (QCTO)) need to work together to be able to unlock all the opportunities, including workplace learning or internships, and to re-design a fit-for-purpose curriculum.

The 4IR has transformed industries, societies, and the way we live and relate to one another. Knowing the aspirations, experiences, and readiness of the Development Studies graduates with regard to the 4IR is critical; hence, this study explored the graduates' state of preparedness and the opportunities available in the labour market. The research significantly contributes to the fields of Development Studies and 4IR, bringing awareness regarding the implications of 4IR for graduates' future employment, unpacking the role of 4IR in development work, and serving as a guideline for higher education institutions seeking to prepare Development Studies graduates for future employability.

KEY CONCEPTS

Development Studies, Fourth Industrial Revolution, Employability, Human Capital Theory, Freire's pedagogical approaches.

TSHOBOKANYO

Diphetogo tsa Bone tsa Thekenoloji (4IR) ga di ne di ama fela maphata a ikonomi le a thuto, mme di tlaa ama gape botshelo jwa baagi mo loagong. Seno se tlhoka gore go nne le maiteko a a rulaganeng a go netefatsa gore naga le baagi ba yone ba siametse go ka dirisa ditšhono tse di tlisitsweng ke 4IR. Pampiri eno e ikaelela go tlhagisa kgonagalo ya go thapega ga baithuti ba Dithuto tsa Tlhabololo ba ba alogileng kwa Yunibesithi ya Johannesburg (UJ).

Thutopatlisiso e tsere thadiso e e tlhalosang tatelano ya ditiragolo, e e tlhakanyang mmeo wa patlisiso wa khwanthitatifi le wa khwalitetifi. Go dirilwe mebotsolotso le dikopanotherisano tsa seranyane, mme di senotse gore batsayakarolo ba ikutlwa ba sa siamela mafelotiro, ba sa tlhaloganye 4IR mme gape ba se na dikgono tse di tlhokegang tsa go ka thapega tse di tlhokegang malebana le 4IR. Batsayakarolo ba bangwe ba dumela gore le fa 4IR e fetola, e sa ntse e tlhoka tsenyo le botlhale jwa batho, mme e baka dikganetsano tsa batho kgatlhanong le metšhini. Go dirisitswe tokololo ya dipalopalo tse di tlhalosang go lokolola datha ya khwanthitatifi mme go dirisitswe tokololo ya merero go lokolola datha ya khwalitatifi. Thutopatlisiso e senotse gore go a bonala gore, gore naga epe fela e tsene bobebe mo mererong ya 4IR, baamegi botlhe (ditheo tsa thuto, madirelo, puso, baithuti, diSETA, batlamedi ba katiso le Lekgotla la Boleng la Ditiro (QCTO)) ba tshwanetse go dira mmogo gore ba kgone go bulela ditšhono tsotlhe, go akarediwa go ithutela tirong, le go thala sešwa kharikhulamo e e maleba.

4IR e fetotse madirelo, baagi, le tsela e re tshelang le go amana ka gone. Go itse dikeletso, maitemogelo, le go siama ga dialogane tsa Dithuto tsa Tlhabololo malebana le 4IR go botlhokwa; ke ka moo thutopatlisiso eno e tlhotlhomisitseng seemo sa dialogane sa go siama le ditšhono tse di gone mo mmarakeng wa ditiro. Patlisiso e tshwaela mo maphateng a Dithuto tsa Tlhabololo le 4IR mme e tlisa temoso malebana le bokao jwa 4IR mo go thapegeng ga dialogane mo isagong, e atolosa seabe sa 4IR mo tirong ya tlhabololo, mme gape e le kaedi ya ditheo tsa thuto e kgolwane tse di batlang go siamisetsa dialogane tsa Dithuto tsa Tlhabololo go thapega.

SETSOPOLWA

Lebakanako la Tšhomišo ya Metšhene go dira Mešomo (4IR) le ka se ame fela maemo a tša ekonomi le a thuto fela eupša le tla ama gape seemo sa tša leago go ditšhaba tša rena. Se se ipiletša go matsapa ao a tseneletšego go netefatša gore naga ye le batho ba yona ba lokile go diriša dibaka a tšeo 4IR e di tlišitšego. Pampiri ye e ikemišeditše go ahlaahla go thwalega ga baithuti ba Dithutamahlale tša Tlhabollo bao ba phethilego dithuto tša bona ka Yunibesithing ya Johannesburg (UJ) magareng ga 2019 le 2021 mabapi le phethagatšo ya 4IR.

Dinyakišišo tše di dirišitše tlhamo ya tatelano ya tlhalošo, yeo e kopanyago mekgwa ya dinyakišišo ya bontši le ya boleng. Dipotšišonyakišišo tše di theilwego go wepsaete le go dipoledišano di dirilwe, tšeo di utollotšego gore bakgathatema ba ile ba ikwa gore ga se ba itokiša ka fao go lekanego go lefelo la mošomo, go hloka kwešišo ya 4IR le mabokgoni ao a hlokegago a go thwalega ao a nyakwago ke 4IR. Bakgathatema ba bangwe ba dumetše gore 4IR e a fetošwa, e sa nyaka go šoma ga batho le bohlale, go hlatloša ngangišano ya magareng ga batho le metšhene. Tshekatsheko ya dipalopalo ya tlhalošo e šomišitšwe go sekaseka tshedimošo ya bontši, gomme tshekatsheko ya merero e šomišitšwe go sekaseka tshedimošo ya boleng. Dinyakišišo di utollotše gore go molaleng go naga efe goba efe e amogela 4IR gabonolo ka fao go kgonagalago, batšeakarolo ka moka (dihlongwa tša thuto, intasteri, mmušo, baithuti, di-SETA, baabi bao ba hlahlago, le Khansele ya tša Boleng ya Dikgwebišano le Mešomo (QCTO)) ba swanetše go šoma mmogo gore ba kgone go bula dibaka ka moka, go akaretšwa go ithuta goba go ithutela mošomo, le go hlama leswa lenaneothuto leo le loketšego maikemišetšo.

4IR e fetošitše diintasteri, ditšhaba, le ka tsela yeo re phelago ka gona le go amana. Go tseba ditlhohlo, maikemišetšo, le gore go itokišetša ga baithuti bao ba phethilego Dithutamahale tša Tlhabollo mabapi le 4IR go bohlokwa; ke ka lebaka leo, dinyakišišo tše di lekotšego seemo sa go itokišetša ga baithuti bao ba phethilego dithuto le dibaka tše di hwetšagalago ka mmarakeng wa bašomi. Dinyakišišo tše di tsenya letsogo kudu go makala a Dithutamahlale tša Tlhabollo le 4IR, go tliša temogo mabapi le diabe tša 4IR go mešomo ya ka moso ya baithuti bao ba phethilego dithuto, go lekola tema ye e

kgathwago ke 4IR ka mošomong wa tlhabollo, le go šoma bjalo ka tlhahlo go dihlongwa tša thuto ya godingwana tše di nyakago go lokišetša baithuti ba Dithutamahlale tša Tlhabollo gore ba hwetše mešomo ka moso.

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LIST OF ABBREVIATIONS

1IR	First Industrial Revolution
3D Printing	Three-dimensional printing
3IR	Third Industrial Revolution
4IR	Fourth Industrial Revolution
4IR PMO	Fourth Industrial Revolution Project Management Office
AI	Artificial intelligence
CET	Community Education and Training Colleges
Covid-19	Coronavirus disease
CPA	Communal Property Association
CPS	Cyber Physical System
DCDT	Department of Communications and Digital Technologies
DHET	Department of Higher Education and Training
DIPEM	Division for Institutional Planning, Evaluation and Monitoring
EDMS	Electronic Document Management System
EL	Experiential Learning
EQPRS	Electronic Quarterly Performance Reporting System
Eskom	Electricity Supply Commission
HCT	Human Capital Theory
HEIs	Higher Education Institutions
ICET	International Council for Educating Teachers
ICT	Information and Communications Technology

IoT	Internet of Things
Iscor	Iron and Steel Industrial Corporation Limited
IT	Information Technology
MICT SETA	Media, Information, and Communication Technologies Sector Education and Training Authority
MTT on 4IR	Ministerial Task Team on the Fourth Industrial Revolution
NDP	National Development Plan
NISIS	National Integrated Social Information System
NGOs	Non-Governmental Organisation
NPOs	Non-Profit Organisations
NSF	National Skills Fund
OECD	Organisation for Economic Co-operation and Development
OFO	Organising Framework for Occupations
PC4IR	Presidential Commission on Fourth Industrial Revolution
PC4IR SIP	Presidential Commission on Fourth Industrial Revolution Strategic Implementation Plan
PSET	Post-School Education and Training System
QCTO	The Quality Council for Trades and Occupations
SAERA	South African Education Research Association
SARS	Severe Acute Respiratory Syndrome
SETAs	Sector Education and Training Authorities
SMMEs	Small, Medium and Micro Enterprises
SoNA	State of the Nation Address

SPSS	Statistical Package for the Social Sciences
STEM	Science, Technology, Engineering, and Mathematics
ToR	Terms of Reference
TVET	Technical Education and Vocational Training Colleges
UJ	University of Johannesburg
UIF	Unemployed Insurance Fund
UNISA	University of South Africa
WEF	World Economic Forum
WIL	Work Integrated Learning
WITS	University of Witwatersrand
WWW	World Wide Web

CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

The Fourth Industrial Revolution (4IR), also known as Industry 4.0, is regarded as an important emerging phenomenon that is likely to reconfigure societies and people throughout the world in ways that are unimaginable (Carrim 2022). According to researchers, employability is one of the primary issues haunting higher education institutions (HEIs) globally (Abelha, Fernandes, Mesquita, Seabra & Ferreira-Oliveira 2020; Krajnakova, Pilinkienė & Bulko 2020). In the global competitive knowledge economy, where change is inevitable, the importance of employability of graduates remains a thorny issue among policymakers, scholars, and academia alike (Römgens, Scoupe & Beausaert 2020). Typically, Higher Education Institutions (HEIs) are expected to be forward-thinking and adaptable, ensuring that their programmes and contents remain reflective of contemporary realities.

However, technology has become internalised, so employers need a highly skilled workforce, and others have modified the ways and forms of doing their business (Krajnakova et al 2020). The advent of the 4IR has compounded the problem, which requires countries to respond by creating new strategies, policies, and innovative plans to foster an inclusive societal approach, with the government taking a leading role.

In response to the dawn and proliferation of artificial intelligence (AI) and robotics applications, in April 2019, Mr. Cyril Ramaphosa, the President of South Africa, initiated the establishment of the Presidential Commission on the Fourth Industrial Revolution (PC4IR), made up of 30 members, each representing a different stakeholder group, including business, government, academia, research institutions (science and technology), and experts in the various fields, such as finance, banking, labour, SMMEs, youth, women, people living with disabilities, and NGOs (Department of Communications and Postal Services 2019).

This is indicative of the complex task at hand and, thus, a requirement for a more comprehensive viewpoint and strategy (Corfe 2018). PC4IR was approved by Cabinet on 30 January 2019 (Department of Communications and Digital Technologies 2022). This was followed by the establishment of the 4IR Project Management Office (4IR PMO) to develop the PC4IR Strategic Implementation Plan (PC4IR SIP) and the 4IRSA Partnership. The 4IR PMO's main responsibility is to organise, lead, and oversee the 4IR initiatives or programmes. Consequently, the National Digital Skills Strategy was developed in 2020 (Department of Communications and Digital Services 2020) which outlines multiple layers at which digital skills need to be prioritised as well as various methods to improve digital skills.

The strategy highlights three strategic implications for its successful implementation. Firstly, there is an implication for education, society, and the economy, which calls for the education sector, including the Sector Education and Training Authorities (SETAs), to invest and prioritise in specialised digital 4IR skills. This includes investing in the development of digital innovation skills across various sectors such as mining, agriculture, manufacturing, health services, and postal services. Secondly, cybersecurity is highlighted, emphasising the importance of giving equal attention to cybersecurity skills alongside other digital skills. Thirdly, monitoring and evaluation are emphasised as mechanisms to cultivate strong resilience for the strategy's successful implementation (Department of Communications and Digital Services 2020). The strategy aims to provide a roadmap for priority digital skills action points and foster stakeholder collaboration. Previously involved partners included the University of Johannesburg, Wits University, the University of Fort Hare, Telkom, Vodacom, Deloitte, DTPS, and Huawei, among others (Carrim 2022).

1.1.1 Functions of higher education

Higher education institutions play a crucial role in shaping our society. They equip graduates with specialized skills and knowledge essential for fostering innovation and productivity in various sectors, thereby enhancing career opportunities and contributing to broader economic advancement. Higher education institutions (HEI) are deemed significant in addressing the needs of the marketplace and transforming the society for better (Yende 2021). Tilak (2008) lists the following as the traditional functions of higher education institutions:

- Contribute to the creation, promotion, absorption, and sharing of knowledge through research and teaching. This represents the notion that universities are focal points of ideas, innovations, and progress, gradually transforming into repositories of knowledge (Yende 2021; Tilak 2008).
- Support the economy's fast technological advancement by bringing in a skilled labour force with the appropriate knowledge and skills (namely, professional, technical, and managerial skills) (Al-Maskari, Riyami & Ghnimi 2022). This is emphasised by Tilak (2008), who stated that as societies transform into societies, higher education needs to play its part by supplying the economy with knowledge workers who are all-rounders. This would assist the communities in reaping the gains associated with globalisation.
- Assist in building the moral compass of the graduates and effecting attitudinal changes.
- Assist in the establishment of a strong nation-state; strengthen democracy by fostering the development of better citizens who engage in political, civil, political, economic, social, and cultural societal activities; and understand, interpret, improve, maintain, and promote regional, national, global, and historical cultures within an environment of cultural diversity and plurality. Furthermore, it has the ability to generate highly skilled and innovative social and political leaders (Tilak 2008; Yende 2021).

1.1.2 Contextualizing Development Studies in the era of the 4IR

Development Studies draws insights from sociology, economics, anthropology and political science to address issues related to development, such as inequality, poverty and social change (Malan 2021). The main goal is to improve the quality of life and economic well-being of people, particularly in developing countries, by understanding and addressing the complex factors that influence development processes and outcomes (Khoo 2015). Within the human sciences, which encompass a wide range of disciplines studying human behaviour, societies, and cultures (Cameron, Tiessen, Grantham & Husband-Ceperkovic 2019). Development Studies focus on analysing social structures, economic systems, and political institutions to comprehend how they interact and affect human development. This interdisciplinary approach is crucial for understanding the multifaceted nature of development and for formulating effective strategies to address global development challenges (Baud, Basile, Kontinen & Itter 2018).

Development Studies graduates are equipped with critical thinking, communication, and analytical skills (Cameron et al 2019). These graduates find value in their ability to adapt to various roles in the professional world, particularly in NGOs, government, and international organizations (Tiessen, Grantham & Cameron 2018). Despite the challenges of entering a competitive job market, Development Studies graduates report that their interdisciplinary training and experiential learning opportunities, such as internships and fieldwork, are crucial for securing employment and thriving in their careers (Cameron et al 2019; Tiessen et al 2018).

The emergence and rapid expansion of the Fourth Industrial Revolution (4IR), characterized by the fusion of physical, digital, and biological technologies, have profound implications for human existence and behaviour (Kayembe & Nel 2019; Xing & Marwala 2017). Automation and artificial intelligence are transforming labour markets by creating new job opportunities while rendering some jobs obsolete (Wessel 2020; Corfe 2018). This shift necessitates a re-evaluation of education and skills development to prepare the workforce for emerging roles.

Development Studies must explore its connections to these technological and societal changes brought about by the 4IR. This involves analysing economic policies to mitigate the adverse effects of automation and promote inclusive growth, addressing social inequalities by leveraging digital technologies to improve (Al-Maskari et al 2022). Additionally, it requires formulating governance strategies that ensure the ethical management of new technologies, protecting individual rights and freedoms while benefiting society as a whole, and integrating technological innovations with sustainable development goals to address environmental challenges and promote long-term resilience (Department of Higher Education and Training 2020).

1.1.3 Understanding of the 4IR

The term 4IR, coined by Klaus Schwab, the founder and executive chairman of the World Economic Forum (WEF), describes 4IR as a reality where people effortlessly navigate between digital and physical environments, leveraging connected technologies to enhance and manage their daily activities (Xu, David & Kim 2018). 4IR is marked by a variety of new technologies that integrate the physical, digital, and biological realms. This integration has given rise to cyber-physical systems (CPS), which include a combination of technologies such as AI, smart manufacturing, the Internet of Things (IoT), robotics, cloud computing, 3D printing, genome editing, big data, augmented and virtual reality, autonomous vehicles, and advanced wireless technologies (Department of Higher Education and Training 2020; Lorenz, Tessarin & Morceiro 2019; Setyaningsih 2020; Xing & Marwala 2017) (Figure 1.1). According to Carrim (2022) these interfaces between physical and cyber systems are expected to surpass the advancements witnessed during the third industrial revolution (3IR), often referred to as the digital age.

This marks a fundamental shift in how people live, learn, work, and interact with one another, affecting all fields (including Development Studies), economies, and sectors (Department of Higher Education and Training 2020; Kayembe & Nel 2019; Xing & Marwala 2017). This involves the requirement for digital skills in the labour market generated by the advent of the 4IR. According to the Department of Higher Education and Training (2020:23), “the 4IR distinguishes itself from its predecessors due to its rapid velocity, exponential growth rate, extensive scope, deep convergence, and

comprehensive impact on industries, businesses, governments, and societies". This transformation is evident in the transition from labour-intensive manufacturing to production reliant on knowledge and skills. To meet these demands, countries will require a readily available pool of digital, commercial, technical, and managerial expertise. The First Industrial Revolution (1IR) began in the eighteenth century (1760-1850) with significant inventions like the steam engine, the spinning Jenny, the mechanical loom, and other revolutionary factory machines (Xu et al 2018; Moll 2022).

Textiles and cotton dominated consumption, distribution, and production during the 1IR, making mass production of clothing and textiles possible (Moll 2022). During the 1IR, there was a major shift from workers using their hands to using machines to increase production, signalling a move from manual techniques (handcraft) to mechanised production, which required inventors, technicians, and mechanics, leading to socioeconomic inequalities, slave trade, labour migration, and the emergence of townships and slums (Alexander 2022). During the 1IR era, coal emerged as the primary energy source, and trains became the main mode of transporting goods (Xu et al 2018).

In this era, textiles and steel stood out as the leading industries in terms of both employment and capital investment (Xu et al 2018). The rising demand for iron and steel led to the establishment of the South African Iron and Steel Industrial Corporation Limited (Iscor) in 1928, highlighting the emergence of a significant iron and steel industry in South Africa (Mkansi & Landman 2021). The second industrial revolution (2IR) unfolded from 1865 until 1914, following the invention of the internal combustion engine (Moll 2022; Xu et al 2018). Known as the Industrial Age, this era was characterised by rapid industrialisation driven by the use of oil and electricity to power mass production (Xu et al 2018). This is the era of great innovation: telephones, electric light bulbs, tall buildings, electrified streets, motor cars, aeroplanes, the unsinkable Titanic, and radio (Moll 2022). It is during the 2IR that the mode of transport started, including roads, infrastructure, or highways, utilizing alternative sources of energy or fuel, which included biodiesel, diesel, and petrol (Moll 2022).

The third industrial revolution (3IR) started in 1969 and is also known as the digital revolution, the computer revolution, or the information age (Kayembe & Nel 2019) as the

economy and production or manufacturing during this era centred on information technology (IT) and electronics (Moll 2022; Xu et al 2018). This era is marked by the invention of the Internet, personal computers, laptops, cell phones, the World Wide Web, or WWW (the web), nuclear energy, and space technology (Moll 2022). In the 4IR, there is a transition towards three-dimensional (3D) printing and computer-generated product design, shifting from traditional methods reliant on screws or welding (Moll 2022; Xu et al 2018). It is also referred to as the knowledge era, characterised by artificial intelligence (AI). Over and above the capabilities and opportunities that are associated with the 4IR, research indicates that the 4IR is altering the way individuals live, work, and interact with one another (Morrar, Arman & Mousa 2017; Carrim 2022; Media, Information and Communication Technologies Sector Education and Training Authority 2022).

This often comes with substantial costs and far-reaching consequences. In South Africa, for instance, the financial services labour market is undergoing restructuring, leading to numerous companies laying off employees due to task automation or displacement (Department of Higher Education and Training 2020; Manda & Dhaou 2019). The retail, services, and financing sectors are among the few sectors hard hit by technological advancement. For example, the banking institutions, postal services, and retail sectors have started their rationalisation process by moving away from brick and mortar to virtual stores. The mining and manufacturing industry and retail are not immune to the negative effects of the 4IR either, or neither is the call center industry (Battista, Grayling & Hasselaar 2023).

One of the examples of the benefits of the 4IR technologies was the introduction of call centres. Their existence lowered the need for face-to-face communication and travel costs (Adeyemi, Saouli & Sinha 2018). However, with the advancement in communication and computer technology, most businesses are integrating new technologies such as big data, digitalisation/digital transformation, and cloud computing (Adeyemi et al 2018). Examples of digitalisation include the American multinational fast-food chains McDonald's and KFC, which are the biggest fast-food chains in South Africa. They are taking full advantage of the technological advancement by providing customers with self-service kiosks that allow customers to order and pay for their favorite meals in-store, unassisted.

Such automation, which eliminates the interaction with the cashier, may lead to downsizing or retrenchments (Corfe 2018; Wessel 2020).

The changes that are listed above come with a high cost for developing countries like South Africa. The unemployment rate has increased to 32.9 percent in the second quarter of 2023 (Statistics South Africa 2023a). In the third quarter of 2023, individuals with less than matriculation experienced a higher unemployment rate of 38.8 percent (up by 0.5 of a percentage point), while graduates had a lower unemployment rate of 8.5 percent (down by 1.1 percentage points) compared to the second quarter of 2023 (Statistics South Africa 2023b). Additionally, year-on-year comparisons indicated a substantial decline in the unemployment rate among graduates (down by 2.2 percentage points) (Statistics South Africa 2023b). This aligns with international trends, which suggest that “tertiary-educated graduates are often associated with low levels of unemployment” (Krajnakova et al 2020:211). The National Development Plan urges academia to create curricula and educational programs that can adapt to the rapidly advancing pace of technology (Department of Higher Education and Training 2020).

Figure 1.1 illustrates the multifaceted impact of the Fourth Industrial Revolution (4IR) across three interconnected spheres: Technology Revolution, Changing Business Models and Government, and Transforming Society. The Technology Revolution highlights advancements such as AI, IoT, and blockchain that drive innovation and connectivity. Changing Business Models and Government focuses on how businesses and governance are evolving with new business models, automation, and increasing customer expectations. Transforming Society explores societal changes, including shifts in demographics, work patterns, and digital identity (Department of Higher Education and Training 2020). The diagram highlights the importance of integrating technological proficiency, adaptability to evolving business models, and understanding societal changes into Development Studies curricula. It suggests that Development Studies curricula should include courses that familiarize students with emerging technologies like AI, blockchain, and big data. Understanding these technologies is crucial for Development Studies graduates to contribute to development projects effectively and to stay relevant in a tech-driven job market (Wessels 2020).

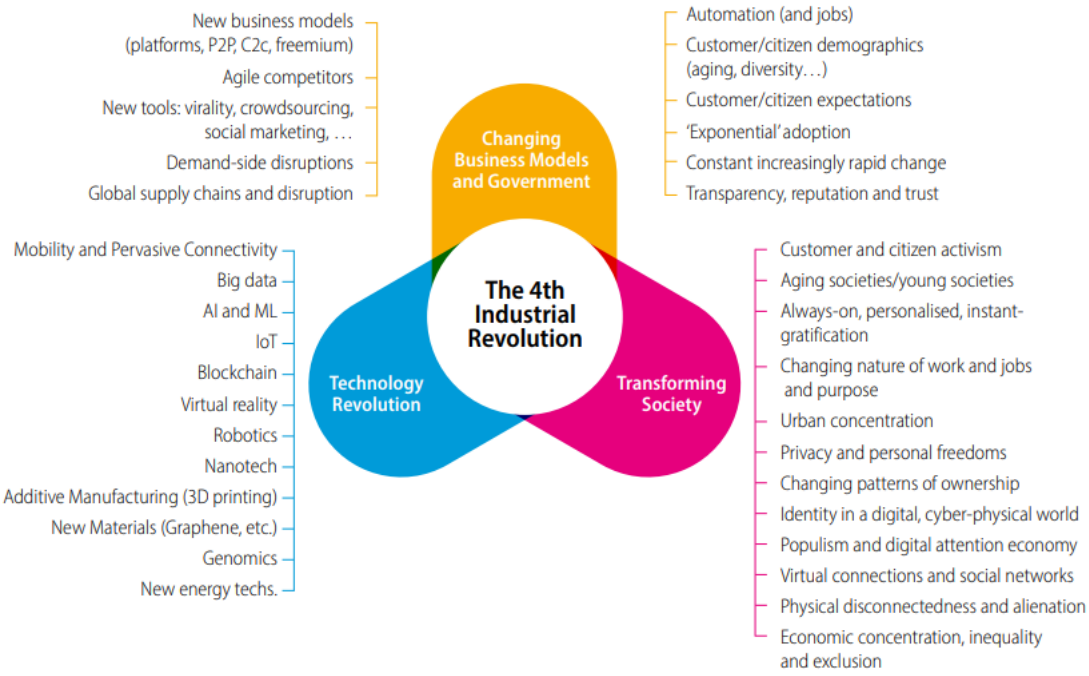

Figure 1.1: Elements of the Fourth Industrial Revolution (Source: Department of Higher Education and Training 2020:22)

In brief, the first three industrial revolutions (namely, 1IR, 2IR, and 3IR) are often characterised differently. For instance, the first was driven by the steam engine, the second by electricity, and the third by digital technology (Kayembe & Nel 2019; Schwab & Nicholas 2018). The 4IR brings in robots, AI and big data (Carrim 2022). A study conducted by Mouchipkhu (2019) at the UJ found that the faculty of human sciences has the highest percentage of unemployed graduates. This raises concerns about the employability skills imparted to these graduates and questions about how the emergence of 4IR might exacerbate the situation. Development Studies is a subject area of the faculty of human (social) sciences or humanities.

In brief, the field of Development Studies is multidisciplinary in nature and studies policies, patterns, and theories related to inequality in global development (Khoo 2015). Development Studies brings together knowledge from history, anthropology, economics, geography, sociology, and many other disciplines. However, it is very difficult to fully

understand and predict the impact that the 4IR has on the future employability of graduates in this multidisciplinary field of study. The university is acknowledged as a key site for both the development and execution of the 4IR (Wessels 2020). This is enunciated further by the expectation that these institutions, globally, are expected to contribute to the advancement and development of their societies by employing learning and teaching strategies that cultivate well-rounded graduates (Yende 2021).

The majority of existing perspectives on employability consider it to be a combination of skills, including both generic and transversal skills (e.g., teamwork, analyse and communicate information, organisational, problem solving, self-management, emotional intelligence, computer and digital competence, information and communication literacy, leadership, entrepreneurship, research skills, planning), and discipline specific (e.g., the knowledge and skills relevant to Development Studies, law, engineering, social work, etc.), as well as personal attributes (e.g., organisation and time management, critical thinking, creativity, self-esteem, self-efficacy, and self-confidence, resilience, discipline, loyalty, integrity, willingness to learn, enthusiasm, motivation) which are essential for employment and highly valued by industries (Abelha et al 2020; Krajnakova et al 2020; Rowe & Zegwaard 2017; Tran 2019).

1.2 STATEMENT OF THE RESEARCH PROBLEM

According to the Department of Higher Education and Training (DHET) Report of the Ministerial Task Team on the Implications of the 4th Industrial Revolution for the Post-School Education and Training System (PSET) (2020), the formal PSET sector lacks adequate preparation to capitalise on the opportunities arising from the 4IR for the country and its citizens. Another concern that was raised by the report is the opinion that the current programmes, curricula, and courses are misaligned with labour. Likewise, the industry believes that higher education institutions (HEIs) should provide graduates with the requisite skills needed to succeed in the workplace (Robinson & Garton 2008). However, there is a perception that the South African public education system is under significant strain in terms of equipping learners with digital skills and creative thinking necessary to contribute effectively to the knowledge economy (Department of

Communications and Digital Technologies 2021). This is primarily due to a lack of resources to develop the relevant infrastructure and procure the required equipment, tools, and machinery.

The foregoing factors lead to the production of outdated skills with catastrophic consequences. This is partly because 4IR renders some people's jobs obsolete while others are replaced by new ones, leading to drastic changes in the labour market (Corfe 2018; Setyaningsih 2020). Likewise, the Department of Higher Education and Training (2020) has observed that the current demand for skills related to the 4IR far exceeds the available supply, resulting in more job vacancies than graduates each year. This is commonly referred to as a skill imbalance. A skills imbalance is a misalignment between the demand and supply of skills in an economy. Conversely, Alexander (2022) suggests that in a 4IR system, competency and skills may hold greater significance than qualifications (e.g., creativity, critical thinking, problem-solving). There is a need to clarify what qualifications is Alexander referring to in his/her attestation.

Despite the extensive literature on the impact of 4IR on various sectors, there is limited research specifically addressing the employability of Development Studies graduates within this context. Research suggests that curricula in many fields, including Development Studies, may not fully align with the latest industry trends and technological advancements. This gap in curriculum relevance can affect Development Studies graduates' readiness for the workforce. Graduates often feel unprepared for the rapidly changing technological world and the new skill sets demanded by modern workplaces (Al-Maskari et al 2022). Adegbite & Adeosun (2021) suggest that both soft and technical skills will be in demand in the future job market, driven by technological advancement. Wessels' (2020) study revealed a significant gap in students' understanding of employability skills essential for the 4IR between the future labour market's requirements and students' perceptions of the skills necessary for future employability. Many studies highlight a mismatch between the skills taught in HEI and those required by employers in the 4IR. Previous studies have examined general employability trends and the effects of 4IR on various professions (Alam & Ogawa 2018; Bingham & Porter 2021) but they often overlook the unique challenges and opportunities faced by graduates from Development

Studies field. This oversight creates an opportunity for new research to fill this gap by providing a detailed examination of how Development Studies graduates perceive their readiness and competence in the evolving job market and strategies for improving their employability in the context of 4IR.

Considering the above, this research attempts to fill the gap by investigating the job preparedness and employability of Development Studies graduates from UJ in the thick of 4IR. Through this exploration, the study seeks to offer valuable insights that will address the discrepancy between graduates' perceptions of readiness or preparedness and the actual skill demands of the dynamic labour market characterised by 4IR.

1.3 BACKGROUND OF THE STUDY

Amid the 4IR, marked by the merging of digital technologies, AI, and extraordinary connectivity, the world of work is undergoing a profound shift, with huge ripple effects. As stated in the foregoing paragraphs, 3IR was digitally based, and 4IR brought with it data, AI, and robots, among others. This brings with it a new skill set, a new curriculum, and a need for retraining or reskilling to avoid mass retrenchments and industrial and social unrest (Carrim 2022). This study seeks to explore and gain insight into the unique position of Development Studies graduates in this transformative era. The study seeks to examine how Development Studies graduates navigate the complexities of the 4IR. By understanding their unique approaches, strategies, skill sets, adaptability, and potential contributions to evolving industries.

Despite the existing study on the impacts of 4IR on employability, there is a notable lack of focused studies investigating its specific effects on Development Studies graduates. Current literature mainly focuses on the technical skills required for fields like engineering and IT, while often overlooking the interdisciplinary and unique skill sets crucial for Development Studies professionals. For example, authors such as Kayembe and Nel (2019) discuss the growing demand for digital proficiency, without exploring analysis and community development skills related to Development Studies. This gap signifies a crucial area for investigation, as understanding these specific requirements can better align educational outcomes with the evolving demands of the job market under the 4IR.

Existing studies often emphasize technical skills, neglecting the importance of soft skills such as critical thinking and adaptability. By investigating the specific employability skills needed by Development Studies graduates, this study aims to fill this gap, providing a holistic understanding of both technical and soft skills required in the context of 4IR, thereby contributing to the advancement of knowledge in the field.

This study will offer valuable insights into the role and impact of these graduates in a world where global issues and new technologies are closely connected.

1.4 SIGNIFICANCE OF THE STUDY

While there is extensive literature and research on the impact of 4IR on society in general, there is scanty research conducted on the employability of university graduates, in particular, Development Studies graduates in the middle of the 4IR, particularly in South Africa. This is the main reason that triggered this current research. The goal of this study is to close this gap by offering insights that can be applied to enhance the employability of graduates, particularly Development Studies graduates. The study aims to make several significant contributions to the fields of Development Studies, 4IR, and future employment. The anticipated outcomes of the study include:

1) Assisting Development Studies graduates in understanding the 4IR and its impact on their future job opportunities or employability.
2) Empower graduates to better prepare themselves for the dynamic world of work driven by technological advancement.
3) Provide support for the need to repurpose and reconfigure curricula to ensure that students acquire the updated skills essential for developing, managing, and utilizing these new technologies. (Department of Higher Education and Training 2020).
4) It is further envisaged that the results of this study will inform the government national response action plan, policies, and strategies to position the country as a leader in the 4IR's development and evolution.

This study will differentiate itself from existing research by focusing specifically on Development Studies graduates and their experiences in the 4IR. Unlike previous studies that address broader or more general contexts, this research will provide targeted insights into how these graduates perceive their readiness, evaluate their competencies, and identify ways to enhance their employability. By doing so, it will contribute to the existing body of knowledge by offering a more understanding of the challenges and opportunities for development studies graduates in the era of 4IR.

1.5 PURPOSE OF THE STUDY

The aim of this research is to assess the employability skills of postgraduate students who graduated in Development Studies between 2019, 2020 and 2021 at the UJ. The study also attempted to evaluate graduates' perspectives on their readiness and preparedness to enter the world of work in the middle of the 4IR. The study was guided by the following objectives:

1) To describe the graduates' perception of readiness and preparedness for the world of work at the time of the 4IR.
2) To describe graduates' self-perceived level of competence in performing their duties in the middle of the 4IR.
3) To explore ways of making graduates employable in the thick of the 4IR.

1.6 RESEARCH QUESTIONS

This study aimed to address the following main research question: What is the employability of Development Studies graduates in the middle of the 4IR? To help answer the main research question, the researcher posed the following sub-questions:

1) How do Development Studies graduates perceive their readiness and preparedness for entering the workforce during the 4IR?
2) How do Development Studies graduates self-assess their level of competence in performing job-related duties in the context of the 4IR?

3) What strategies can be implemented to enhance the employability of Development Studies graduates in the context of the 4IR?

1.7 SCOPE OF THE STUDY

The scope of the study is defined by several key parameters. Firstly, it focuses exclusively on Development Studies graduates who obtained their honours degrees between 2019 and 2021 at the University of Johannesburg (UJ), South Africa. Graduates from other universities and those who obtained their degrees outside this specified timeframe were intentionally excluded. The study targets both employed and unemployed graduates, utilising a questionnaire for general respondents and a semi-structured interview for those practising in Development Studies and associated fields. Although the study is limited to a specific university and timeframes, it does not discriminate against respondents on any ground (e.g., age, gender, disability status, race, colour, ethnicity, language, or religion).

1.8 DEFINITIONS OF KEY CONCEPTS OR TERMS

Development Studies graduates are defined as individuals holding a degree in Development Studies, and equipped with interdisciplinary knowledge encompassing social, economic, political, and cultural aspects (Khoo 2015)

Employability refers to an individual's perceived capability to secure and sustain employment for their career (Römgens et al 2020).

The **knowledge economy** is an economy that revolves around the creation, assessment, and exchange of knowledge (Department of Communications and Digital Technologies 2021).

Dialogic education is an instructional method focused on involving students in classroom discussions, enabling them to articulate their perspectives, evaluate others' viewpoints, and enhance their cognitive abilities, critical thinking, and knowledge (Cui & Teo 2021). This approach serves as a mechanism for reshaping social interactions in the classroom and generating new knowledge (Putra, Mizani, Basir, Muflihin & Aslan 2020).

A job is described as a collection of tasks and responsibilities performed or intended to be performed by an individual for a specific employer, which may also encompass self-employment. Similarly, an occupation is delineated as a group of jobs characterized by a significant degree of similarity in their primary tasks and duties, as classified by the Organising Framework for Occupations (OFO) (Department of Higher Education and Training 2020). According to the Battista et al (2023), it is projected that 65 percent of children entering primary school today will eventually pursue careers in entirely new job categories that haven't been created yet. However, the funding, advancement, and formal training of qualifications related to the 4IR face challenges due to the limited recognition of emerging 4IR occupations in the Organising Framework for Occupations (OFO), such as IoT specialists and cloud architects (Media, Information and Communication Technologies Sector Education and Training Authority 2022).

OFO is a coded system for classifying occupations, utilised by the Department of Higher Education and Training as a vital instrument for identifying, reporting, and monitoring skills demand and supply within the South African labour market (Department of Higher Education and Training 2020). The OFO has grouped all occupational groups into eight (8) groups: (1) Manager; (2) Professionals; (3) Technicians and Associated Professionals; (4) Clerical Support Workers; (5) Service and Sales Workers; (6) Skilled Agricultural, Forestry, Fishery, Craft and Related Trades Workers; (7) Plant and Machine Operators and Assemblers; and (8) Elementary Occupations which are described in the succeeding chapter.

A skill refers to the ability to carry out the tasks and responsibilities required for a specific job (Alexander 2022). Competence or workplace output is tied to the performance of specific tasks, for which curriculum components and standards are being developed (Adegbite & Adeosun 2021).

1.9 CHAPTER LAYOUT

Chapter 1: Introduction and background

The chapter provides an introduction and background to the study; problem statement; the significance of the study; purpose of the study; research questions; Scope of the study; definition of key terms.

Chapter 2: Literature Review

This chapter covers the literature review and theoretical framework.

Chapter 3: Research Methodology

The chapter covers the methodological approach; sampling methods; Data collection procedures and ethical considerations.

Chapter 4: Results/ Findings

The chapter presents the data analysis and results of the collected data (questionnaire and interview), including the characteristics of the sample and the discussion.

Chapter 5: Discussions

In this chapter, limitation of the study; suggestions for further research; recommendations and conclusions are covered.

1.10 CHAPTER SUMMARY

The first chapter provided background information for the study, including the national government response, mechanisms, and strategies for advancing digital skills, as well as the relevant partnerships involved in advancing the skill levels of the students or citizens. The chapter further describes the nature and purpose of the study, the statement of the research problem, the guiding research questions, and the scope of the study. Additionally, the chapter explains the significance of and justification for conducting this study. The chapter further defined the terms and key concepts to be used in the entire report.

CHAPTER 2

REVIEW OF THE LITERATURE

2.1 INTRODUCTION

Building on the foundation laid in Chapter 1, the following Chapter provides a comprehensive review of existing literature relevant to this study. This chapter provided the study with insight into the research topic and the existing research, literature, and debates relevant to the research study. It also provided the study with the background and knowledge that assisted her in developing the data collection tools. Additionally, it assisted in the formulation of the research questions, methodology, and to contextualise the findings of the current findings. Further, the chapter presents different perspectives and literature of scholars on the extent to which Development Studies and related careers are impacted by the 4IR and the critique.

2.2 DEMAND FOR DEVELOPMENT STUDIES GRADUATES

Understanding the current employability of Development Studies graduates and their role in the professional world is essential for anticipating future employability trends. This section will explore the employability of Development Studies graduates in the middle of the 4IR.

2.2.1 Development Studies in the world of work

Development Studies is a subject area of the social sciences that is taught in universities under the faculty of humanities. Malan (2021) states that studying Development Studies equips students with knowledge of the social mechanisms that produce, maintain, and challenge poverty, inequality, and marginalization. This field of study is multidisciplinary by nature and encompasses both academic and non-academic theory, policy, and practice, but also problem-oriented (Cameron et al 2019). It is cross-disciplinary and involves a range of inter-disciplinarity, and trans-disciplinarity across a variety of

academic disciplines, including politics, economics, education, sociology, health, anthropology, agriculture, geography, law, and so forth. (Baud et al 2018).

Its objective is to understand the dynamics of societal change across local, national, regional, and global levels and how these dynamics intersect with economic, cultural, political, social, ecological, and gender-related factors (Khoo 2015). Development Studies practitioners play a key role in advocating for political and social change; hence, most of them are activists in their own right or members of the activist group. For what it is worth, they are change agents or catalysts for change. They actually champion change within their communities. This is because they understand how inequalities come about and what the implications are for people and the environment (Baud et al 2018). Furthermore, they seek ways to improve situations and empower vulnerable communities and their people. Khoo (2015) argue that Development Studies address issues that are very sensitive, such as famine, humanitarian aid or relief to refugees, and victims of natural disasters, wars, and famines, among other things. Additionally, (Malan 2021) stipulates that Development Studies is grounded in social science, which exposes graduates to skills that enable them to know how to handle interpersonal relationships, comprehend the dynamics of the environment, solve problems, address issues, and make decisions.

2.2.2 Employability of Development Studies Graduates in South Africa

One of the greatest disappointments in South Africa is the economy's failure to create sufficient jobs for young people, especially graduates, who are supposed to enter the labour market (Pauceanu, Rabie and Moustafa 2020). The unemployment rate for first-time job seekers remains extremely high in South Africa and continues to escalate as one of the most concerning socio-economic challenges. Unemployment in South Africa was recorded as among the highest in the world with 32.9 percent in the second quarter of 2023 (South African Statistics 2023a).

According to Tiessen et al (2018), Development Studies graduates possess a diverse skill set that includes critical thinking, problem-solving, and effective communication. These competencies are highly valued across various professional contexts, making Development Studies graduates versatile and adaptable in the job market (Cameron et

al 2019). These graduates secure employment in diverse sectors, including non-governmental organizations (NGOs), government agencies, and international organizations. The interdisciplinary nature of this field is identified as a key asset, allowing graduates to be exposed to a wide range of roles and environments effectively (Cameron et al 2019). According to Tiessen et al (2018) study, Development Studies graduates are mostly exposed to experiential learning opportunities, which provides them with practical experience and facilitate professional networking. The employability of Development Studies graduates is significantly enhanced by the experiential learning opportunities, such as internships and fieldwork.

4IR has a huge impact on the employability of graduates (including Development Studies graduates) by altering skill requirements, creating new job opportunities, and transforming the employment landscape (Kayembe & Nel 2019; Pauceanu et al 2020). The job market for Development Studies graduates is also evolving through the technologies brought by 4IR. Organizations are increasingly seeking professionals who can bridge the gap between technology and social impact (Morrar et al 2017). Consequently, the employability of Development Studies graduates is becoming increasingly tied to their ability to adapt to and integrate these new technologies into their work. While the 4IR introduces significant changes in technology, automation, and digitalization across various industries (Battista et al 2023; Hirschi 2018).

The employability of Development Studies graduates will significantly be impacted by 4IR technologies by reshaping skill requirements and job opportunities. As 4IR technologies like artificial intelligence, machine learning, and big data analytics become integral to various sectors, graduates need to be proficient in digital literacy and data analysis to stay competitive (Mkansi & Landman 2021; Alexander 2022). This revolution has led to the emergence of new roles in sustainable development, smart cities, and digital transformation, demanding an interdisciplinary approach that combines technical skills with socio-economic and political analysis (Kayembe & Nel 2019). While traditional roles may evolve or diminish due to automation, the ability to innovate and adapt to technological advancements is crucial (Yende 2021). Additionally, the rise of remote work expands the job market globally, offering graduates broader employment opportunities.

Continuous learning and staying updated with technological trends are essential for maintaining employability in this changing world of work (Battista et al 2023; Hirschi 2018; Yende 2021).

2.3 THE FOURTH INDUSTRIAL REVOLUTION IN THE WORLD OF WORK

The 4IR is distinguished by the integration of emerging automation technologies, such as big data analytics, and enhanced connectivity through the Internet of Things (IoT). This integration serves as the cornerstone for flexible and intelligent manufacturing aimed at boosting efficiency, productivity, and competitiveness (Lorenz et al 2019; Pauceanu et al 2020). As a result, rapid technological advancements such as the IoT and AI are going to alter how we communicate with one another and completely alter the nature of the work we currently do (Adegbite & Adeosun 2021; Kayembe & Nel 2019).

Many consider 4IR to be the force to reckon with. Hirschi (2018) suggests that 4IR will significantly reshape the nature of work, business, and society for good. Likewise, various researchers (Corfe 2018; Kayembe & Nel 2019; Pauceanu t al 2020; Schwab & Nicholas 2018; Windapo, Windapo & Alade 2020) postulate that technology-driven processes like digitisation, automation of work processes, robotics, biotechnology, and the latest innovation like the use of AI and machine learning to enhance product supply, reduce costs, and boost productivity have already brought about transformative changes in the workplace, employment, and business in general, thus affecting individual careers.

It is evidence that automation has taken over some tasks previously performed by humans (Schwab & Nicholas 2018) and also given rise to new or emerging skills needs. Table 2.1 provides a list of the eight (8) major occupational categories and examples of jobs using the 2021 Organizing Framework for Occupations (OFO) as a foundation. Examples of the negative impact on individual careers or jobs are well articulated in the foregoing paragraphs, citing the American multinational fast-food chains McDonald's and KFC, which are the biggest fast-food chains in South Africa.

According to the researchers (Battista et al 2023; Whitehead, Bhorat, Hill, Köhler & Steenkamp 2021; Windapo et al 2020), jobs at risk due to technological advancement and digitalization include those with repetitive and routine tasks, such as manual data entry and assembly line work, as well as roles susceptible to automation or streamlining through artificial intelligence and machine learning, like certain customer service and accounting functions. They fall within the four major occupational groups, namely: (1) technicians and associate professionals (e.g., purchasing or logistics officers); (2) clerical support workers (e.g., bank teller and related clerks, bank workers, postal frontline service workers, data entry operators, data capturers, data entry clerks); (3) service and sales workers (e.g., cashiers and ticket clerks, security officers); and (4) elementary workers (e.g., assembly, manufacturing, construction, and factory workers). Conversely, the fastest-growing jobs include roles such as AI and machine learning specialists, sustainability specialists, and business analysts (Battista et al 2023). According to Adegbite & Adeosun (2021), AI has the capacity to enable machines to perform tasks that were previously carried out by humans, making some workers obsolete and creating further unemployment. Conversely, lower-wage jobs like gardening, plumbing, and caregiving are expected to be less impacted by automation (Setyaningsih 2020).

According to Battista et al (2023), the majority of the fastest-growing positions listed are in the technology field. Conversely, most of the swiftly declining roles are clerical or secretarial positions (Battista et al 2023). Likewise, Corfe (2018) argues that the increasing level of automation is likely to disrupt traditional career paths and jobs. It is assumed that business productivity, quality, and efficiency are likely to be improved with automation and using robots, especially for complex tasks for human capabilities (Corfe 2018). As outlined in the preceding paragraphs, these shifts may lead to the phasing out of traditional roles and the emergence of new skill sets, jobs, and industries. Consequently, “this could bring about significant structural changes in the labour market and work dynamics” (Hirschi 2018:2).

This is the case in China, which used survey and design technology in developing its third-generation bridge (Zhou & Zhang 2019). Such a shift can enhance working

conditions by replacing hazardous and physically demanding tasks with safer and more efficient technological innovations and inventions (Lau et al 2021). The survey and design technology used in China depended on the use of tunneling robots to help China achieve its dream bridge. This is linked to what Carrim (2022) regards as benevolence. The significant advancements in science and technology prompt fundamental questions about humanity, as stated by the Organisation for Economic Co-operation and Development (2018).

No.	*Major Occupations*	*Occupational Descriptors*	*Examples of jobs*
1	Managers	Plan, direct, coordinate and evaluate the overall activities of enterprises, governments, and other organizations, or of organizational units within them, and formulate and review their policies, laws, rules, and regulations.	Planning and development managers, community development managers
2	Professionals	Increase the existing stock of knowledge, apply scientific or artistic concepts and theories, teach about the foregoing in a systematic manner, or engage in any combination of these activities.	Community development practitioners, Digital marketing specialists, policy analysts, database analysts, e-commerce specialists
3	Technicians and Associate Professionals	Perform mostly technical and related tasks connected with research and the application of scientific or artistic concepts and operational methods, and government or business regulations.	Purchasing officers
4	Clerical Support Workers	Record, organise, store, compute and retrieve information related, and perform several clerical duties in connection with money-handling operations, travel arrangements, requests for information, and appointments.	Bank teller and related clerks, payroll clerks, postal clerk, data entry clerks, data capturer
5	Service and Sales Workers	Provide personal and protective services related to travel, housekeeping, catering, personal care, or protection against fire and unlawful acts, or demonstrate and sell goods in	ICT Sales Assistants (cashiers and ticket clerks)

No.	*Major Occupations*	*Occupational Descriptors*	*Examples of jobs*
		wholesale or retail shops and similar establishments, as well as at stalls and on markets.	
6	Skilled Agricultural, Forestry, Fisheries, Craft, and Related Trades Workers	Apply specific knowledge and skills to construct and maintain buildings, form metal, erect metal structures, set machine tools, or make, fit, maintain and repair machinery, equipment or tools, carry out printing work produce or process foodstuffs, textiles, or wooden, metal and other articles, including handicraft goods.	Agricultural equipment operators
		They grow and harvest field or tree and shrub crops, breed, tend or hunt animals, produce a variety of animal husbandry products, cultivate, conserve and exploit forests and breed or catch fish.	
7	Plant and Machine Operators and Assemblers	Operate and monitor industrial and agricultural machinery and equipment on the spot or by remote control, drive and operate trains, motor vehicles and mobile machinery and equipment, or assemble products from component parts according to strict specifications and procedures.	Machinery mechanics and repairers
		The work mainly calls for experience with and an understanding of industrial and agricultural machinery and equipment as well as an ability to cope with machine-paced operations and to adapt to technological innovations.	

No.	*Major Occupations*	*Occupational Descriptors*	*Examples of jobs*
8	Elementary Occupations	Involve the performance of simple and routine tasks which may require the use of hand-held tools and considerable physical effort.	Construction, assembly and factory workers

Table 2.1: Major Occupational Groups and Descriptors using the OFO Version 2021 (Source: DHET 2021)

2.3.1 Characteristics of the Fourth Industrial Revolution

Due to the use of technology, many unusual ideas and concepts are now brought to life. This includes virtual reality, smart cities, big data, the IoT, and AI, which have all played an important role in guiding growth in the 4IR era (Kayembe and Nel 2019). According to some authors (Mkansi & Landman 2021; Schwab & Nicholas 2018), the 4IR, which is driving the workplace, consists of genome sequencing, nanotechnology, renewable energy sources, quantum computing, IoT, cyber-physical systems, and the smart factory. These concepts are relevant to the study as they represent the cutting-edge technologies reshaping the job market (Battista et al 2023), including for Development Studies graduates. For instance, genome sequencing is revolutionizing healthcare and agricultural development, areas where Development Studies professionals can contribute significantly. Nanotechnology offers new materials and solutions for sustainable development projects (Hirschi 2018). Renewable energy sources align with the goals of sustainable development, requiring expertise in policy and community engagement to implement effectively. Quantum computing, though still emerging, promises advancements in data processing and problem-solving capabilities crucial for development analytics (Kayembe & Nel 2019; Adegbite & Adeosun 2021). The IoT enables more efficient and effective project monitoring and implementation, while cyber-physical systems and smart factories exemplify the integration of digital and physical systems, creating new opportunities for innovation in development practices (Kayembe & Nel 2019). By understanding and leveraging these technologies, Development Studies graduates can enhance their employability and contribute to the evolving landscape shaped by the 4IR.

2.3.2 Future work skills and competencies

As the world of work changes, new jobs will emerge, and a new skill set will be required for those emerging jobs. According to Mkansi & Landman (2021), technological advancements are reshaping the current skill requirements in the workplaces, highlighting the need to acquire new skills beyond enhanced capacities. Battista et al (2023) underlines the importance of a new skill set for innovative and technology-oriented

workers. This shift towards future-oriented skills, some of which are yet to be defined (Manda & Dhaou 2019), emphasizes the significance of job technical skills, soft skills, readiness skills, and entrepreneurial skills (Morrar et al 2017). According to Xing and Marwala (2017), the 4IR demands a distinct set of skills compared to those required in the Third Industrial Revolution (3IR), where IT was the primary driving force. These skills encompass emotional intelligence, critical thinking, negotiation, people management, cognitive flexibility, judgment, and knowledge production and management (Xing & Marwala 2017; Battista et al 2023).

In this study, it was reported that over and above the soft and technical skills required to land a job, continuous learning, networking, and perseverance play a big role in finally getting a job and staying relevant in the ever-changing job landscape. Kayembe and Nel (2019) argued that 35 percent of the skills deemed crucial in today's workforce will undergo changes in the coming years. The World Economic Forum's Report outlines the top 10 skills on the rise, emphasising a mix of soft and hard skills for the future (Battista et al 2023). The rise of automation, as noted by Battista et al (2023), will demand the adoption of new IT and non-IT skills to ensure ongoing employability. Pauceanu et al (2020) highlight the significance of employability skills as effective tools for sustaining employment in future labour markets. Battista et al (2023) specify a set of job-related skills, known as employability skills, that university graduates are expected to possess by 2030. Businesses predict significant disruptions in workers' core skills, with a projected 44 percent undergoing change by 2027 (Battista et al 2023). Battista et al (2023) further identify AI, creative thinking, analytical thinking, and data analysis and management as the top in-demand skills by 2027. Additionally, leadership and social influence, along with traits like curiosity and a commitment to continuous improvement through lifelong learning, are becoming increasingly valuable in the 4IR global economy. As a result, individuals who possess these qualities are expected to experience a growing demand for their skills (Carrim 2022; Battista et al 2023). Figure 2.1 presents the top 10 skills on the rise.

Figure 2.1: Top 10 skills on the rise (Source: Battista et al 2023)

According to Battista et al (2023), creative thinking and analytical thinking were listed as the critical skills identified by most companies. These were followed by technology literacy, curiosity and resilience, lifelong learning, flexibility and agility, self-awareness, and motivation (Battista et al 2023). The two highest priority skills for the period between 2024 and 2027 are analytical thinking and creative thinking (including problem-solving skills) (Battista et al 2023). Therefore, institutions of higher learning should prioritise the development of priority skills at the time of the 4IR, which are also highly sought by employers or companies (Azmi, Kamin, Noordin & Nasir 2018). This includes soft skills such as communication (language) skills, meta-cognitive skills like critical skills or creative thinking and innovative skills, analytical thinking, emotional and social skills such as empathy, self-efficacy, and collaboration, information and communication technology (ICT) literacy, data analysis, data security, problem-solving skills, and interpersonal skills (teamwork) (Azmi et al 2018; Battista et al 2023; Organisation for Economic Co-operation and Development 2018). Given the dramatic shift in the workplace from traditional to industry 4.0, this would require graduates who are adaptable and all-rounders and who possess up-to-date skills to align with current industry needs (Kayembe & Nel 2019).

There is also a need to acquire 4IR-aligned skills to be in charge of the 4IR, *lest the homo sapiens lose the war against the 4IR*. However, with the right human intelligence, skills (skilling), training, retraining, and reskilling of the existing employees, the country could harvest the fruit of the 4IR (Manda & Dhaou 2019; Morrar et al 2017). In ensuring that the country is ready to explore new or emerging opportunities that the 4IR brings, the South African government established the Presidential Commission on 4IR, which is not only mandated to develop the national response action plan (strategy) but also to provide the President with advice on future employment and skill development, mobilise the resources required to implement the 4IR interventions and suggest methods for measuring the influence of interventions on 4IR interventions (Department of Communications and Digital Technologies 2022). This is in consonant with the first black head of state and the first democratically elected Nobel Peace Prize Laurette, Dr Nelson Rolihlahla Mandela, said that education is the great engine of personal development. It is through education that the daughter of a peasant can rise to become a doctor, the son of a mine worker can rise to lead the mine, and the child of a farm worker can aspire to become the president of a great nation. It is not about the hand we're dealt, but rather what we make of it that distinguishes one individual from another.

2.4 GRADUATES 4IR READINESS AND JOB PREPAREDNESS

According to Carrim (2022), 4IR is here, it is happening, and it is inevitable, and its pace of advancement will only accelerate, making its eventual impact unavoidable. It is transforming the way of doing business (Schwab & Nicholas 2018), and the only people who will survive or succeed in this revolution are the swimmers who are not afraid of sinking. The common adage of Darwin’s evolutionary theory of natural selection, survival of the fittest, is assumed here. There have been numerous debates concerning graduates' workplace readiness. Wessels (2020) posits that the biggest challenge of higher education is to prepare students for future career jobs. Unfortunately, these institutions have failed to achieve this noble goal.

It is postulated that graduates have been taught about careers within their field of study but not relevant work skills and work readiness (Wessels 2020). Nevertheless, a study

conducted by Mobarak (2019) revealed that graduates often do not feel sufficiently equipped for the demands of the workplace. They often lack the necessary skills and knowledge to perform effectively in professional settings (Mobarak 2019). Others are not aware of the available relevant job opportunities, and they end up applying and taking job offers not related to their areas of study (Mouchipkhu 2019).

2.4.1 Graduates' awareness of 4IR as a requirement for work readiness

Various researchers found that awareness of the 4IR in schools and universities is very low; hence, students were not aware of the implications that the 4IR will have on their careers and future jobs (Lau et al 2021). Wessels (2020) emphasizes that some students are aware of 4IR, but they have limited knowledge of the applications of this technology. These divergent views could be because of the different research settings and the 12-year difference between the two research studies. Conversely, Pauceanu et al (2020) contest that teachers and lecturers are not provided with training to educate learners about 4IR.

Cele, Matli and Bhana (2023) and Kayembe and Nel (2019) argue that the current school curriculum falls short in equipping students with the necessary employability skills needed for the 4IR. Addressing this issue has become a top priority globally and regionally. For instance, during the International Council for Educating Teachers (ICET) conference held in July 2019, themed "Reconceptualizing teacher education for the 4th Industrial Revolution and Knowledge Democracy: Teaching beyond the 3rd," the 4IR was prominently featured on the agenda not only for education but also for teacher training (Carrim 2022). This would require all stakeholders to invest in school infrastructure, indirectly addressing the digital divide and inequality eminent in public schools in South Africa. There is also a need for alternative power supplies to mitigate the intermittent power supply issues associated with the Electricity Supply Commission (Eskom).

Following the ICET conference, the South African Education Research Association (SAERA) hosted its gathering in October 2019. This conference focused on exploring the essential educational reactions to the 4IR: Analysing interpretations, implementations,

and criticisms. The discussion at this conference took the motion started at the ICET conference to greater heights (Carrim 2022). The two academic conferences and their related publications, which concentrate on the 4IR, played a significant role in the integration of curricula featuring disciplines such as data sciences (Carrim 2022). This led to President Cyril Ramaphosa announcing that the government will be introducing robotics and coding in Grade R to 3 in all the schools by 2022, in his 2020 State of the Nation Address (SoNA). This sounds like a pipe dream given all the challenges the schooling system faces in this country, namely, lack of infrastructure, lack of access to reliable electricity supply, lack of digital infrastructure, and lack of internet connectivity.

To compound matters, reports reveal that South Africans rank in the lowest five percent on international literacy and numeracy exams, with nearly 80 percent of Grade 4 students unable to comprehend what they read (Carrim 2022). As a result, it becomes nearly impossible to develop the higher-order thinking skills demanded by the 4IR. Likewise, universities around the world have faced difficulties in promoting higher-order thinking abilities (Wessels 2020). This makes it a global challenge. As a result, there is a misalignment between the demand for future employability skills and graduates' opinions regarding such demands (Pauceanu et al 2020). Graduates should be able to develop a culture that promotes the long-term feasibility of advanced technology in a mindful and responsible manner (Pauceanu et al 2020). Employers are searching for graduates who are prepared to help drive their organizations to success in today's internationally competitive workplace, and as such, they choose to recruit individuals who possess social skills (e.g., interpersonal skills) and are capable of effectively using modern technology (Cele et al 2023). This includes the Internet, AI, robotics, 3D printing, computers, IoT, quantum computing, and data analytics (Lorenz et al 2019).

The impact of modern 4IR technology on employment and labour systems cannot be underestimated. Traditional manual employment may be threatened by technological advances, but they may also create new job opportunities that demand workers with advanced skills (Cele et al 2023). Therefore, to remain relevant and competitive in the labour market in the middle of the 4IR, these individuals must constantly enhance their

abilities. This includes elements of life-long learning by any means possible. Further, Morrar et al (2017) state that employment requiring a level of human engagement, such as guiding robot behavior, is expected to be in high demand in the future. Humans and robots, as well as other 4IR technologies, require a new level of flexibility to collaborate and create new job profiles (Battista et al 2023).

2.4.2 Preparing graduates for the future

According to Wessels (2020), putting students at the centre means investing in their mindsets, knowledge, and skills needed to control the complexities of the present and the future. Ujakpa, Osakwe, Iyawa, Hashiyana and Mutalya (2020) claim that it is important to increase awareness to enhance students' knowledge of the 4IR, as this will encourage students to work hard and develop the necessary skills to be employable within the 4IR. Additionally, Wessels (2020) argues that knowing about technological advancement is not enough for students; they must know how to use it correctly and meaningfully. Preparing future graduates for employment requires universities to align their processes and teaching with technological advancements.

New and flexible curricula and the method and practice of teaching (pedagogy) are required to meet students' current and future demands (Wessels 2020). The 4IR technologies are predicted to have a significant influence on learning procedures, methods of instruction, and policies in education (Ujakpa et al 2020). Cele et al (2023) emphasize that universities are not merely required to present students with degrees but also to connect them to relevant external practice, thus improving their employability. There is also a human-technology interface that must be understood to cope with the ever-increasing complexity of practice (Department of Higher Education and Training 2020; Kayembe & Nel 2019; Xing & Marwala 2017). This includes the use of robotics, computers, and virtual reality, which enable the assimilation of massive amount of data and images and interaction with technology (that is, machines and computers) (Schwab & Nicholas 2018; Hirschi 2018). This coexistence or mutual form of relation between

humans and machines (namely, robots, AI, etc.) is referred to as 'symbiosis' (Gerber, Derckx, Döppner & Schoder 2020).

Marwala highlights several key points that are needed to assist in preparing for the future without knowing what will happen in the future (Sasol 2022). Additionally, he mentioned incorporating multi-disciplinary education, in which individuals studying science and technology must also study human and social sciences, and vice versa. Further, it is indicated that all students must enroll in courses like AI in 4IR and Africa in the science module (Sasol 2022).

Cross-sectoral teaching and learning are crucial, ensuring that students and educators from diverse fields understand the various elements essential for effectively implementing the 4IR (Kayembe & Nel 2019). In that case, the 4IR curriculum must address political and social tensions caused by the increased speed of technological advancement. Moreover, it is important that the new curriculum includes subjects and topics such as data analytics and coding. Therefore, including these subjects in the school curriculum is essential for both technical and non-technical students. Additionally, 4IR requires high-level skills and knowledge for participation in its economy. Schools and teacher education programs must adapt to ensure the development of such advanced knowledge and skills through education (Wessels 2020).

Teaching students about these new technologies (data analytics and coding) as part of their curriculum means that the learning approach needs to change or be re-designed (Mobarak 2019; Pauceanu et al 2020). Similarly, Marshall (2016) further states that a digital education strategy must reflect the impact of changes in the educational system. As circumstances evolve, adaptability and the capacity to pursue work that offers a sense of significance and purpose are expected to grow in importance for individuals (Hirschi 2018). Kayembe and Nel (2019) explain that digital literacy is a foundation for students to develop adaptability to obtain new opportunities for employment and social inclusion, to capitalize on the opportunities presented by the digital economy, and to actively engage in the global digital society. Students in both basic and applied science fields should grasp the political and social dynamics of their environment, while humanities and social science

students ought to have a foundational understanding of the 4IR and its mechanisms (Sasol 2022).

The educational sector in South Africa is confronted with several obstacles when it comes to adapting to the 4IR. These include issues related to insufficient funding, infrastructure, and a shortage of skills needed to prepare graduates for involvement in the 4IR (Kayembe & Nel 2019). Consequently, South Africa continues to grapple with a critical shortage of skills in 4IR (Manda & Dhaou 2019).

The educational sector in South Africa faces several challenges in adapting to 4IR. This includes infrastructure, insufficient funding, and skills to prepare graduates to participate in the 4IR (Kayembe & Nel 2019). Thus, South Africa remains challenged by a significant scarcity of skills in the 4IR (Manda & Dhaou 2019). Provided that most primary and high school learners do not have access to computers and that most of them even reach grade 12 without interacting with a computer (Pauceanu et al 2020), there is a pressing need to address this digital divide to ensure that students are thoroughly equipped for the technologically driven demands of the modern world.

South African universities and TVET colleges must find innovative ways to address concerns and issues associated with the new technological changes. 4IR requires universities and TVET colleges to equip students with the appropriate tools to devise new and innovative solutions to address societal issues (Kayembe & Nel 2019). Furthermore, Pauceanu et al (2020) argue that it is significant that universities shift from students' outputs to students' outcomes. For universities to continue producing successful graduates, they must prepare students using the right resources and tools (Ujakpa et al 2020).

2.5 THEORETICAL FRAMEWORK

Conceptual approaches to examine employability encompass a range of theoretical frameworks, with the dominant ones underpinned by human capital theory (Fakunle & Higson 2021) and Freire's pedagogical approaches. The use of both theories is envisaged to provide a holistic view and understanding of the employability of Development Studies graduates at the time of the 4IR. These complementary theories are discussed and critiqued in the subsequent paragraphs.

2.5.1 Human Capital Theory (HCT)

Human capital theory is a modern economic concept that examines issues related to the development and quality of the workforce. The advocates of this theory posit that individuals can increase their labour productivity by investing in their education, skills, and knowledge (Moodie & Wheelahan 2023). Likewise, Wuttaphan (2017) suggest that human capital represents an economic measure of individuals' skills, comprising their knowledge, abilities, attitudes, and experience.

Additionally, Fakunle and Higson (2021), maintain that this theory underlines the importance of education in fostering a skilled and productive workforce, contributing to economic growth, and it remains the main conceptualization of employability. The scholars further assume that education, training, and other forms of investments in human beings are viewed as a form of capital. This could further include workshops, coaching, conferences, and online courses. They also assume that a population with higher levels of human capital is more likely to experience economic growth and development.

Some scholars have argued that (Fakunle & Higson 2021; Moodie & Wheelahan 2023; Wessels 2020), a well-educated and skilled workforce is like a well-oiled machine contributor innovation, and efficiency, aimed at enhancing economic productivity and prosperity. This could lead to high absorption rates and a reduced unemployment rate. The central premise of this theory is that individuals are viewed as assets, just like physical and financial capital or assets, and can enhance their value and contribution

through investing in their development (Wuttaphan 2017). This is echoed by the first democratic president of the Republic of South Africa, the anti-apartheid activist and politician, and Nobel Prize laureate of 1983, Dr. Nelson Mandela, who said that education serves as the great engine for personal development.

The advocates of this theory place a significant emphasis on formal education and training as essential investments in an individual's human capital (Wessels 2020). The theory suggests that the skills and knowledge gained through education contribute directly to a person's productivity in the workforce (Fakunle & Higson 2021; Wessels 2020). This is the part that the PSET system, in particular, the higher education institutions, and the SETAs play to increase human capital by improving the skills and knowledge of the students and employees (Wuttaphan 2017). According to Wessels (2020), the idea of investing in human capital strengthens the university's role in transferring knowledge, skills, and expertise, thereby boosting productivity and economic growth in the industry 4.0 or 4IR workplace. This theory suggests that investing in skills and knowledge enhances an individual's productivity and employability (Wuttaphan 2017).

Education leads to increased productivity and enhances economic growth. An economy that is growing has a high absorption rate. This could help tackle the triple challenges of poverty, inequality, and unemployment that are prevalent in South Africa (Atuahene, Kong & Bentum-Micah 2020; Carrim 2022; Lorenz et al 2019). Conversely, Tran (2019) claims that this theory is myopic by design and naïve to think that the skills developed will directly be transferred to the application setting. Tran (2019) critiques the assumption that the skills developed during education in the context of the 4IR will seamlessly transfer to practical applications in the workplace. Tran (2019 emphasizes that merely equipping students with technical skills does not guarantee their effective use in professional settings. Instead, he suggests that a deeper understanding of how these skills interact with existing processes, organizational cultures, and societal norms is crucial for their successful application.

This theory is further criticized for adopting an individual-centric approach and narrow-mindedness to education and training, overlooking broader societal (e.g., systematic inequalities), psychological, and cultural dimensions that restrict some people's access to education, development, and employment opportunities (Moodie & Wheelahan 2023). The theory is pro-market value (or economic potential) and seems to neglect the importance of education in general personal development and cultural enrichment. It also fails to acknowledge the role played by education in the modern knowledge-based economy (Marginson 2019; Wessels 2020). It is criticized for its narrow-mindedness by deviating from a holistic human development approach in favour of cognitive growth at the expense of non-cognitive aspects of human development (Fakunle & Higson 2021).

These contestations suggest that a more comprehensive framework for education and training is needed, one that integrates cognitive and non-cognitive development, addresses systemic barriers, and recognizes the diverse roles of education in personal and societal growth. This approach would ensure that education systems are better equipped to prepare individuals for the complexities of the 4IR while promoting equity, inclusivity, and holistic human development. By integrating these broader perspectives, we can develop educational models that not only respond to the demands of the modern workforce but also support the overall development of individuals and contribute to a more just and sustainable society.

According to Marginson (2019), the theory's primary shortcoming is its overemphasis on the individual economic returns of education, often at the expense of acknowledging broader social and structural factors. The author argues that "human capital theory tends to ignore the structural inequalities and labour market issues that impact the value of education" (Marginson 2019:289). This focus on individual outcomes can obscure the fact that educational benefits are not uniformly distributed across different social groups. The relationship between educational attainment and income is more complex and may not always align with the expected economic gains (Marginson 2019). The theory's limitations highlight the need for a more understanding that incorporates economic, social and structural factors influencing educational and labour market outcomes.

2.5.2 Freire's Pedagogical Approach

Paulo Freire's work provides a valuable theoretical foundation for thinking about employability and education in the context of the 4IR (Putra et al 2020). This theory emphasizes the importance of developing critical thinking in learners (Putra et al 2020) and dialogical education. According to Putra et al (2020), critical analysis helps to ensure that development efforts are contextually relevant and aligned with the principles of social justice. Additionally, critical thinking is thought of as a foundational skill that equips individuals to thrive and contribute effectively to a dynamic world prone to technological advancements. This theory also emphasizes the significance of dialogue and collaboration in the process of learning (Freire 1996). For Development Studies practitioners, this means cultivating the ability to critically evaluate and adapt development strategies in response to technological advancements and shifting socio-economic conditions. This approach helps ensure that development initiatives are not only effective but also equitable and responsive to the needs of diverse communities. This theory encourages Development Studies graduates to engage in open, participatory processes with communities, stakeholders.

The theory subscribes to the notion of life-long learning. This idea is supported by Shih (2018), who proposed that practitioners and students of Development Studies should be encouraged to continually learn and adapt to new technologies and trends. This theory falls short of its practical application within the traditional educational structure, which is characterized by standard curricula and assessment methods (Putra et al 2020). It is also criticized for its potential for indoctrination or being biased towards specific values and ideological stances, thus swaying students in that direction. In the context of Development Studies and employability during the 4IR, Freire's ideas could be applied to foster critical thinking skills, problem-solving abilities, adaptability, and a deeper understanding of the social and economic implications of rapid technological change (Shih 2018). In the context of Development Studies and employability, this means that individuals should be equipped with agility and employability skills to take full advantage of the 4IR.

Although Development Studies discipline draws from various disciplines, it often incorporates key principles that align with Paulo Freire's thinking, particularly when it comes to education, empowerment, and social justice. Development Studies encourages scholars and practitioners to question the assumptions and impacts of development initiatives (Cameron et al 2019), like Freire's focus on critical thinking. This critical analysis helps to ensure that development efforts are contextually relevant and aligned with the principle of social justice (Putra et al 2020). In a world characterized by rapid technological advancements and complex challenges, critical thinking is a foundational skill that equips individuals to thrive and contribute effectively (Putra et al 2020). It is not just about problem-solving; it is about fostering a mindset of curiosity, open-mindedness, and reasoned judgment, which is invaluable in 4IR and beyond (Shih 2018). In the context of Development Studies and employability, this translates into the need for individuals to work collaboratively in multidisciplinary teams, as this is often the nature of work in the middle of the 4IR.

Freire advocates for education that is rooted in the context of learners (Putra et al 2020). Paulo Freire advocates for an educational approach that is deeply rooted in the lived experiences and context of the learners (Putra et al 2020). This means that education should not be a one-size-fits-all model but should be tailored to address the specific social, cultural, and economic realities of the students. Freire argues that learning should be relevant to the students' lives and should empower them to critically engage with their world. By rooting education in the learners' context, Freire emphasizes the importance of making education meaningful and applicable to their daily lives. This involves understanding the challenges and opportunities they face and using this understanding to inform the educational content and methods. For instance, in the context of the Fourth Industrial Revolution, education should not only focus on technical skills but also on how these skills can be applied to address local issues, promote social justice, and foster sustainable development.

In the context of Development Studies and employability, applying Freire's ideas means equipping individuals with critical thinking, problem-solving skills, adaptability, and a deeper understanding of technological change's social and economic implications (Shih

2018). This approach would ensure that graduates are not only technically proficient but also socially aware and capable of driving positive change in a 4IR-driven world. To present this theory's application to Development Studies careers, one must emphasize the integration of critical pedagogy into curricula, promoting an educational model that is adaptive, reflective, and socially conscious. This would prepare students to meet the demands of the 4IR while advocating for equitable and inclusive development practices.

2.6 CHAPTER SUMMARY

In conclusion, Chapter 2 has provided a comprehensive review of the existing literature relevant to the employability of Development Studies graduates within the context of the 4IR. This chapter has highlighted the significant gaps in current research, particularly the lack of focus on the interdisciplinary and unique skill sets required for Development Studies professionals. Moreover, this chapter has explored how awareness and understanding of 4IR technologies, such as genome sequencing, nanotechnology, and the Internet of Things, are essential for the modern workforce. However, it also noted that current educational structures often fall short in preparing students for these advancements, primarily due to rigid curricula and inadequate emphasis on lifelong learning.

By establishing these connections, this chapter sets the stage for the succeeding chapters, which will explore deeper into the specific impacts of 4IR on Development Studies graduates' employability and explore practical educational strategies to bridge the identified gaps.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the research methodology employed to investigate the employability of Development Studies graduates in the context of the 4IR. The methodology is designed to address the research questions identified in Chapter 1 and to fill the literature gaps discussed in Chapter 2. It includes a detailed description of the research design, data collection methods, data analysis techniques, and ethical considerations.

3.2 METHODOLOGICAL APPROACH

The following section provides an overview of the research methodology and design implemented in the study.

3.2.1 Research paradigms and the approach

The study adopted a triangulation of mixed method, which can be seen as a means of combining rationalistic (quantitative) and naturalistic (qualitative) paradigms to complement each other (Bans-Akutey & Tiimub 2021). According to Cutler, Halcomb & Sim (2021), naturalists prefer natural settings, and their inquiry relies heavily on qualitative rather than quantitative research methods. The naturalist believes that some degree of transferability is possible if enough thick description (e.g., written records, interview transcripts) is available in the collected data (Carter, Bryant-Lukosius, DiCenso, Blythe & Neville 2014). The rationalist, on the other hand, prefers to conduct studies under controlled conditions like a laboratory to exclude any extraneous influences or factors (Yeasmin & Rahman 2012).

According to various researchers and authors, triangulation refers to employing multiple data sources or integrating quantitative and qualitative data collection, analysis, and integration in a single or multiphase study (Creswell & Plano Clark 2017). The integration of mixed methods and triangulation represents a powerful synergy in research methodology (Bans-Akutey & Tiimub 2021). Mixed methods allow researchers to approach a research question from multiple angles, leveraging both quantitative and qualitative data to gain a holistic understanding of the phenomenon under study (Bans-Akutey & Tiimub 2021). Triangulation in mixed methods research involves using multiple methods in a complementary manner to cross-validate findings and enhance the validity of the study. By triangulating data from different sources or using different methods, researchers can mitigate the limitations of any single methodological approach (Carter et al 2014) For example, quantitative data might confirm trends suggested by qualitative findings, while qualitative data could provide explanations or context for statistical patterns observed.

Yeasmin & Rahman (2012) advocate for between-method triangulation, aiming to mitigate personal biases of investigators and address deficiencies inherent in single-investigator, single-theory, or single-method studies, thereby enhancing the validity of the findings. In the current study, quantitative data was collected first, and then cross-validated with the insights gained from qualitative data (Creswell & Plano Clark 2017). The use of this method was favored by the researcher as it enabled her to elaborate, enhance, illustrate, and clarify the descriptive results from the quantitative research component using the results from the qualitative (interviews) component, which captured the participants' personal experiences regarding their employability within the challenges posed by the 4IR. The use of both quantitative and qualitative is useful in facilitating the thickness and richness of data (rich description), augmenting interpretation, and usefulness of the findings (Aung, Razak & Nazry 2021).

Triangulation involves employing various methods or data sources in qualitative research to obtain a comprehensive understanding of phenomena (Bans-Akutey & Tiimub 2021). It serves as a qualitative research strategy aimed at validating findings by converging

information from diverse sources (Carter et al 2014). This type of triangulation may consist of observation, interviews, and field notes (Carter et al 2014). Qualitative research provided in-depth insights into participants' views, complementing the quantitative data (Creswell & Plano Clark 2017).

This approach was chosen for its ability to enrich the comprehension of the phenomenon being studied by incorporating various methods and theories (Yeasmin & Rahman 2012). Bans-Akutey & Tiimub (2021) argue that utilizing both types of data enables researchers to generalize findings from a sample to a population and acquire a thorough understanding of the phenomenon of interest. In this research, the emphasis is on gaining an in-depth understanding of the employability of Development Studies graduates within the 4IR.

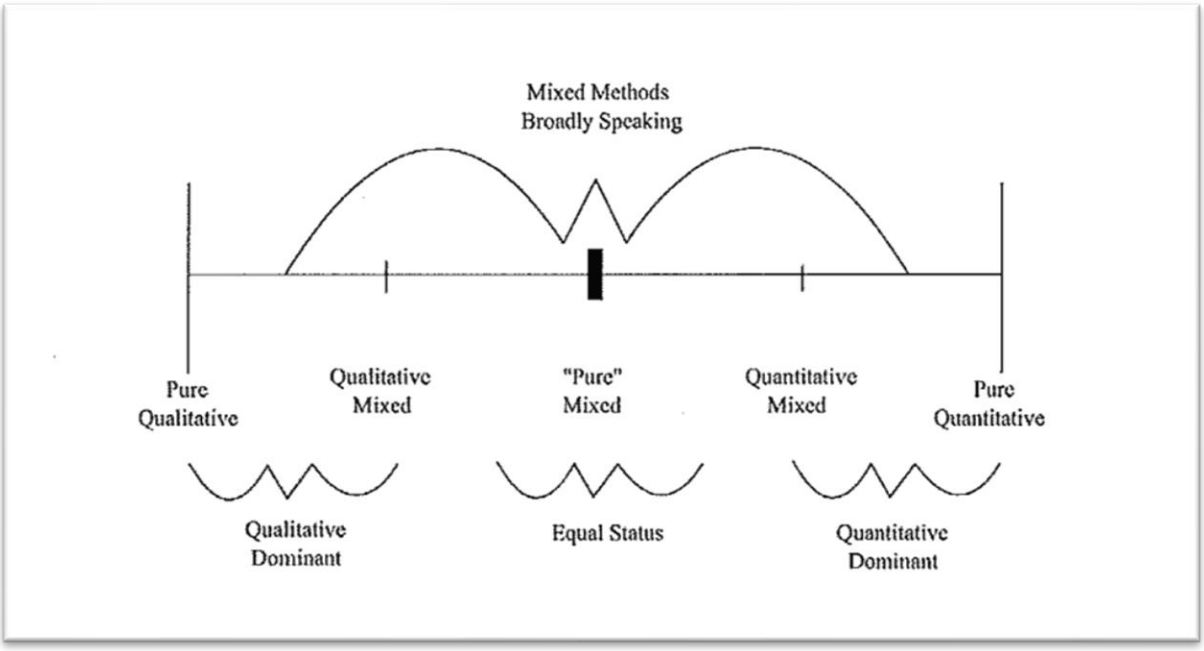

Figure 3.1: Three Major Research Paradigms (Source: Johnson, Onwuegbuzie, and Turner 2007:124)

For quantitative researchers, a key methodological concern revolves around the reliability and representativeness of the sample, while in qualitative research, authenticity tends to be more pertinent than reliability (Yeasmin & Rahman 2012).

3.2.2 Research design

The study adopted an explanatory sequential design, which combines quantitative and qualitative research methodologies, prioritising the quantitative phase before the qualitative phase (Toyon 2021). In this design, the qualitative phase serves to clarify and provide context to the findings obtained in the quantitative phase (Toyon 2021). The process involves several stages, including defining ontological and epistemological positions, selecting an inquiry approach, data collection, quantitative data analysis, additional data collection, qualitative data analysis, and ultimately, integrating and reporting the results (refer to Figure 3.2).

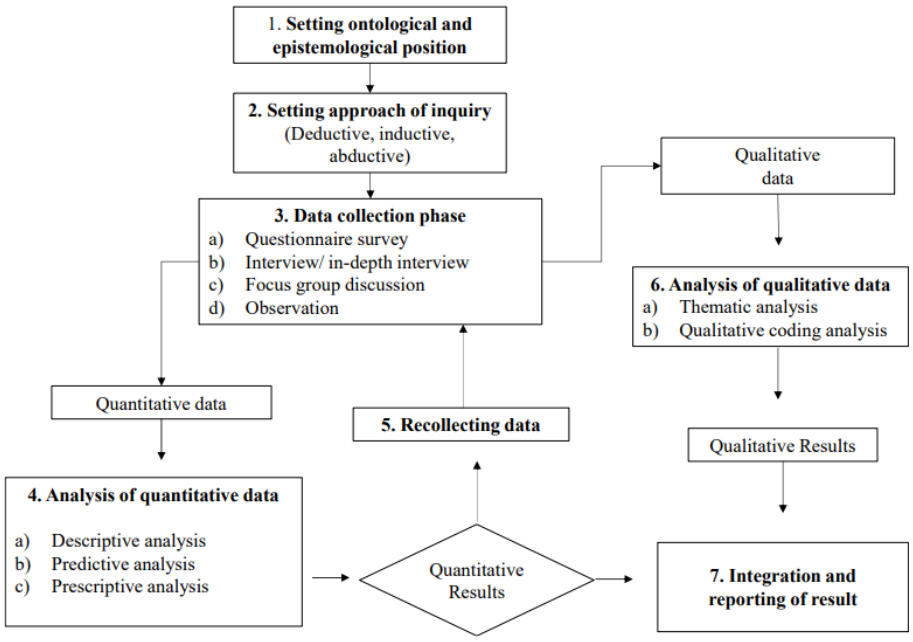

Figure 3.2: Phases of explanatory sequential design of mixed methods research (Source: Toyon 2021: 256)

The foregoing steps help determine what quantitative results need further explanation. In the current study, the researcher gained a general understanding using quantitative data and further insight by using qualitative information (Draucker, Rawl & Carter-Harris 2020).

Quantitative results informed the subsequent qualitative interviews, enabling a detailed interpretation of the findings (Yeasmin & Rahman 2012). The design allowed all Development Studies graduates to be included in the survey, and follow-ups through interviews were based on their employment status (Draucker et al 2020).

This approach was crucial as it ensured that only graduates of interest were interviewed, making it essential for the study's success. To ensure credibility of the study, both the interview and the questionnaire schedule were pilot tested (Aung et al 2021; Gani, Imtiaz, Rathakrishnan & Krishnasamy 2020). No significant adjustments were deemed necessary following the analysis of the pilot study data. The only challenge with the questionnaire was that some respondents struggled to open the Ms Word attachment, and this prompted the use of the web-based questionnaire. The analysis of the interview responses suggests that the semi-structured questions utilized in the research instrument can be considered valid and reliable and can be used in the real study (Aung et al 2021; Gani et al 2020).

Farooq & De Villiers (2017) argue that telephonic interviews offer researchers the flexibility to engage participants from diverse geographic locations without the need for travel, making them a practical choice when financial constraints hinder extensive travel. This approach also grants participants greater anonymity, encouraging them to share personal experiences openly. In the absence of travel funding to cover all South African provinces, telephonic interviews proved relevant and feasible for capturing varied perspectives. With the participants' consent, the interviews were recorded and later transcribed by the researcher, proficient in the participants' vernacular languages, ensuring the integrity of the qualitative data. To maintain reliability, qualitative researchers, as noted by Farooq & De Villiers (2017), particularly document interview proceedings and analysis procedures. In this study, transcripts were rigorously analyzed for content and structure by the principal researcher and an independent reviewer.

3.3 SAMPLING METHODS

The following section outlines the sampling methods employed in the research.

3.3.1 Research Setting

The study took place countrywide and specifically targeted Development Studies graduates from the UJ. The choice of this university was deliberate, as the primary researcher had also earned her honours degree from the same institution. This personal connection allowed the primary researcher to leverage her knowledge and familiarity with the university's context, making it a practical choice for the study. Additionally, the researcher anticipated that her fellow classmates and peers would cooperate and offer valuable insights and provide an in-depth understanding of the research study.

3.3.2 Population

The population of interest for this study are the students who completed their postgraduate (honours) studies in Development Studies and graduated at the UJ, between 2019 and 2021. This period coincided with the heightened interest in 4IR in South Africa, catalysed by President Cyril Ramaphosa's announcement during the official opening address of 4IR SA-Digital Economy Summit in 2019 (South African Government 2019). The choice of the UJ as the study sample was deliberate, given the institution's proactive embrace of the technological advancements shaping our future. Notably, Professor Tshilidzi Marwala, the previous Vice-Chancellor and principal of the UJ, also served as the Deputy Chair of the Presidential Commission on 4IR, further highlighting the university's commitment to this transformative agenda.

The study targeted Development Studies students who completed their honours degree and graduated between 2019, 2020 and 2021, irrespective of their employment status, disability, gender, age, and race. Development Studies is more about development and the process of societal change. The primary researcher is a UJ alumni and currently a master’s student in the Department of Development Studies at the University of South Africa (Unisa), and she finds the field worthy of being researched for future employability

amid technological advancement. Consequently, the researcher obtained a database of all Development Studies postgraduate students who completed their honours degree between 2019, 2020 and 2021 from the UJ. This database consisted of a total of 66 graduates.

3.3.3 Sample size

As far as the quantitative phase of the study is concerned, 55 respondents were reached. This is about 86 percent of the population (from a list of 66 potential respondents provided by the UJ) and like they say, the bigger the sample the better (Mweshi & Sakyi 2020). This is generally to enable the generalization of the findings to the population (Hennink & Kaiser 2022).

In the qualitative component of the study, interviews, a total of 19 interviews were conducted. This is per various scholars who suggested that researchers should aim for a sample of between 12 and 20, depending on the purpose of the study (Kaur 2017).

3.3.4 Sampling procedures

Owing to budget limitations and practical reasons (e.g., access to participants or respondents), the researcher used snowball sampling technique to obtain participants Additional respondents were obtained by information provided by the initial respondent and as such giving attributes of a (Mweshi & Sakyi 2020). This allowed the researcher to tap into their acquaintances or friends and social networks. The advantage of using this method is that it is the most used technique and less expensive (Mweshi & Sakyi 2020). Conversely, it must be noted that with this kind of sampling method, you can only generalize the results to those who participated, not to the entire population. Through this method, the respondents were then encouraged to share the questionnaire link with potential respondents within their circles of friends or networks and even provide leads, expanding the actual number of participants finally reached (Gentles, Charles, Ploeg & McKibbon 2015). This included the use of personal networks such as former classmates

and acquaintances from the UJ to reach out to the population of interest guided by the database provided by the Division for Institutional Planning, Evaluation and Monitoring (DIPEM) of the university. This is in accordance with Mweshi & Sakyi (2020) who posit that convenience samples are recruited based on accessibility to the researcher.

After the questionnaire data had been collected and analysed, the researcher applied convenience/purposive sampling, also called judgment sampling, a non-probability (non-representative) sampling technique to survey the respondents of this study (Mweshi & Sakyi 2020). This method relies on the judgement of the researcher in the selection of the sample units that are to be studied (Gentles, Charles, Ploeg & McKibbon 2015). Purposive sampling technique is relevant for selecting participants for interviews as it allows the researcher to select based on participants' characteristics while focusing on the objectives of the study (Mweshi & Sakyi 2020).

3.4 DATA COLLECTION PROCEDURES

The following section presents the data gathering methods and tools that were used in the study. Additionally, methods used in the analysis of data are also discussed.

3.4.1 Data collection methods

In this study, Google forms, a survey administration software, which has the capability to store data was used to collect quantitative data, was used to design and deploy the online questionnaire. The questionnaire link was then distributed to the first few who requested to share the link to the questionnaire with those they know using any form of social media (email, WhatsApp, Facebook, etc.). The questionnaire link for the main study was distributed between January and March 2023. This data collection method was preferred as it is inexpensive, and the researcher did not have any resources to carry out the study (Rathi & Ronald 2022). From a total of 66 graduates on the list provided by the UJ, a total of 55 completed respondents completed the online survey, reaching a 91.6 percent response rate. To enrich the dataset qualitatively, the researcher also conducted 19 interviews (six semi-structured face-to-face and 13 telephonic interviews) employing

open-ended questions aligned to both the research questions and objectives between May and June 2023. It is commonly believed that the best way to obtain a true knowledge of people's experiences is through the use of open-ended questions (Jain 2021). The choice for using semi-structure interview is based on its flexibility in terms of allowing for follow-up on participants' responses (Aung et al 2021). The electronic version of the informed consent form was integrated in the online survey form.

Likewise, ethical issues like anonymity, confidentiality and voluntary participation were also outlined in the introductory part of the online (web-based) survey tool. It is assumed that these guarantees boasted a high response rate and assisted the respondents in providing honest answers (Jain 2021).

3.4.2 Data Collection Instruments/Measures

To gather quantitative data, a Google Forms questionnaire was designed. There were both open-ended and closed-ended items in each of the four sections of the questionnaire (Rathi & Ronald 2022). Dichotomous choice questions, such as yes/no, may be favoured over open-ended questions since their responses can be compiled, as opposed to the latter, which need coding (Jain 2021). Rathi & Ronald (2022) stated that this was done to prevent researcher bias and deception. Demographic data, including age, gender, and year of completion, were requested in the first section of the survey. The second part assessed the participant's employment status, employment sector or industry, length of employment, nature of the employment contract, and the type of work. In the first, second and fourth parts of the questionnaire, respondents' answers were limited to a fixed-choice questions (Jain 2021). For example, the fourth part of the questionnaire explored the respondents' perceptions of work readiness on a five-point Likert scale, with 1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree, and 5=Strongly Disagree (Appendix A).

The third part, which aimed at soliciting the respondents' understanding of the 4IR in the workplace, allowed respondents to reply to the questions in their own words. This section also offered the respondents the chance to list the types of technology devices and systems they use to execute their tasks. It took about fifteen to twenty minutes to complete the web-based survey. Part 2 of the questionnaire, in particular, the employment status

was used as the basis for the inclusion or exclusion in the follow-up interview, with only the respondents who reported that they were employed as being included in the qualitative phase of the research. Of the 55 respondents who completed the self-reporting online (web-based) survey, 19 agreed to participate in the qualitative component of the study, that is face-to-face and telephonic interviews.

According to Kaur (2017) in purposive samples, the size is determined by the idea of saturation. During this phase of data collection and analysis, there is little to no change in the codebook or themes as a result of new information. The analysis of the quantitative data informed sample selection for the second phase of the study, interviews. Based on the results of the quantitative phase and their willingness to participate in the follow-up study, 19 interviews (telephonic and face-to-face) were conducted. Each interview took approximately 30 minutes to conduct. Even though saturation depends on several things, including the following: (1) the number and complexity of data; (2) investigator experience and fatigue; and (3) the number of analysts reviewing the data (Hennink & Kaiser 2022), in the current study, data saturation occurred with the first 19 interviews. This was done to reduce the possibility that, should the analysis be finished too quickly, additional significant and in-depth content will be missed (Hennink & Kaiser 2022). This is in accordance with the literature which indicates that the sample for saturation ranges between five (5) and 24 interviews (Hennink & Kaiser 2022).

The interview schedule explored the following areas of the study: (i) aspects of the job that require demonstration of 4IR skills; (ii) ability to demonstrate 4IR readiness; (iii) how technology, including AI, is transforming the labour market and the workplace. Trial run interviews were conducted on the proposed interview questions and the questionnaire with five respondents between July and September 2022 in preparing a large-scale study to pre-test the research tools beforehand. There were no major problems or errors in either of the instruments that were identified warranting major improvements. In both the pilot and the real phases of the research, no incentives were offered or promised to the respondents. The interview began with a general greeting, self-introductions from the interviewer and the interviewee, and an explanation of the session's objectives by the

researcher. The interviewer also discussed the issue of recording the proceeding and approval. The participant was then interviewed by the researcher according to the interview guidelines. Finally, the researcher thanked the participant for his/her time and support and no token of appreciation was given.

3.4.3 Data analysis

To analyze quantitative data, the Statistical Package for the Social Sciences (SPSS) Version 28 was utilized. The raw data were analysed using descriptive statistics to summarise numeric data (Kulas, Roji & Smith 2021). The most common descriptive statistics include the mean, median, mode, variance, and standard deviation (Vetter 2017). This report uses frequencies, percentages, tables, and figures to summarise the collected quantitative data (Vetter 2017). According to Braun & Clarke (2021) transparency in study reports regarding analytical methods is one way that qualitative researchers can ensure rigor in their work.

Following the foregoing statement, in the current study, data collected from the interviews' narratives was analyzed using thematic analysis. The researcher used procedures outlined by Thelwall (2022) and Braun & Clarke (2021) to code, categorise, and interpret qualitative data. Likewise, Attride-Stirling (2001), concludes that for qualitative research to produce valuable and practical outcomes, it is essential to analyse the material systematically. One way of yielding meaningful and useful results is to use thematic networks as an analytic tool (Thelwall 2022). According to Braun & Clarke (2021) using thematic networks is a method for organising thematic analysis of qualitative data. It aims to uncover the prominent themes within a text at various levels, and its goal is to aid in structuring and illustrating these themes. The analysis of the interviews followed these steps:

Step 1: The first analytical step involves regularly reading the transcripts and verbatim records of the interviews by the primary researcher to give her an initial sense of issues arising from the data (De Wet & Erasmus 2005). This

allowed the primary researcher to interact with data as a whole and also provided her with the opportunity to listen to the participants' voices (Thelwall 2022). This approach allowed her to grasp the essence of the text before applying codes to it (De Wet & Erasmus 2005).

Step 2: After thoroughly reviewing the transcripts, the primary researcher began coding the data by assigning distinct labels to text excerpts that pertained to specific categories of information. The system was carried out manually. These coded segments were then organized into overarching themes (Braun & Clarke 2021). This method facilitated the identification of patterns and recurring concepts within the qualitative data. Themes were organised based on saliency, frequency, or significance (Attride-Stirling 2001; De Wet & Erasmus 2005).

Step 3: The Independent Researcher, who has extensive experience in analyzing qualitative data, was sourced, and acted as the second independent coder. His role was to check, confirm and test themes for accuracy (De Wet & Erasmus 2005).

Step 4: Primary Researcher and Independent Researcher meeting/dialogue to refine the themes and check for congruency (De Wet & Erasmus 2005). At this meeting, the themes were modified, and the final list produced following a consensus between the two parties.

3.5 ETHICAL CONSIDERATIONS

The current study received ethical clearance from the University of South Africa, College of Human Science Research Ethics Review Committee, to carry out research within the stipulated research protocols of the university. Again, the researcher was granted permission to conduct research at the UJ by its Research and Innovation Division of the university. Likewise, ethical issues like anonymity, confidentiality and voluntary participation were articulated in the introductory part of the online (web-based) survey

tool. Over and above that, the respondents were also assured that their responses would be treated with utmost secrecy. They were also guaranteed that no names would be attached to their responses and the collected information would solely be used for research purposes. In the event identification is to be used in the discussion of the results, pseudonyms like respondent or participant number 1 will be used, instead of their actual name. Again, after the study, the information will be kept on a computer protected by pin-codes.

3.6 CHAPTER CONCLUSION

The research approach, data collection tools, and data analysis procedures or methods were articulated. The chapter also delineates the values and principles associated with ethical issues including confidentiality, privacy, and voluntary participation which are key in conducting research as prescribed by the UNISA Policy on Research Ethics. These methodological foundations set the stage for the data analysis presented in Chapter 4.

CHAPTER 4

RESULTS/FINDINGS

4.1 INTRODUCTION

Following the comprehensive outline of the research methodology in Chapter 3, which detailed the research design, sampling methods, data collection techniques, and data analysis procedures, Chapter 4 presents the results and findings of this study. This chapter presents a summary of the data collected and details the statistical treatment using tables, frequencies, percentages, and graphs. In the discussion sub-section of this chapter, the results are summarised, evaluated, and interpreted with respect to the original research questions.

4.2 RESULTS FROM THE SURVEY

The results from the participants' survey responses are presented in the following sub-sections.

4.2.1 Participants' Demographic Information

This section provides an overview of the demographic information of the study participants. The demographics are essential to understanding the diversity of the sample and how various factors may influence the employability skills and readiness of graduates. The analysis includes data on the year of completion, gender distribution, and age range of the participants.

As shown in Figure 4.1 below, the study revealed that there were more graduates in the year 2019 (36.36 percent) and the year 2021 (38.18 percent) than in the year 2020 (25.45 percent). This variability in graduation years is significant as it may reflect the impact of external factors, such as the COVID-19 pandemic, on graduation rates and the preparedness of students entering the workforce. The distribution of graduates over these years provides insights into the evolving nature of the Development Studies qualification.

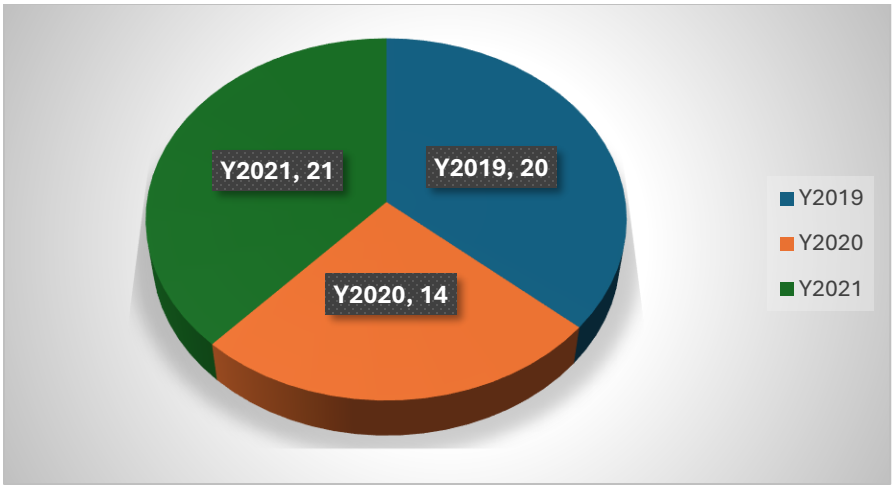

Figure 4.1: Participants by Year of Completion

Figure 4.2 indicates that there were more female participants (61.8 percent) than their male counterparts (38.2 percent). This gender distribution is notable and may have implications for the study's findings. The higher proportion of female graduates could reflect broader trends in higher education where women are increasingly enrolling and completing degrees at higher rates than men. It is also important in the context of Development Studies, a field often associated with social sciences and humanities, which tend to have higher female participation.

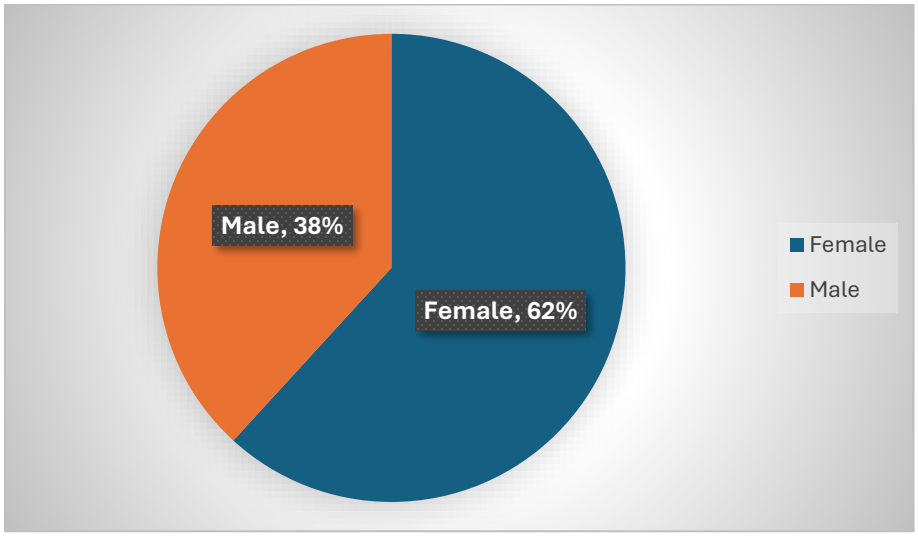

Figure 4.2: Participants by gender

Figure 4.3 shows that most participants are between 26-30 years old (54 percent), followed by those aged 21-25 years (43.6 percent), with a small percentage being 30 years and above (1.8 percent). This age distribution is important as it may relate with different levels of professional experience and maturity. Graduates in the 26-30 age range are likely to have more work experience or higher education compared to those in the 21-25 range, which could affect their perceptions of readiness and employability skills.

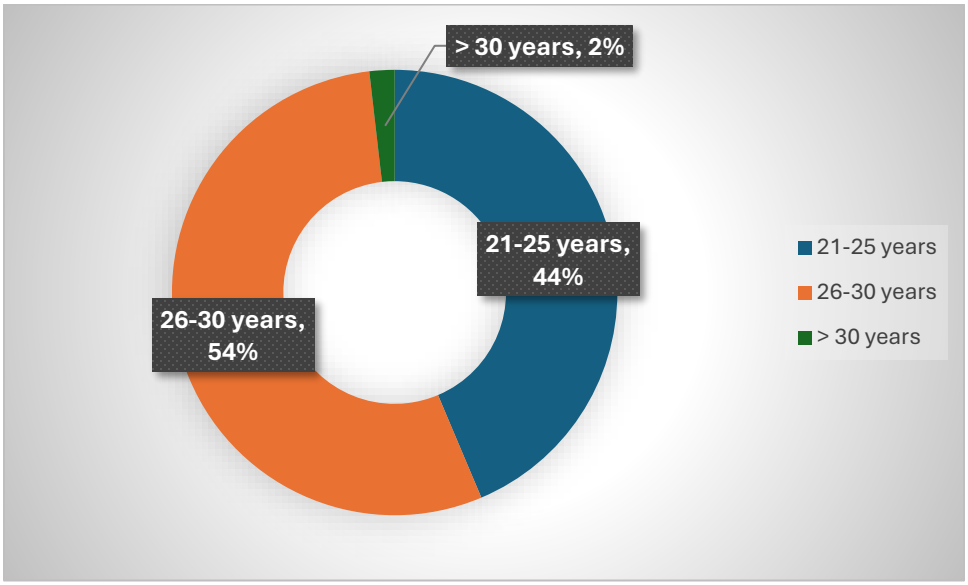

Figure 4.3: Participants by age category

4.2.2 Participants' Employment Status

The result of the survey indicates that about two-thirds majority (61.8 percent) of the participants reported to be employed in contrast with over one-third (38.2 percent) who reported to be unemployed. According to the analysis, 47.1 percent of the Development Studies graduates who are employed graduated in 2019, 26.5 percent in 2020 and 2021, respectively. This suggests that participants who completed their studies earlier are more likely to be employed compared to those who graduated most recently. Based on the survey, 23.63 percent of the Development Studies graduates are employed in the private sector while 20 percent work in government or the public sector, and 18.18 percent are employed in the NGOs/NPOs (Table 4.1). This is an indication of the diverse nature of

the qualification, Development Studies graduates, employed across different economic sectors. It is also interesting to note that one of the graduates has declared that he/she is currently an ethnographer in training thus affirming the multiple career pathing that the Development Studies qualification offers.

Field/Work/Sector	Frequency	Percent
Public Sector	11	20%
Private Sector	13	23.63%
NGOs/NPOs	10	18.18%

Table 4.1: Frequency and percentage of employment by economic sector

The substantial employment of graduates within and outside the Development Studies field further suggests that the skills and knowledge acquired through this qualification are not only relevant but also valued across different economic sectors. This demonstrates that Development Studies graduates are versatile all-rounders. Figure 4.4 shows that most of the Development Studies graduates are given contracts (41.81 percent), and only a few (20 percent) are given permanent jobs.

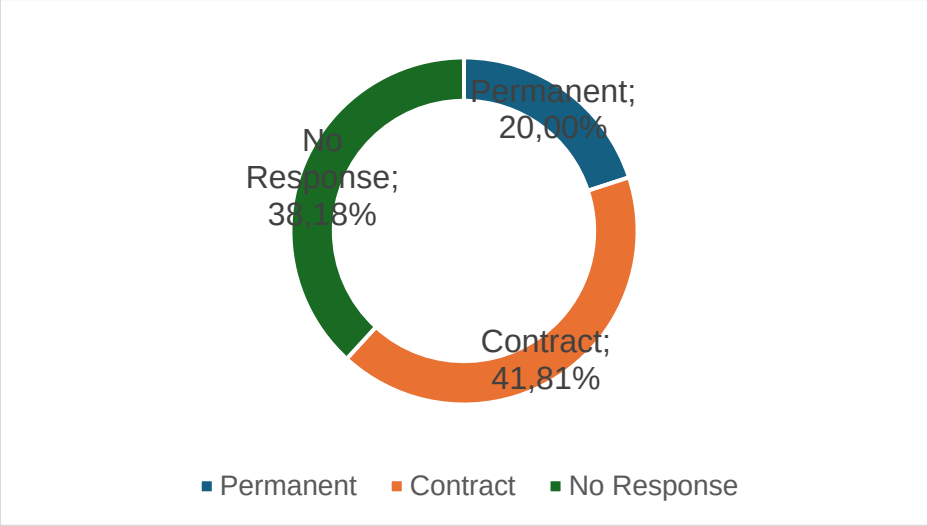

Figure 4.4: Employment Status by Type of Employment

Data revealed that from the 34 graduates placed, over two-thirds (67.6 percent) of them were on contract, and a third was appointed permanently. Most of the graduates who are

or were on the contract were employed mostly in the public sector (32.35 percent), private sector (20.58 percent) and NGOs/NPOs (14.70 percent). The private sector employed 17.64 percent and the NGOs/NPOs employed only 14.70 percent permanently. The data reveal that there is a higher likelihood of students who graduated in 2019 and 2020 to find employment than recent graduates, that is the 2021 cohort. Table 4.2 shows that 34 percent of the employed graduates, 64.7 percent of them are female compared to their male counterparts (35.5 percent).

Likewise, more female graduate (57.1 percent) indicated that they are unemployed compared to their male counterparts (42.9 percent) from the cohort of UJ students who graduated between 2019 to 2021. It must, however, be noted that this difference may be because of the total number of female graduates (n=34) who participated in the study as compared to their male counterparts (n=21).

Employment Status	**Gender**			
	Female		**Male**	
	Count	**%**	**Count**	**%**
Employed	22	64.7%	12	35.5%
Unemployed	12	57.1%	9	42.9%
	34		21	

Table 4.2: Number of graduates based on employment status and gender

4.2.3 Knowledge of systems, skills, and technology requisites

The analysis shows that 78.1 percent of the respondents stipulated that they use computers in their workplaces as an enabler to perform their day-to-day duties and responsibilities. This was followed by cell phones, Tablets, and iPads at 47.1 and 14.7 percent, respectively. Microsoft (MS) Office, in particular, Ms Teams, Ms Outlook, Ms Excel, and Ms Word, emerged as the most used (primary) applications, with a whopping 98.7 percent of participants reporting that they were utilising it, followed by Google Tools (57.9 percent), and social media platforms (47.3 percent) in their assigned job responsibilities. Likewise, respondents showed that they rely on MS Teams, Skype, and Zoom to run their meetings.

They also indicated that they store documents using cloud and organisational online systems like the Electronic Document Management System (EDMS), uFiling, among others. Other participants indicated that they also make use of NexCT (a travel and accommodation booking system), and LOGIS (to procure stationery and equipment in the public service). Additionally, respondents reported that they use National Integrated Social Information System (NISIS), which allows the user to keep track of the households living in poverty, and coordinate and monitor sustainable livelihood projects, and online surveys and databases to gather information. Likewise, some participants reported using Electronic Quarterly Performance Reporting System (EQPRS) to access reports from external sources or stakeholders, and SPSS and MS Excel to analyse data. However, these competencies are not signs of being 4IR-ready. Additionally, other participants reported that they use MS Word and Ms Excel to prepare reports and data information or data on the spreadsheet. Other participants reported that they use technology for data collection during inspections and for analysing trends. These findings indicate that Development Studies graduates are by nature, versatile, and conversant with various computer applications.

4.2.4 Perceptions and opinions of graduates' employability skills

The graduate perceptions and opinions towards 4IR and their employability skills are composed of twelve (12) items that were rated on a 5-point Likert scale, from strongly agree (1) to strongly disagree (5). Additionally, the interview schedule was administered to explore further their opinions, views, and observations on how 4IR (AI, automation) affected their employment prospects, the relevance of their skills in the future, and general workplace readiness. Figure 4.5 reveals that even though Development Studies practitioners play a crucial role in development, as agreed by over half (54.5 percent) of the respondents, about three-quarters (74.5 percent) indicate that it is not easy to find a job using this qualification. It is concerning to notice that almost half (47.3 percent) of the respondents were of the view that the qualification they possess did not give them the

leverage in securing the appropriate job. They actually believe that their qualifications did not adequately prepare them for the labour market or the job market.

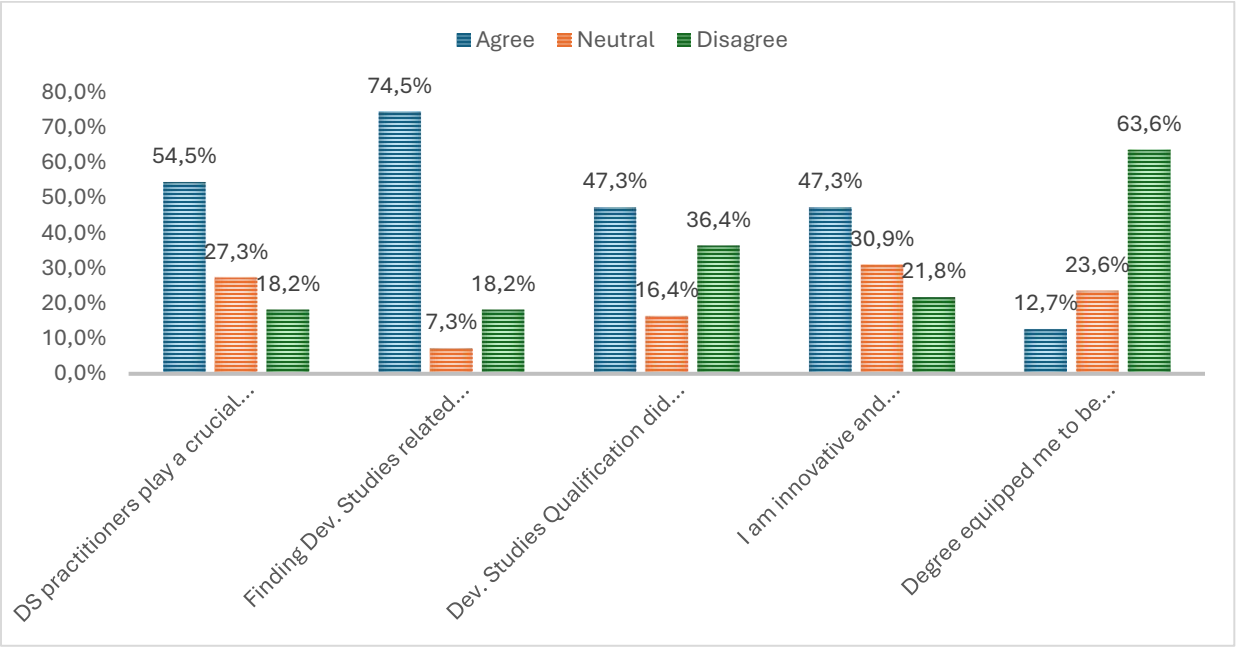

Figure 4.5: Relevance of Development Studies and Employability

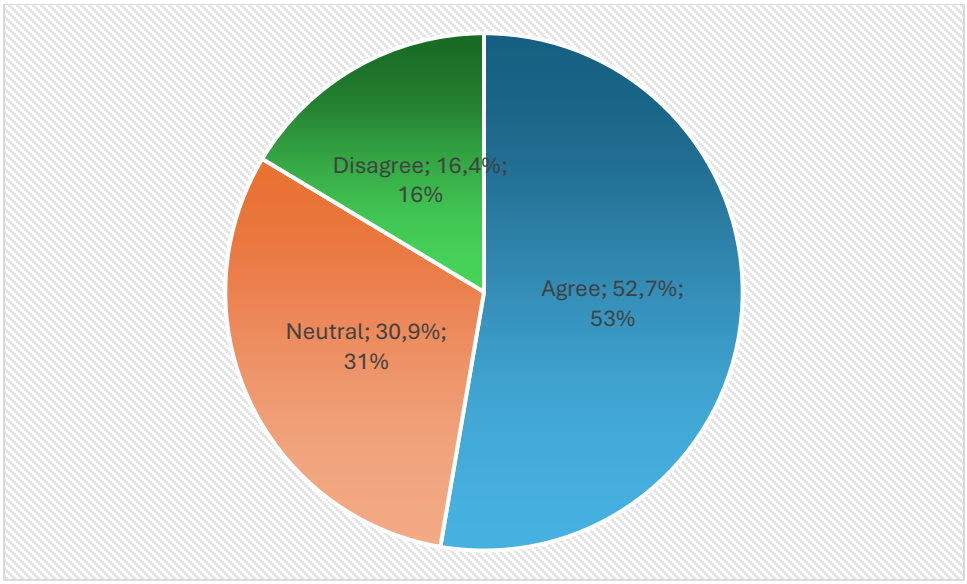

Figure 4.6: Awareness of changes related to 4IR

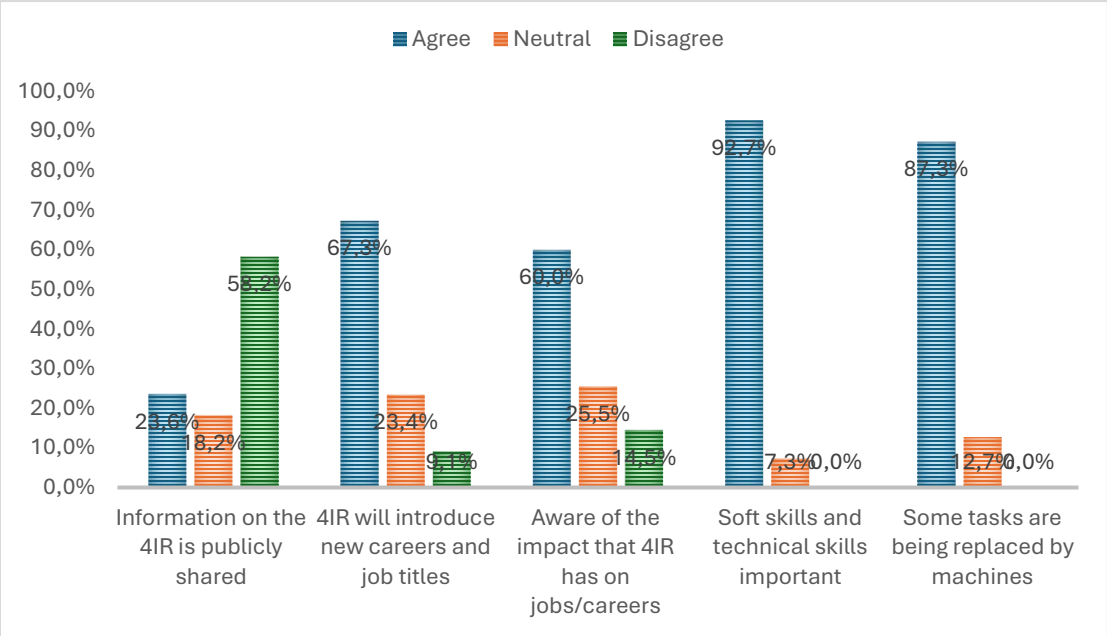

Figure 4.7: Knowledge and Perception of the 4IR

Even though 94.5 percent of the respondent agree that they are aware of how 4IR is already changing how people live, work, and interact; 87.3 percent acknowledge the fact that some tasks that were originally performed by humans have now become obsolete; and 67.3 percent agreeing that 4IR will introduce new skills requirements and jobs, it is worrying to note that 58.2 percent of the respondents feel that information on the 4IR is not well disseminated or shared in the public domain (Figure 4.7).

It is however comforting to note that 92.7 percent of the respondents acknowledged that it is important to have both soft skills (e.g., decision-making, working in teams, communication skills, adaptability) and technical know-how of machines for production and to carry out maintenance-related activities. It is however disheartening to note that 63.6 percent of the respondents felt that the qualification did not prepare them to be technically savvy to take advantage of the future of work.

4.3 RESULTS FROM THE INTERVIEWS

The audio-recorded interviews were transcribed by the primary researcher, and notes were reviewed and coded using qualitative data analysis methods to augment the quantitative data (Creswell & Plano Clark 2017). The interview (qualitative) data were analyzed by means of thematic analysis borrowing from grounded theorists who code and categorize data during the initial stages of data collection (De Wet & Erasmus 2005). To increase the reliability of the study, the services of an independent researcher were sought to co-code and develop and confirm the themes from the data collected. Regular discussions and meetings were held to compare and discuss the evolving thematic categories. Consequently, the primary researcher and the independent researcher reached consensus on the major themes arising from the coding of the qualitative data.

4.3.1 Profile of graduates interviewed

Key Responsibility Areas (KRAs)	***f***	***Percent***
Monitoring and Evaluation	4	21.1%
Project Management/Coordination	4	21.1%
Research and Development	3	15.4%
Youth and Community Development	2	10.6%
Control Environmental Officer/Compliance Inspector	2	10.6%
Data Collection and Capturing	1	5.3%
Intergovernmental Relations	1	5.3%
Occupational Health and Safety	1	5.3%
Business Support and Administration	1	5.3%

Table 4.3: Profile of graduates interviewed

4.4 DISCUSSION: SUMMARY AND INTERPRETATION

The purpose of this study is to assess the employability skills of students who graduated in Development Studies between 2019, 2020 and 2021 at the UJ. The study revealed that there were more female participants than their male counterparts. This is in line with the national university graduation rates statistics, which show that university graduation rates

for female students have remained consistently higher than those for male students over the past decade (Khuluvhe, Netshifhefhe, Ganyaupfu & Negogogo 2021). It further reveals that there were more graduates in the year 2019 than in the outer years, that is, 2020 and 2021. This suggests that participants who completed their studies earlier are more likely to be employed compared to those who graduated most recently. This is a sign that there are employment prospects out there, especially if one possesses the right skills (employability), attitude, and knowledge.

The study supports the assertion that even though Development Studies practitioners play a crucial role in development, it is not easy for them, like any other graduate, to l a job or enter the labour market in South Africa. It is against this background that most graduates tend to believe that their qualification did not adequately prepare them for the labour market or the job market. However, some authors are optimistic about the value of a qualification and concluded that, compared with persons who had not completed high school, persons with at least a high school certificate or associate degree averaged one and a half years to their first job (Tiessen et al 2018). Likewise, persons with a bachelor's degree (or higher) averaged three less years to their first job (Tiessen et al 2018).

However, it must also be remembered that the 2020 year coincided with the outbreak of the COVID-19 pandemic, a highly infectious disease that caused severe acute respiratory syndrome and was a major threat to public health globally (Wu et al 2020). The pandemic did not only create a public health emergence globally but also caused disruptions in the normal daily lives of people, the world economy (economic growth), and the complete transformation of the education system (Atuahene et al 2020; Ngwacho 2020; Tarkar 2020).

This exposed the real problems faced by the education system, namely, that some schools do not have computers, electricity, or access to the internet, or, if they do experience poor internet connectivity and a persistently unreliable power supply (load shedding). Exposure to computer technology in schools is also lacking (Carrim 2022). To compound matters, computer literacy is also not well developed, and all these point to

persistent inequality, the digital divide, poverty, and unemployment, which are prevalent in South Africa (Cele et al 2023; Atuahene et al 2020; Fox & Signé 2021). Despite all these challenges, universities worldwide were forced to scale up remote or online teaching (Burki 2020; Ngwacho 2020; Tarkar 2020). This shift to online teaching and learning in response to COVID-19 entailed unexpected expenditure, especially for underprivileged students and their families, leading to possible poor educational outcomes (Burki 2020; Ngwacho 2020).

The current study provided evidence for the demand for Development Studies graduates in the three sectors, namely, the private, public, and NGO/NPO sectors. This is a proof of how diverse the qualification can be with multiple career paths. They can map their career direction based on the cross-functional roles they play in the labour market, from monitoring and evaluation to conducting routine inspections. The study further revealed that a majority of the permanently employed graduates are working for the private sector and NGOs/NPOs, and the majority of those on contract are employed in the public sector. This is in accordance with the research findings of Tiessen et al 2018, who found that the key sectors driving Development Studies graduate employment are the NGOs/NPOs and public sectors, which exposes them to experiential learning. Other studies (Burki 2020; Mobarak 2019; Krajnakova et al 2020; Rowe & Zegwaard 2017) suggest that employability can be affected by a number of factors that affect the actual number and types of jobs available for graduates, including youth unemployment, the increasing number of students in the PSET system, and the mismatch between the skills and qualifications produced by the PSET system and demand by the industry.

Even though most of the Development Studies graduates are given fixed contracts and only a few are given permanent jobs, it appears as if they are expanding their sphere of influence in the world of work as they can make inroads and left indelible marks across all the sectors. First, the graduate is employed at the local government, advising the Executive Mayor on the youth policies as a Youth Development Office and coordinating and mainstreaming youth development programmes in the City of Tshwane Metropolitan Municipality. Second, the graduate is employed as an occupational health and safety

officer responsible for ensuring that the workplace complies with safety regulations, conducts risk assessments, and implements safety protocols. Third, the graduate is working as an environmental officer, overseeing environmental projects, ensuring compliance with regulations, and promoting sustainable practices. All these are employed permanently and are making strides in the world of work.

Likewise, six (6) of the graduates who were employed as interns were on fixed-term contracts for 24 months and were assigned to strategic projects and higher administrative functions. Internship programmes mostly lead to entry-level jobs and, as such, serve as steppingstones to a future career. They were/are responsible, among other things: (i) coordinating the work of the provinces and reporting using the EQPRS; (ii) overseeing the planning, execution, and evaluation of various projects to keep track of what and how well it is done; (iii) coordinating the development initiatives in rural areas, safeguarding tenure rights for farm occupiers, regularising Communal Property Association (CPA), providing training to the members; (iv) providing project administrative support; and (v) conducting fieldwork or gathering data for various research projects. These are very rewarding positions, and the experience acquired in these positions is invaluable. There is no doubt that the few Development Studies graduates who are employed make an indelible mark and thus should be able to make employers hire more graduates from the same field of study in the future.

When it came to the role of technology in the world of work, all the participants recognised the pervasive influence technology plays in their respective workplaces. The results showed that some of the benefits listed by the participants of technology in the world of work include providing real-time data on air and water quality, savings (time and resources), accuracy and timely reporting, efficiency, and effectiveness. For example, one of the participants indicated that she/he uses EQPRS, and if it were not due to digitalisation of their reporting system, that would mean going across the nine provinces of South Africa to gather information and evidence related to the performance of the provinces on the agreed performance indicators. This was going to be cumbersome, costly, and time-consuming. However, a few of the participants raised concerns or fears

about the threats posed by the introduction of automation, as it could easily replace the activities performed by them. The impression is that the machine can do some of the activities currently performed by humans even faster and better.

When it came to specific aspects of the participants' jobs that require the application of 4IR skills, the participants of the study reported electronic communication methods, social media, virtual meeting platforms (e.g., Microsoft Teams, Zoom, Skype), online document management (e.g., EDMS, uFiling), booking systems (e.g., NexCT), and the use of digital tools (e.g., LOGIS, NISIS) as ways of demonstrating their 4IR readiness. Generally, the participants lack insight into what 4IR is and the employability skills required by 4IR. The skill sets and competencies listed above belong to the digital age (3IR), characterized by the implementation of electronics and IT, and not the 4IR. This is an indication that 4IR awareness among the graduates is limited, as are its applications. This is in accordance with Wessels (2020), who found similar trends among schools and universities.

The study reveals that respondents possessed multiple skills sets, namely, leadership skills, problem solving, communication skills, research skills, active listening, critical thinking, and creative skills. Over and above that, most of the respondents believe that they are innovative, and technology oriented. They also reported that they possess technical skills such as computer skills, MS Office, project management, data analysis, and data management skills. This is in accordance with the position held by Azmi et al (2018), who maintain that critical thinking, communication, problem-solving, and interpersonal skills are highlighted as crucial by employers. Additionally, they acknowledged that the COVID-19 pandemic fast-tracked technological advancement in their workplaces.

However, Carrim (2022) advises that while the shift to online platforms may appear to align with the trajectory of the 4IR, it is essential to recognize that simply going online doesn't equate to embracing the full scope of the 4IR. In reality, the pandemic might have accelerated the transition into the digital age, possibly bridging the gap between the digital

era and the 4IR (Kayembe & Nel 2019). Additionally, Cele et al (2023) posit that graduates lack a thorough understanding of the employability skills required by 4IR.

On the positive side, some participants in the current study were optimistic that there will always be room for human intelligence and interaction, particularly in community-based service-related jobs like development practice. Therefore, this suggests that there will always be a need for the field of studies like Development Studies. In fact, technology is seen as a support system rather than a complete substitute, which resonates with Freira's emphasis on the learner's critical consciousness and active participation in their own learning process. However, most participants indicated a need for up-skilling, self-learning, and retraining (re-skilling) existing employees so that everyone can be onboard on the 4IR 'speed train'. This suggests that all the stakeholders (employers, educational institutions, government, and students) should be on board if the country is to reap the benefits that come with 4IR. This is in accordance with the Human Capital Theory, which indicates that investment in education and training (skills development) contributes to an individual's human capital, enhancing productivity and employability. Most participants in the interviews expressed a need to take a proactive approach to learning, like searching for and taking free online courses.

Overall, the findings emphasise a need for a multiparty, comprehensive approach involving all the stakeholders involved in education and training. However, it must be borne in mind that productivity was outside the scope of this study, it rather focused on whether the participants felt adequately prepared or not for their current or future job opportunities. Likewise, Freira's pedagogical approach was relevant as it advocates learner-centered education and training and critical thinking. Indeed, participants in this study encourage other graduates to take ownership of their own development (upskilling) through taking online courses to survive the 4IR wave and increase their employability. When it came to job preparedness, most employed participants felt better prepared for their desired jobs.

A few that indicated that they were not thoroughly prepared for their responsibilities reported that their employers play a pivotal role in teaching them the technical skills required in their roles. This aligns with the objectives of the two theoretical frameworks employed in this study. Participants in the current study further conceded that they needed a blend of theoretical and practical skills, real-world projects, and technology during their studies. Specifically, Rowe and Zegwaard (2017) posit that WIL, which brings together the two components (theory and practice), could assist in improving employability outcomes for students and graduates in various ways. This includes building their confidence, communication, teamwork, problem-solving, and critical thinking (Rowe & Zegwaard 2017). Additionally, this will also assist in bridging the gap between academic knowledge and workplace skills. However, these are primarily soft skills and not technical skills or 4IR skills required to perform well in the 4IR era. Only two participants alleged that they use data analytics tools to carry out their duties, which include the following: (i) assessing the impact (evaluation) of their projects; and (ii) safety monitoring.

Since the aim of the interview was to explore various issues related to employability of Development Studies graduate under the 4IR, in conducting the qualitative analysis, the researcher used verbatim transcriptions of the participants' response to all interview questions using their own words (voices) and expressions (or dialects). The interview schedule explored the following in detail: (i) aspects of the job performed by the Development Studies graduate that requires demonstration of 4IR skills; (ii) ability to demonstrate 4IR readiness; and (iii) how AI and other technologies are changing the world of work and the labour market. Carrim (2022) identified four coordinates in the 4IR enunciations, namely, inevitability, STEM matter, instrumentalism, and benevolence. The analysis of the interview transcripts led to the identification of three themes.

4.4.1 Theme 1: Nepotism in the workplace

This theme relates to the responses provided by the respondents posed by the researcher on the reasons they gave for the challenges they face in their search for employment opportunities other than 4IR readiness. Graduates scramble for the limited job

opportunities armed with, mostly, only their qualifications. However, the participants raised other extraneous factors at play to secure employment, and this is not related to the qualification. It all revolves around who one knows in the workplace. Some graduates believe that even though they may be more suitable and qualified for the advertised job opportunity, their job applications are ignored or rejected in favour of family members, children of their allies, close friends, or even relatives. This is usually facilitated by a 'contact' in the form of a third party, or a mutual acquaintance, who becomes an intermediary between the jobseeker (graduate) and the employer. This raises serious concerns as connections seem to be more important than qualifications, personal attributes, embedded knowledge, acquired skills, and relevant experience. It is concerning that in a country with rigorous labour laws and a world-class constitution, this is happening.

This is evidence in the following sentiments:

"I found this job because I knew someone who knew someone. Like job hunting is a very serious challenge in our country whether you have a degree or not. These days, qualifications do not work if you do not know anyone". - P16

This theme of nepotism in the workplace indirectly relates to graduates' perceptions of readiness for the world of work at the time of the 4IR. Graduates may feel prepared and ready for the workforce, but nepotism can overshadow their qualifications, leading them to feel that readiness alone is insufficient for securing employment. Even competent graduates may struggle to find employment if nepotism is prevalent, thus potentially affecting their career progression and ability to apply their skills. This theme is highly relevant to exploring ways of making graduates employable in the thick of the 4IR, as it suggests that addressing nepotism and promoting fair hiring practices are crucial for improving employability. Ensuring that graduates are hired based on merit can enhance the overall employability of Development Studies graduates in the 4IR. Nepotism might obscure the true demand for qualifications, as job opportunities may not always be awarded based on demand and merit. Understanding this can help address discrepancies in employment practices. While the role of the 4IR focuses on technological

advancements, recognizing how non-technological factors like nepotism impact employment can provide a more comprehensive view of the workforce dynamics during the 4IR.

4.4.2 Theme 2: Excitement/Euphoria Stage

The second theme is linked to benevolence, as ascribed by Carrim (2022). In this study, participants expressed great appreciation for the efficacy of technology in their everyday lives, in conducting their businesses, carrying out their job responsibilities and duties. This theme aligns closely with the graduates' self-perceived competence in leveraging digital tools for their duties. self-perceived level of competence in performing their duties in the middle of the 4IR. Participants indicated that technology has made their work and life easier. However, it also highlights a gap in understanding the full scope of the 4IR, suggesting that while graduates feel ready, their perception may be limited to current technological conveniences rather than the transformative potential of the 4IR. The examples provided demonstrate their ability to effectively use technology for communication, collaboration, and operational efficiency.

"*We use online tools to work together on progress, and sometimes we gather public opinions online*". - P34

"*Technology is integral to ensuring a safe working environment*". - P36

"We use technology to attend meetings with external and internal stakeholders without being in the same room". - P43

"*After the outbreak of Covid-19, most things changed. I mean, we didn't even know that we could work from home. Like now, things have changed to the point that there is less travelling and through online platforms, we are able to attend two or three meetings in the same day at the comfort of house*". - P28

Furthermore, it also points to a possible discrepancy between their current competencies and the advanced skills required for full 4IR integration. This highlights the importance of aligning graduates' skills with the demands of the 4IR. While current technological skills are beneficial, there is a need to further integrate 4IR-specific competencies into their

education and training. Addressing this gap can enhance their employability and ensure they are prepared for the more advanced technological that comes with 4IR. The theme suggests that there is a demand for graduates who are proficient with current technologies. However, it also implies that the demand may evolve as the 4IR progresses, requiring graduates to acquire more advanced technological skills to remain competitive.

The role of the 4IR in transforming work environments is evident in the participants' experiences with digital tools and remote work. This theme highlights the immediate benefits of technology while also indicating the broader, transformative impact that the 4IR will have on work processes and human-machine interactions. Graduates are aware of and appreciate the current technological advancements, but their understanding of the 4IR may be limited. This theme suggests the need for greater awareness and education on the full scope and potential of the 4IR. Graduates feel prepared because of their proficiency with existing technologies. However, the theme also indicates that their preparedness may not fully align with the advanced technological requirements of the 4IR. This highlights the importance of expanding their skills and knowledge to include more comprehensive 4IR competencies.

4.4.3 Theme 3: Indifferent/Apathy State

This theme is linked to what Yende (2021) refers to as instrumentalism, which assumes that education should lead to actual practice and that constant upgrading through lifelong learning is critical to becoming highly skilled to function in the 4IR global economy. The concept of life-long learning is central to Paulo Freire's theory (Putra et al 2020). This could be done through attending or taking online courses, attending seminars, and so forth. This is in accordance with Shih (2018), who proposed that practitioners and students of Development Studies should be encouraged to continually learn and adapt to new technologies and trends. It seems most participants support this notion and a culture of life-long or continuous learning to render their skills sets and knowledge fluid. On the question that explored their views about the increasing role of AI and automation in the workplace and the risk of some roles being automated, some participants were more

oblivious about the long-term impact of technology or the introduction of automated systems, artificial intelligence, or robots.

They are resolute that their services will still be required in the future, even in the face of technological advancement. This is in alignment with Carrim (2022), who indicated that technology works with what we give it, and technology is seen as a means (an instrument) to an end. This could be because of the nature of the work that they do, which they think machines are unable to do. It could also be because of their pure ignorance of what is happening in and around them as far as technological advancement is concerned. It could also be due to resistance to new changes and technologies, as identified by Lau et al (2021).

Alternatively, it could be a sign of perceived readiness, acquired experience, and other personal factors like resilience, or subscribe to another school of thought that regards 4IR as a myth. Be that as it may, several participants agree with Carrim's conclusion about technology being controlled by humans, and that is evident in their sentiments below:

"While technology enhances our work, I believe the human touch is irreplaceable in the NGO sector. Empathy, understanding local contexts, and building relationships are important aspects of our work, at least for now, and cannot be fully automated". - P16

"Robots and automation aren't human, and certain things still need human intelligence and participation". - P21

"Well, without a doubt, technology is getting smarter and smarter, but I have also noticed that it works with what we give it". - P1

"Even though we depend on technology for things like project reporting, data analysis, and reporting…human intelligence is also needed, which is something machines cannot do". - P3

"Technology is just an additional support for our work and nothing hectic…the most important part of our job to be carried out depends on emotional intelligence and interactions of which artificial intelligence cannot master even in the near future". - P4

“There is a possibility for certain routine tasks to be fully automated, but the human judgment and understanding needed for compliance assessments make the job less likely to be fully automated”. - P14

“While technology is handy, the core of my job involves on-site assessments, understanding ecosystems, and working with communities. That is something technology cannot replace!”. - P43

“I think there is a balance. While some tasks could be automated, the human touch in managing projects and understanding community needs is crucial”. - P3

“Ethnography involves understanding people’s lives and culture through direct engagement. I don’t think a robot can do that”. - P11

“…*the work we do sometimes depend on human interaction and emotions. Technology can never be humans, and some of the things need humans’ intelligence and interactions”*. - P16

“The truth is 4IR is very complicated and we cannot even tell what exactly it will bring tomorrow..”. - P16

4.5 CHAPTER SUMMARY

This chapter presented participants demographic information, with more female than male graduates, with a majority being between 26 and 30 years (54 percent), 43.6 percent between 21 and 25 years, and a few 30 years and above. The findings show that most of the graduates employed completed their studies in 2019, and most of them are employed in the private sector (23.63 percent), and 20 percent in the public sector. Further, quantitative and qualitative analysis are provided using descriptive statistics and thematic analysis. Building on these findings, Chapter 5 synthesizes the analysis to draw meaningful conclusions, addressing the research questions and discussing the implications for theory, practice, and future research.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

Chapter 5 will provide a comprehensive conclusion and discussion of the study's findings, drawing connections to the research objectives and questions outlined in earlier chapters. It will address the limitations encountered during the research process, suggest areas for further research, and offer recommendations for enhancing the employability of Development Studies graduates in the context of the 4IR. By reflecting on the study's contributions and implications, this chapter aims to provide a holistic view of the research and its potential impact on the field.

5.2 FINDINGS OF THE STUDY

Development Studies graduates generally perceived themselves as equipped with the most crucial set of skills that are highly relevant to addressing global development challenges. Despite their valuable interdisciplinary skills, these graduates face challenges when it comes to the complexities of the 4IR job market. Their perceptions of readiness are influenced by their educational background, perceived employability, and the evolving demands of the global economy. However, when it comes to the 4IR, which is characterized by digital transformation, automation, and artificial intelligence, graduates may feel less prepared. They recognize the increasing importance of digital skills, such as data analysis, coding, and proficiency with digital tools and platforms. There is a perception that their formal education might not have adequately prepared them for these technological advancements and their implications for the job market.

Many Development Studies graduates feel equipped with critical thinking, analytical, and research skills that are valuable in various sectors, including international development, NGOs, government, and public sectors. However, their preparedness for the 4IR can be

perceived as mixed, with concerns about technological skills and digital literacy. Furthermore, there is a general confidence in the employability of Development Studies graduates because of their knowledge in social sciences, economics, and policy analysis. Concerns arise regarding the alignment of their skills with evolving job market demands, including data analytics, digital innovation, and sustainable development technologies. While they appreciate their qualification for providing a holistic understanding of global issues and development processes, there are doubts about its practical applicability in rapidly changing sectors driven by technological advancements. Challenges such as a skills gap between their education and employer expectations in the 4IR economy, perceptions of nepotism impacting hiring practices, and limited proficiency in digital skills create barriers to their competitiveness in the job market.

Development Studies graduates recognize that technology has significantly improved both their professional and personal lives, enabling them to work more efficiently and communicate effectively. However, their understanding of the 4IR seems focused on current technological conveniences rather than grasping its full transformative potential. While graduates feel confident in using technology for immediate tasks like communication and collaboration, they may not fully anticipate broader implications such as AI, automation, and big data analytics across various industries. This highlights a need for participants to expand their awareness and education regarding emerging technologies and their impact on future work environments and societal structures. By developing a deeper understanding of the 4IR's transformative capabilities and promoting continuous skills enhancement.

Higher education institutions are instrumental in shaping society by equipping graduates with specialized skills and knowledge that are essential for fostering innovation and productivity across various sectors. This is particularly pertinent in the context of the fourth industrial revolution, where technological advancements are rapidly transforming industries and creating new job roles. Continuous learning and upskilling are crucial for Development Studies professionals to stay relevant amidst these shifts, highlighting the importance of lifelong learning beyond formal education. By preparing graduates to adapt to and lead in a changing global economy, higher education institutions play a pivotal role

in enhancing the employability and impact of Development Studies professionals in the fourth industrial revolution.

5.3 LIMITATION OF THE STUDY

This study had various limitations. First, the qualitative research method is known for lacking reproducibility and generalisability (Creswell & Plano Clark 2017). The study used convenience/purposive sampling with a variable sampling method. The foremost limitation of this sampling method is the fact that variability and researcher bias cannot be controlled (Paulhus & Vazire 2007). Second, the population used in this study focused on the UJ Development Studies graduates from 2019 and 2021. Therefore, results from the collected data cannot be generalised beyond the sample used, namely, graduates from other departments or universities or South Africa as a whole and other countries. Third, self-report surveys have a problem triggering socially desirable responses, which can lead to respondents providing answers that inaccurately reflect reality or their actual knowledge, experiences, and understanding, or even avoid providing responses that are considered embarrassing to them (Lietz 2010). This is possible as society holds graduates in high esteem and expects them to understand a lot about the industrial revolution and the associated challenges.

5.4 SUGGESTIONS FOR FURTHER RESEARCH

The study has investigated the employability of Development Studies graduates under 4IR. There is scanty of information about the impact of 4IR in economic growth, job creation, and the associated opportunities that come with it especially in improving the quality of life of the citizens in digital divide and inequal society like South Africa. Higher education institutions offering Development Studies programs should consider revising their curriculum to incorporate more technical skills, such as data analysis and cybersecurity, alongside the existing soft skills. This could be an area of future research to explore the feasibility of such a proposal given the limited resources and capacity constraints.

5.5 RECOMMENDATIONS

Based on the results of this study, following recommendations are made:

a) First, even though it is not the panacea of all the challenges faced by the Development Studies graduates, the Department of Development Studies at the UJ, should consider entrenching WIL programme as a compulsory component of its qualification, as a critical strategy for enhancing graduate employability as advocated by Rowe and Zegwaard (2017).

b) Second, there is an urgent need to develop, or re-design 'fit-for-purpose' (curriculum adaptation) curriculum aimed at developing new competencies for the automation workforce (Setyaningsih 2020).

c) Third, there is a need for the upgrading or re-skilling of teachers and lecturers' digital skills and competencies. Malcolm X, an American human rights activist said, education is our passport to the future, for tomorrow belongs to the people who prepare for it today. This is in accordance with the findings of Pauceanu et al (2020) who suggested that teachers and lecturers were not provided with training to educate their learners about 4IR.

d) Fourth, investment in the relevant infrastructure and internet connectivity in the centres of education (namely, the schools, TVET colleges, and universities). This could assist not only in redressing the digital divide but also lay proper foundation for the much-needed digital skills associated with the 4IR. It will also enable the government to realise its dream of fully rolling out the introduction of coding and robotics subjects at primary schools nationally, which is lagging.

e) Fifth, invest in digital 4IR skills, training, and re-training (skills programmes) targeting the employed and unemployed to leverage on the identified (new) technical skills (e.g., programming, robotics, AI, data analytics, IoT, etc.) using the country's solid skills landscape in the SETAs (e.g., MICT SETA), the NSF, UIF, and other funders.

f) Sixth, the government must provide leadership role as the custodian of the national response action plan, policies, and the National Digital Skills Strategy to position the country as a leader in the evolution and development of the 4IR.

Higher education institutions offering Development Studies programs should consider revising their curriculum to incorporate more technical skills, such as data analysis and cybersecurity, alongside the existing soft skills. Or universities could encourage a broader selection of electives from other disciplines to complement those that are lacking in Development Studies. This will better equip graduates for the evolving job market. Collaboration between educational institutions and employers is crucial. Through this collaboration, educational programs can be better matched with industry demands, guaranteeing that graduates are ready for the demands of the labour market. The study suggests a need for ongoing research in this area, given the dynamic nature of the job market. Future studies should explore the changing demands and assess the effectiveness of interventions in equipping Development Studies graduates for 4IR employment.

5.6 CONCLUSION

Interview participants, generally, lack a basic understanding of the 4IR and the employability skills required by the 4IR. There is a sense that the participants are confusing the two industrial revolutions, namely, 3IR and 4IR. However, they agree that technological advancement poses a serious threat to their livelihood, as some jobs can best be done by machines with precision. They also acknowledge that, even though automation and AI pose threats, these machines will still need human input, and there is also a consensus that some activities will still require human interaction.

Generally, the participants lack some grounding in 4IR, and the employability skills required by 4IR. Participants concede that even though technology shapes the way they live and work, it has its own shortfalls. It can do some of the things smarter than a human being and save time and resources, but it needs inputs and human intelligence to be effective and efficient. Some jobs also require emotions and human interactions, which a machine is incapable of doing for now. There are a few graduates who are stuck in the past and ignore all the signs of the arrival of 4IR. Most of the graduates also indicated that they were not thoroughly prepared for the world of work, were not exposed to the use

of technology, and had to learn most of the things at work. This is comforting, as it shows that employers have also heeded the call to make every workplace a learning space.

However, there is a need for a smooth transition from the 3IR to the 4IR, as the latter is likely to be disruptive to people's lives and livelihoods and the education system in general. This may lead to industrial (economic instability) and social unrest, some sort of "Arab Spring" on a global stage. If not contained wisely, it may even lead to the rise of militancy groups and the violent overthrow of the government, the first coup d'etat in South Africa. However, some participants remain resolute in the face of adversity and believe that it is not all doom and gloom. They acknowledge the fact that, even though technology could master some human activities, it cannot operate everything or solve some of the problems (e.g., social problems). It will need a human touch to analyse data, make recommendations, and even solve some problems.

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APPENDICES

Appendix A: Consent to Participate in the Study

Research Title**:** Employability of Development Studies Graduates Under the 4IR

Researcher: Miss Lovedelia Lerato Tshoteli

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits, and anticipated inconvenience of participation. I have read (or had explained to me) and understood the study as explained in the information sheet. I have had sufficient opportunity to ask questions and am prepared to participate in the study. I understand that my participation is voluntary and that I am free to withdraw at any time without penalty. I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the phone to be used to record. I have received a signed copy of the informed consent agreement.

Participant Name and Surname…… (please print)

Participant Signature……..Date……

Researcher's Name and Surname: Lovedelia Lerato Tshoteli

Researcher's signature  Date: 06/04/2022

Appendix B: Graduate Questionnaire

INTRODUCTION

Dear Development Studies Honours Graduate.

You are invited and selected to participate in the survey questionnaire administrated by a UNISA Development Studies master's student: Lerato Tshoteli. By completing this survey, you will help the researcher understand the current and future employability of Development Studies under the Fourth Industrial Revolution (4IR). If you are self-employed, employed, or unemployed, the researcher would like you to assist and complete the questionnaire. The questionnaire is likely to take approximately 15-20 minutes of your time to complete. The researcher assures you that all responses are anonymous and confidential. Participation is voluntary, therefore there will be no form of reward. All questions are to be answered to the best of your knowledge and understanding. By continuing with the questionnaire, you give concern to participate in the research. If not, then you are allowed to exit the questionnaire.

SECTION A (DEMOGRAPHICS)

Question 1: What will your age in years be on 31 December 2022?

21-25 yrs.		26-30 yrs.		31 yrs. +	

Question 2: With which gender do you prefer? Male/Female

Question 3: When did you complete your Development Studies honours Degree?

2019		2020		2021	

SECTION B (EMPLOYMENT STATUS)

Question 4: What is your current employment status?

Employed		Unemployed	

Question 5: Which sector are you/ were you employed in? (Applicable to those employed graduates)

Public		Private		NGO/NPO		Self	

Question 6: How long have you been working? (Applicable to those employed graduates)

Less than 24 months		More than 24 months	

Question 7: What is the nature of your contract? (Applicable to those employed graduates) Permanent/Contract

Question 8: Is the type of work related to your Development Studies qualification? (Applicable to those employed graduates) Yes/No

SECTION C (UNDERSTANDING OF 4IR)

Question 9: Do you make use of technology devices/ systems/ services to complete your job task? (Applicable to those employed graduates)

1. Yes
2. No
3. Not Applicable

Question 10: If yes, do you find it useful in completing your task? (Applicable to those employed graduates)

1. Yes
2. No
3. Not Applicable

Question 11: List the types of technology devices you use to complete your task. (Applicable to those employed graduates)

Question 12: List the types of technology systems you use to complete your task. (Applicable to those employed graduates)

Question 13: Which soft skills do you have? (Select as much as you can)

1. Leadership skills
2. Communication skills
3. Critical thinking
4. Creative
5. Active listening
6. Problem solving
7. Research
8. Embracing change
9. Others: _____

Question 14: Which technical skills do you have?

1. Programming
2. Data analysis
3. Computer literate
4. Database management
5. Cyber security skills
6. Project management
7. Digital design
8. Microsoft office
9. Coding
10. Others: _____

Question 15: Which of the 4IR technologies have you heard of?

1. Artificial intelligence.
2. Robots.
3. Cloud computing.
4. Internet of Things (IoT).

5. Virtual reality.
6. Others_____

Question 16: Select what best describes you (you can select as many as you can).
1. I am up to date with existing technology.
2. I can communicate using video conferencing through online platforms.
3. I could communicate information (sending and receiving emails).
4. I can save documents online (cloud/ electronic filing)
5. I am Microsoft literate.
6. I have the skill to conduct online research.
7. I can adopt to work independently.
8. I can navigate/ adopt to technology easily.

SECTION D (4IR & WORK READINESS)

This section assesses your perception of your work readiness. Kindly rate your level of agreement or disagreement using the options provided below: **SA**=Strongly Agree, **A**=Agree, **N**=Neutral, **D**=Disagree, and **SD**=Strongly Disagree.

Statement	**SA**	**A**	**N**	**D**	**SD**
Development Studies practitioners play a crucial role in development					
Finding a job using Development Studies qualification is not easy					
I feel that my qualification did not adequately prepare me for my job.					
I am aware of the technologies that is introduce by the 4IR					
I am aware of the impact that 4IR will have on future jobs and careers					
Information on the 4IR is publicly shared enough					
I am aware that 4IR is already changing how we work, live, and interact with one another					
4IR will introduce new careers and new job titles					
It is important to have both soft skills and technical skills to be employable in the future					
Some tasks conducted by humans are already being obsolete due automation and robots					
As a Development Studies graduate, I am innovative, and technology oriented					
My degree equipped me to be technologically literate and skilled to be employable in the future					

Thank you for your participation.

Appendix C: Interview Schedule/Questions

1. What is your Job title and your role in it?
2. Which aspect of your current job requires you to demonstrate 4IR skills?
3. Are you able to demonstrate your 4IR readiness well when doing your job? Give examples of how you do that.
4. Does your job depend on technology devices or systems to deliver the work? Explain.
5. From your observation has the 4IR changed the way you work? If so, how?
6. Looking at how artificial intelligence and other technologies are changing the world of work and replacing jobs. Do you think that your role runs a risk of being automated?
7. Were you prepared enough for this job during your qualification?
8. Do the skills you have guarantee you a job in the future, looking at how 4IR is taking over?
9. Who do you think is responsible to ensure that graduates are prepared for the future employment?
10. What suggestions or recommendations would you give to them to ensure that graduates are employable in the future?

Appendix D: UNISA College of Human Sciences Research Ethics Clearance

UNISA university of south africa

COLLEGE OF HUMAN SCIENCES RESEARCH ETHICS REVIEW COMMITTEE

07 June 2022

NHREC Registration # :
Rec-240816-052
CREC Reference # :
58436626_CREC_CHS_2022

Dear Ms Lovedelia Lerato Tshoteli

Decision:
Ethics Approval from 07 June 2022 to 07 June 2025

Researcher(s): Name: Ms LL Tshoteli
Contact details: 58436626@mylife.unisa.ac.za
Supervisor(s): Name: Dr MS Motebang
Contact details: motebams@unisa.ac.za

Title: Employability of Development Studies Graduates under the Fourth Industrial Revolution

Degree Purpose: MA (Development Studies)

Thank you for the application for research ethics clearance by the Unisa College of Human Science Ethics Committee. Ethics approval is granted for five years.

The ***low risk application*** *was reviewed by* College of Human Sciences Research Ethics Committee, in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the College Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the

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confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.

5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
7. No fieldwork activities may continue after the expiry date **(07 June 2025).** Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

*The reference number **58436626_CREC_CHS_2022** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

Signature: Khan

Prof. KB Khan
CHS Research Ethics Committee Chairperson
Email: khankb@unisa.ac.za
Tel: (012) 429 8210

Signature: PP AHMudau si

Prof K. Masemola
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Appendix E: University of Johannesburg Permission to Conduct Research

02 November 2023

Lerato Tshoteli
University of South Africa (UNISA)

Dear Lerato Tshoteli

PERMISSION TO CONDUCT RESEARCH AT THE UNIVERSITY OF JOHANNESBURG

The request for the project titled *Employability of Development Studies Graduates under the Fourth Industrial Revolution* refers. Permission is granted to conduct this study at the University of Johannesburg (UJ).

Please note that the granting of permission does not make it mandatory for UJ students and/or staff to participate in the study. As the researcher/applicant, you will need to engage with potential participants to obtain their consent to participate in the study.

Should you require assistance in distributing the survey to UJ students and/or staff, kindly send a brief description of your study together with the link to where participants can access the survey to tdewet@uj.ac.za, copying hemalij@uj.ac.za and rloots@uj.ac.za.

Sincerely

Dr Ndivhuwo Luruli
Executive Director: Research and Innovation
Email: nmluruli@uj.ac.za