A graduate level ethics framework for the Higher Education Information Systems curriculum in South Africa

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DECLARATION

Hereby, I, Yusuf Adams, declare that *"A graduate level ethics framework for the Higher Education Information Systems curriculum in South Africa"* is my own original work and that all sources have been accurately reported and acknowledged, and that this document has not previously in its entirety or in part been submitted at any university in order to obtain an academic qualification.

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Date:

Signature 

Approved by

Dr Johan Breytenbach

Supervisor

ABSTRACT

A graduate level ethics framework for the Higher Education Information Systems curriculum in South Africa

Purpose: The objective of this study was to fill a gap in the Information Systems (IS) literature concerning the manner in which ethics are to be incorporated into the Information Systems curriculum to allow for accelerated learning by IS students in the field of ethics. This was accomplished by developing a framework that assisted Information Systems lecturers to embed ethics into the curriculum in ways that improved graduate comprehension and application of ethical principles during Information Systems learning, research and practice.

Methodology/design: This study used a single case study design, gathering data from two cohorts of IS graduates at a single university, before and after exposure to ethics teaching and learning that translated ethical considerations of AI systems into familiar IS concepts, such as input, process, output, and the technology-organisation-environment taxonomy.

Practical implications: This study added value to IS curriculum design as a discipline, clarifying how ethical principles that relate to IS are mapped to an existing undergraduate understanding of Information Systems – the existing curriculum, including a phased breakdown into input, design, and output, as well as IS concepts such as functional and non-functional system requirements.

Findings: Even after having received learning in ethics that were carefully embedded into relevant modules of the IS curriculum, students did not have a solid understanding of the essential ethical concerns required to create and design 'ethical-by-design' systems in the field of Information Systems.

These clear misunderstandings are evident in the inconsistent and contradictory results generated by both pre- and post-intervention surveys. More importantly, it was also revealed that once students were provided the basic definitions – which formed the basis of the second survey – they answered the questions related to functional aspects of computer ethics more precisely and, on average, produced superior results in these categories in the post-intervention survey. When compared to the results of the first cohort, the second cohort indicated a greater understanding of ethics in regard to the system's operation. This was the case while holding all other variables constant. More importantly, ethical considerations pertaining to non-technical functions were poorly understood even after the embedding of information through accelerated learning. This calls for a separate IS ethics module that covers non-functional aspects of computer ethics.

Originality/value: From a comprehensive review of literature, there is a clear gap in IS research knowledge regarding how ethical principles should be framed and taught in the graduate IS classroom.

Key words: Information Systems, Ethical considerations, Design principals

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thought-provoking questions concerning IS ethics, statistical methods, and research methodologies. The meetings and conversations were essential in motivating me to think creatively and from a variety of perspectives in order to formulate a critical analysis that is both exhaustive and impartial.
To my technical editor, Brian Carlson, I say gratitude. Whose quick and thorough editorial assistance was invaluable.

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DEDICATIONS

This piece of work, which is my thesis, is dedicated to my wife, Naseera, who has been an unwavering support and motivational force for me throughout the challenging times of graduate school and throughout my life. I am incredibly grateful to God for bringing you into my existence. This work is also dedicated to my parents, Imtiaz and Shahieda, whose unconditional love and positive example have taught me to work hard for the things that I aspire to accomplish. I thank you both for everything you've done for me.

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LIST OF ACRONYMS

4IR	Fourth Industrial Revolution
AI	Artificial Intelligence
AL	Accelerated Learning
COVID-19	Coronavirus Disease 2019
DI	Digital Innovation
ETL	Extract, Transform, and Load
fMRI	Functional Magnetic Resonance Imaging
IL	Intensive Learning
IPO	Input, Process, Output
PGDip	Postgraduate Diploma
SI	Social Informatics
STS	Science and Technology Studies
TOE	Technology, Organisation, and Environment

CHAPTER 1: INTRODUCTION AND BACKGROUND 1

1.1 INTRODUCTION

In this study of Information Systems (IS), we examined the major ethical issues surrounding IS and present a theoretical framework for the incorporation of ethics as a field of study into graduate level Information Systems curricula. From a preliminary literature review, it was established that ethics is not well understood by current IS graduates, hence a framework will be proposed to enrich their studies with ethics and ultimately 'ethicise' their future Information Systems endeavours.

This chapter will introduce the following foundational concept within an Information Systems context:

1. General ethics,
2. Computer ethics,
3. Ethics of information systems.

The theoretical overview of ethics topics related to IS will be further expanded in Chapter 2. Furthermore, attention will be paid to topics such as Ethics-by-Design (EbD) and the categorisation of ethical concerns into IS framework categories.

Chapter 1 also includes a brief description of the research methodology implemented, a statement of the research problem, research questions and objectives with an included process diagram, a summary of findings, and a statement of the research limitations.

1.1.1 Background

Introductory broad definition of ethics

In order to come up with a comprehensive explanation of 'what ethics is not', the Markkula Centre for Applied Ethics at Santa Clara University in California was given the responsibility of working on the problem. It is not difficult to link ethics with one's religious beliefs or the legal system of a given country. It shouldn't come as much of a surprise that the vast majority of religions encourage adhering to strict moral standards for the sake of the "common good". On the other hand, ethics does not solely pertain to individuals of a certain religious orientation and, as a consequence, it cannot be confused with a theological principle. In addition, a society's legal system cannot be used to set ethical standards (Vallor, 2018).

Ethics cannot be accurately reduced to a mere reflection of the legal system within a country or region. The laws that once governed slavery in historic South Africa and those that oversee contemporary Apartheid represent vivid instances of legal frameworks deviating significantly from ethical principles. This is especially true of the laws that governed Apartheid in South Africa. (Schwarz, 2005). One can therefore not equate ethics with a country's constitution.

Ethics is a systematic approach to understanding, analysing and distinguishing matters of right and wrong, good, and bad, admirable, and deplorable (Rich, 2018), separate from religion and legal systems.

From literature ethics is primarily "the study of good and bad linked to actions (or societal 'systems')". We next define computer ethics, and ethics according to the Information Systems curriculum in this chapter.

Defining computer ethics

In understanding computer ethics, one may look at computer-specific historical narratives whereby ethical practice has not been implemented. In Moor's seminal article on computer ethics (Moor, 1985), the author explains how a programmer instructed a computer to deposit fractions of a cent of financial transactions to the programmer's personal account.
The money landing in the programmer's bank account was generated from automated rounding up in a computer algorithm. Although this is an ordinary case of stealing, the example remains relevant to computer ethics in that computer technology is essentially involved and there is a question about what policy to institute to best detect and prevent such abuse in the future.

Computer ethics can be more accurately defined as ethical concerns (good versus bad) related to an entire body of "computer-related technology" (Moor, 1985). This body of knowledge includes computers and their associated technology. Computer ethics may also be seen as a unique intermediary field between science and ethics (Moor, 1985).

In 1996 Terrell Ward Bynum developed another broad definition of computer ethics following a suggestion in Moor's 1985 paper. According to Bynum (1996), computer ethics identifies and analyses the impacts of information technology on social and human values such as health, wealth, freedom, democracy, knowledge, privacy, security, and self-fulfilment (Bynum, 1996). The fact that specific ethical problems have arisen as a direct result of the development of computer technology lends credence to the claim that computer ethics should be recognised as a distinct subfield within the larger field of applied ethics.

As a consequence of this, it is conceivable to comprehend computer ethics as a subfield of applied ethics (Bynum, 1996), an important subfield of ethical research that can be pursued independently of the more broad-ranging study of ethics within academic institutions.

Furthermore, there are ethical dilemmas that are peculiar to computers and their related technology that is inextricably linked to them. Another piece of evidence demonstrating the uniqueness of computer ethics is the absence of relevant comparisons between non-computer-related topics and computer ethics.

Ethicists are expected to identify new moral standards, formulate new moral principles, and develop new rules that match entirely with computer-related technology. This area of study is known as "computer ethics" and it requires them to do all of these things (Manor, 1995).

Input processing output as a framework

James Moor continues by describing computers as having a "logically malleable" nature. This indicates that actions and processes can be shaped into their corresponding processes (Moor, 1985), which are referred to as:

1. Input
2. Processing
3. Output

This logical 'malleability' is an essential resource that enables the user to make use of the computer's logic in a variety of different procedures (Moor, 1985).

There is a potential for ethical problems to arise from any one of these three distinct processes: input, processing, or output. As a part of this continuing investigation, a new ethical framework is being presented, and one of the core components (dimensions) of this framework is the categorisation of actions into three different processes: the input, the process, and the output of information.

Professor Kuzu of the Department of Computer Ethics at Anadolu University in Istanbul also made an advancement on Moor's ethical paper by stating that, despite the fact that computers provide

individuals with many benefits, they might also serve as grounds for several societal and ethical problems which vary in accordance with the contexts and purposes of their use (Kuzu, 2009).

According to Kuzu, the most important role that computers played in the early days of their development was that of information processors. Examples of this type of information processing include the tabulation of votes and the execution of financial transactions, including the practice of rounding off transactions. If financial transactions are pooled together and funds are seized, then this technique may cross the line into unethical behaviour. These are all processing concerns, and each of them will have its own regulations and ethical norms in place to follow. In a culture-driven by information, the capacity of individuals to quickly and readily access information is essential to the society's continued development and competitiveness (Kuzu, 2009).

Professor Berzai claims in his article titled "Ethical Problems in Computing" that a significant portion of the causes of ethical concern around information systems is the vast amount of information collection that is made possible by computers (Berzai, 2019). As a direct consequence of the unethical collection of this information, the confidentiality of the personal details of individuals is now at risk. If someone is successful in breaking into a computer system that stores personal information, then that person will have access to all of this information even though they do not have permission or authorisation to do so. Theft of identity and other forms of criminal action are both potential outcomes that might result from this trend. The most fundamental characteristics of the computer, notably "its capacity to store, organise, and distribute data," are at the heart of the debate over privacy and its implications (Berzai, 2019).

Furthermore, when stored digitally, information can be easily exchanged, and the effect of a small error can be magnified. Such errors can persist in systems indefinitely. Personal user-related

usage information is usually captured and stored permanently in identity records for governmental use. Computers, therefore "create the possibility that incidents in one's life or errors in one's records will follow one through life, profoundly affecting how one is perceived and treated.” (Johnson, 1985). This strong statement by Johnson reiterates the challenges that people face when they lose control over their lives when incorrect information about them is stored

Banks, educational institutions, credit businesses, and a variety of other organisations, among others, collect customers' personal information. All of these systems are concerned with the process of inputting information and, as a result, they are active participants in the input stage within the logical malleability of a computer's design.

Towards the purpose of this thesis, we note that Moor's input-process-output categorisation can be utilised by a computer ethicist in order to regulate and comprehend the ethical concerns that are associated with the field of computer ethics. Each of the three stages — the input, the processing, and the output — may be associated with a unique set of ethical concerns, which, for the purposes of this work, will be linked to the ethical characteristics that are discussed in their respective subsections. The input, processing, and output stages will be expanded on with their relative ethical dilemmas in Chapter 2.

Ethics in the IS curriculum

Ethics and Information Systems (IS) studies have traditionally been taught as independent fields respectively (Santoro, 2021). According to Breytenbach et al. (2020), the majority of students majoring in Information Systems do not have any educational grounding in ethical principles. As a result, they lack the resources necessary to articulate their conceptions of morality within any area of ethics. A very limited knowledge of the responsibilities involved in assuring ethical use in the design of Artificial Intelligence (AI) and

associated technologies is another area of concern (Breytenbach, 2020).

Some modern educational institutes add computer ethics as a small body within an ethics introductory course in order to sensitise social science graduates to the growing concern around computer ethics. These social science introductions to 'IS ethics' courses do not specialise in the unique application required for understanding computer ethics (Gupta, 2005).

1.2 PROBLEM STATEMENT

As a result of a lack of ethics studies, IS students are not able to distinguish which category of computer tasks (input, process, or output) correlates with which ethical principles, and whether the resolution of an ethical concern about a computer system is technical (technology or data-driven) or non-technical (organisational or environmental) in nature. To rectify IS students' lack of understanding of computer ethics, ethics (as a field of study) should be incorporated into the IS curriculum. The problem that this study focuses on is that there is no guidance available to IS academics on how ethics should be embedded into IS. The primary focus of this study revolves around the absence of guidance available to IS academics regarding the incorporation of ethics into the IS curriculum. The existing problem lies not in the lack of understanding by IS students but rather in the absence of comprehensive guidance, guidelines, or frameworks for IS academics. This study aims to emphasize that the deficiency in student understanding is a consequence of the broader issue – the absence of clear directives for IS academics on effectively embedding ethics into the Information Systems curriculum.

1.3 PRIMARY RESEARCH QUESTION

How can ethical principles that relate to information systems be presented within a familiar IS framework of input, process, output,

and technical/non-technical to promote a deeper, accelerated learning of computer ethics among IS students?

1.3.1 Research objectives

1. Describe computer ethics, ethics within Information Systems (IS), and ethics-by-design from existing literature, incorporating recent IS ethics frameworks and standards. Concurrently, identify and address knowledge gaps in understanding ethics within the Information Systems environment, with a focus on proposing solutions within the IS classroom.
   (Chapter 2: Literature Review)
2. To suggest a process for embedding ethics into the existing IS curriculum, and to establish how ethics are understood by IS graduate students pre and post an embedding intervention (two surveys, with analysis). (Chapter 4: Data Collection and Data Presentation)
3. Analyse survey results to identify crucial ethical considerations and attributes for inclusion in the Information Systems (IS) curriculum, specifically exploring the necessity of integrating an IS ethics module at the graduate level. Simultaneously, develop a comprehensive framework for the incorporation of ethics into the IS curriculum, encompassing the Technology, Organization, and Environment (TOE) aspects, as well as the Input, Process, and Output (IPO) components.

Table 1 Research objectives

Number	Research Objective	Location
1	Describe computer ethics, ethics within Information Systems (IS), and ethics-by-design from existing literature, incorporating recent IS ethics frameworks and standards. Concurrently, identify and address knowledge gaps in understanding ethics within the Information Systems environment, with a focus on proposing solutions within the IS classroom.	Chapter 2: Literature Review
2	To suggest a process for embedding ethics into the existing IS curriculum, and to establish how ethics are understood by IS graduate students pre and post an embedding intervention (two surveys, with analysis).	Chapter 4: Data Collection and Data Presentation

1.3.2 Alignment of the primary research question to research sub-questions, methods, and research objectives

Table 2 Overview of research sub-questions, methods and research objectives

Research question: Which ethical considerations related to input of systems design should be included in the Information Systems curriculum?		
Research Sub-Questions	**Methods**	**Research Objectives**
What is ethics, computer ethics, ethics within IS, and ethical principles that relate to the IS curriculum?	Analysis of literature	To understand ethics, computer ethics, ethics within IS, and ethics-by-design from literature, including recent IS ethics frameworks and standards (Chapter 2: Literature Review)
How is ethics currently understood by graduate students?	Longitudinal Survey	To establish how ethics are currently understood by IS graduate students through a longitudinal (pre- and post-test) survey analysis
Which ethical considerations should be included in the IS curriculum?	Survey Analysis	Identify important ethical considerations and attributes to be included in the IS curriculum
Is there currently a knowledge gap in how ethics is understood by IS students?	Analysis of Literature	To identify the knowledge gap in how ethics is understood in the Information Systems environment

Which ethical considerations should be prevalent in the IPO and TOE frameworks?	Theoretical Framework Applied	To create a framework for embedding ethics into the Information Systems curriculum

1.4 PRELIMINARY LITERATURE REVIEW

In this section, a brief preliminary overview will be provided from literature on the following topics:

1 A list of ethical considerations that relate to computer information systems
2 An introduction to the TOE framework
3 An introduction to the DOI framework

A comprehensive literature review of the study topic is presented in Chapter 2.

1.4.1 Functional vs non-functional ethical concerns

There are two primary categories of system requirements that will be discussed further in Chapter 2: Functional and Non-functional Ethical Considerations. As explained in Chapter 2, we rely in System Requirements Engineering as foundational for defining ethical considerations. Functional ethics relate to technical system functions, and non-functional ethical considerations relate to organisational or environmental system requirements. In order to make the distinction between functional and non-functional ethical concerns clearer to the IS reader, we use the terminology of a popular IS framework, the Technology-Organisation-Environment (TOE) framework, and translate functional ethical concerns as ethics related to "T" and non-functional ethical concerns as ethics related to "O" or "E".

Understanding the distinction between the two ensures that developers will create a product with the desired performance and ethicality. We

now present a summarised view of functional and non-functional ethical concerns related to Information Systems. A complete discussion on these topics will follow in Chapter 2.

1.4.2 Ethical considerations related to Information Systems

Table 3 Functional and non-functional ethical considerations

Functional		Non-functional	
1	Accountability	1	Democracy (of access, etc.)
2	Autonomy	2	Ecology
3	Bias / Discrimination	3	Fairness
4	Accuracy / Misinformation	4	Human dignity / Human displacement
5	Explainability	5	Inclusion (digital and social)
6	Transparency		
7	Privacy		
8	Responsibility / Responsible use		
9	Security and (technical) robustness		
10	Reliability		

1.4.3 Functional system requirements ethical considerations

Table 4 Functional system requirements

Accountability	Accountability makes it feasible to recognise and isolate inappropriate conduct, to limit harm, and to assign accountability to those with questionable reputations for acts and states that are inaccurate or inconsistent. A more succinct definition of accountability is the existence of a natural or legal person, often referred to as an agent, who is responsible for some consequence. This obligation is made public and, as a result, it is now possible for a devoted principal to ask this agent for his, her, or their account and blame this agent for an undesirable consequence. Accountability is the readiness or preparedness to give an explanation or justification to stakeholders for one's judgments, intentions, and actions. It is important to differentiate between human-related accountability and that within algorithms. There is a region known as an 'accountability gap'. Autonomous machines are not responsible in the same morally relevant sense as human agents. This creates an accountability gap that must be addressed so that clear and imputable sources of human answerability can be attached to decisions assisted or produced by an AI system. The error or ethical concern may easily be identified	(Ball, 2009) (Yumerefendi, 2004) (Bivins, 2015) (Leslie, 2019)

	within one of the above phases of the AI or data lifecycle.	
Autonomy	People have the right to self-determination, which means they have the right to choose how they want to conduct their lives without interference from other people (including systems) Artificial intelligence (AI) systems automate cognitive functions that were previously traceable solely to human actors. This can make it more difficult to assign blame for the outcomes that were generated by an algorithm. Because of the intricate nature of the processes involved in the planning, development, and installation of AI systems, it may be challenging for these systems to correctly identify responsible parties.	(Leslie, 2019)
Bias / Discrimination	A system discriminates unfairly if it denies an opportunity or good or if it assigns an undesirable outcome to an individual or group of individuals on grounds that are unreasonable or inappropriate. Bias refers to computer systems that systematically and unfairly discriminate against certain individuals or groups of individuals in favour of others. In the event of a credit adviser who routinely gives persons with ethnic surnames worse credit ratings, the advisor is engaging in discrimination on grounds that are irrelevant to credit evaluations and, as a result, the advisor is engaging in unfair discrimination. On the other hand, if the advisor chooses not to extend credit to those who have a track record of	(Friedman, 1996)

	repeatedly missed payments, this does not constitute discrimination against those individuals.	
Accuracy	Accuracy represents the legitimacy, precision and authenticity with which information is rendered. Who is responsible when a programmer adjusts the accounting system of a bank to hide overdrawn accounts and avoid the (Data Accuracy) overdraft charge? The special difficulties posed by the system will be investigated beginning in Chapter 2.	(Masrom, 2010)
Accessibility	Accessibility deals with the right or privilege to obtain data or information from another source. What information does one have a right to obtain from government or business organisation computer systems?	(Hara, 2006)
Explainability (Unique concept to AI)	Explainable AI refers to a subset of artificial intelligence (AI) in which the problem-solving findings may be comprehended by humans. The development of AI was conducted by computer scientists. Widespread opinion holds that AI algorithms must satisfy all three of the following criteria: transparency, interpretability, and the ability to explain themselves. The concept of explainability, sometimes known as 'interpretability', relates to the idea that a machine learning model and its output may be explained in a way that 'makes sense' to humans. This idea is commonly known as 'explainability'. Another name that might be used to allude to this concept is 'interpretability'.	(C3.ai, 2020)

	Using AI to enhance the loan decision-making process – if appropriately evaluated for bias – could be a useful financial services tool. To pass regulatory inspections and examinations, however, the financial services organisation may require that the algorithm be auditable and explicable. Regulation 679 of the European Union grants consumers the "right to an explanation of the decision taken after such evaluation".	
Transparency	A transparent AI system involves the interpretability of a given AI system, i.e., the ability to know how and why a model performed the way it did in a specific context and therefore to understand the rationale behind its decision or behaviour. Transparency is also the organisation being upfront and visible about the actions it takes, and whether those actions are consistent with its values. At every stage of the design and implementation of your AI project, team members should be held to rigorous standards of conduct that secure and maintain professionalism.	(Leslie, 2019)
Privacy	Privacy is the right of individuals to retain certain information about themselves without disclosure and to have any information collected about them with their consent protected against unauthorised access. Considering privacy from an ethical point of view and establishing a code of conduct makes all individuals in an	(Zimmer, 2006) (Bank, 2015)

	organisation, not just security personnel, accountable for protecting valuable data. Minimal Disclosure should be proportional to the sensitivity of the transaction and its purpose. Why should a credit card number ever be used to verify one's age? These privacy-enhanced solutions are all possible under the Privacy-Embedded Laws of Identity. Personal data should not be used for unlawful surveillance or profiling by governments or third parties. Users should have certain rights over data about them, including the ability to obtain and correct erroneous data.	
Responsibility / Responsible use	Responsibility is an ethical concept that refers to the fact that individuals and groups have morally based obligations and duties to others and to larger ethical and moral codes, standards, and traditions. In New York City in 2013, the Taxi and Limousine Commission released supposedly anonymised information data on pick-up and drop-off times, locations, fares and tip amounts. But, within days, several civic hacker groups had managed to identify relevant taxi licences and medallion numbers. The consequences were worrisome and potentially rights-violating: the data could be used to calculate a driver's annual income, for example, and to identify	(Verhulst, 2016)

	consumer travel and spending habits, including details on several celebrities, which raised their risk of stalking.	
Security and (technical) robustness	AI systems should be robust, secure and safe throughout their entire lifecycle so that in normal use or misuse they function appropriately and do not pose unreasonable safety risks. AI actors should ensure traceability, including in relation to datasets, processes and decisions made during the AI system lifecycle.	(OECD, 2022)
Reliability	Reliability in data analytics, including AI machine learning, is predicting when an asset will fail or otherwise deteriorate so that it can be serviced or replaced before failing. The fact of the matter is that you are already investing in the dependability of the data in some form or another. Whether it's through the manual work your team is doing to verify data, the custom validation rules your engineers are writing, or simply the cost of decisions made based on broken data or silent errors that went unnoticed, there are multiple ways in which your company could be losing money because of invalid data. The benefits of data reliability include lower costs, reduced unplanned downtime, increased safety and increased rates of asset utilisation, and extended asset life.	(C3.ai, 2020) (Ekstedt, 2014) (C3.ai, 2020)

1.4.4 Non-functional system requirements (ethical considerations)

Table 5 Non-functional system requirements

Democracy	Democracy can be defined as the right to access or authorisation and the accountability for each environment's layer. It increases collective decision-making by empowering citizens with more authority and aids politicians in making better, fairer, and quicker decisions by fostering a more efficient, productive, and problem-solving society. The internet enables individuals to be better educated about political issues and politicians in a timelier manner, and consequently enables politicians to get advice from a larger number of people in real time. Data democracy is the practice of making data accessible to non-technical and non-IT members of an organisation. The most successful businesses make their data accessible throughout the organisation. Employees have access to self-service analytics tools that allow them to conduct customised queries.	(Yaffe, 2020) (Anastasiadou, 2019)
Ecology	The purpose of an ethics of ecology is to provide guidance that will assist us in avoiding activities that might compromise the ecological integrity, stability, or beauty of nature. This, in turn, is a necessary prerequisite for bringing about ecological justice, which may be regarded as consisting of fair treatment extended to both human organisms and systems as well as	(Keller, 2019)

	non-human species and systems. Humans are moral actors who are rooted in biotic communities; as a result, the activities we take invariably have an effect on other beings who are deserving of moral attention.	
Fairness	Fairness is concerned with actions, processes, and consequences that are morally right, honourable and equitable. In essence, the virtue of fairness establishes moral standards for decisions that affect others. Fair decisions are made in an appropriate manner based on appropriate criteria. Decisions should be made, carefully, honestly, and objectively. There are five principles derived from the judicial system that help assure fairness. These include notice of the standards by which a person will be judged. The impartiality of the decision maker and thoroughness in gathering facts are also important.	(Ethics, 2018)
Human dignity / human displacement	The combination of widespread job cuts, workers' inability to access their places of employment, and the augmentation and replacement of human labour by digital technologies, especially Artificial Intelligence (AI), imply that the current changes in the labour market may not be temporary situation, but rather a prologue to a deeper transformation that may force large numbers of people to take up non-standard jobs or face the possibility of being unemployed. The digital age has arrived earlier than was anticipated and is gaining momentum; as a direct consequence, the digital age will lead to the widespread	(Stirrup, 2022) (Nissim, 2021)

	replacement of human work by automated labour.	
Inclusion	Social Inclusion may be defined as a state in which people are unable to participate fully in economic, social, political, and cultural life, or the process leading to and sustaining such a state. Participation may be hindered when people lack access to material resources, including income, employment, land, housing, and education.	(Yang, 2016)

1.4.5 TOE framework

To provide a theoretical structure the research into the implementation of technologies has made extensive use of the Technology-Organisation-Environment (TOE) framework developed by Tornatzky and Fleischer (1990). This theoretical framework derives its name from the three axis (technology, organisation, and environmental context) along which it investigates the factors necessary for the successful adoption of different technological advancements within organisations. The technological component accounts for the company's internal and external technological resources. The market's characteristics, such as competitive dynamics, are considered part of the environmental setting. Management backing is just one example of the organisational framework, which also includes other relationships and systems inside the business that are important for the successful implementation of new technologies.

The TOE framework has a solid theoretical basis and the potential for application in the IS adoption. The process of adopting new innovations has been studied for over 30 years, and one of the most popular adoption models is described by Rogers in his book, Diffusion of Innovations (Sherry, 2002).

TOE indicates that technologically innovative companies may outperform their competitors (Geroski, 1993). Extensive theoretical and empirical

investigations have been devoted to technological innovation. Innovation refers to an idea, behaviour, or thing that is seen as novel by a person or other unit of adaptation. This innovation encompasses not only technological advancement within a firm, but also a rejuvenation of mind and conduct (Erind, 2015).

The model has been utilised extensively to categorically measure the success of a business. The three clearly defined categories, namely technological, organisational, and environmental could be similarly applied in an ethical framework. The technological context includes both internal and external technologies that might be useful in improving organisational productivity (Oliveira, 2011).

In line with this argument, we found that the TOE framework includes the environment context (not included in the DOI theory). Hence, we have chosen to extend TOE framework into the embedding process of the prospective IS curriculum. The TOE framework will be expanded on further in Chapter 2, the literature review.

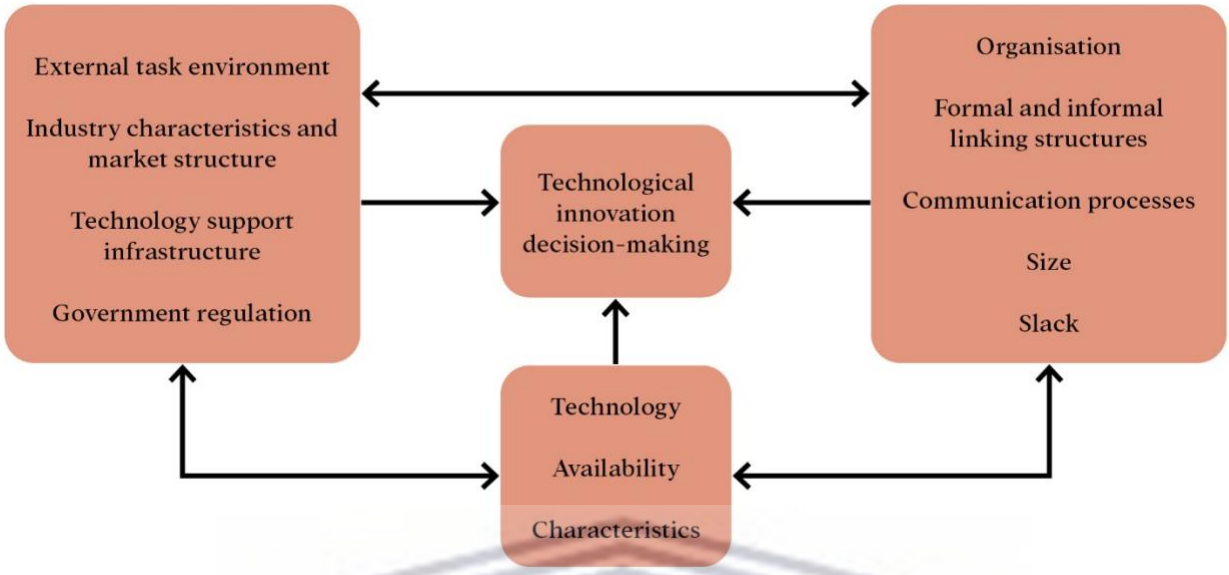

Figure 1 TOE Framework (Baker, 2012)

1.4.6 Overview of theoretical framework

The TOE framework (technology-organisation-environment) identifies three aspects of an organisation's context that influence the process of adopting and implementing a technological innovation, namely, technological context, organisational context and external environmental context. The TOE framework will serve as foundation to our reasoning and substantiation during the construction of an IS ethics embedding process.

1.5 INTRODUCTION TO THE TOE FRAMEWORK

TOE is a paradigm that has seen significant application within IS in recent years for the purpose of quantitatively evaluating the achievements of a company. For this thesis, we argue that it is possible to apply the clearly defined categories of technology, organisations, and the environment in a comparable manner to an IS ethics framework. The technical environment encompasses all the different kinds of technology, both internal and external to the company, that have the potential to help increase productivity. TOE has been utilised to explain the adoption of innovations in a variety of different industries, such as the manufacturing industry, the

health care industry, retail, wholesale, and financial services (Mishra, 2007).

In addition to this, the TOE model has been validated in a variety of settings around the globe, including those in Europe, the United States of America, Asia, and developing countries alike. There are an increasing number of hypotheses and research on the topic of technological innovation and the incorporation of new technologies. These theories are going to serve as benchmarking methods for any business that wants to be successful. In an ideal scenario, these success criteria would be based on empirical evidence in comparison to that benchmark. TOE and DOI are the two organisational structures that can be used to incorporate technology into a company's operations.

It is incumbent to note that innovations are a key source of a competitive advantage that determines the economic success of each organisation. Research further indicates that technologically innovative companies may outperform their competitors (Erind, 1993). Technological innovation has been the subject of extensive theoretical and empirical studies and is now widely acknowledged as an important determinant of sustained superior performance (Blundell, 1999). The TOE framework attributes technology as a key factor in any organisation and similarly a strong framework to build in ethical considerations as to how they apply in each of the stages of TOE.

1.6 RELATIONSHIP BETWEEN IS ETHICS AND ARTIFICIAL INTELLIGENCE

A plethora of moral and ethical concerns are brought to light by the prospect of building thinking robots. These problems are relevant not just to ensuring that such machines do not cause harm to humans and other ethically relevant beings, but also to the moral status of the machines themselves as entities in their own right. The first part of this thesis looks at some of the problems that Artificial Intelligence (AI) may face in the not-too-distant future.

In Chapter 2, we discuss the difficulties involved in maintaining AI's operational security when it becomes more intelligent than humans. Furthermore, we discussed how we might determine whether or not AIs themselves have moral status, as well as under what conditions this would be the case.

The way in which we engage with the world around us is being revolutionised by artificial intelligence (AI). People are able to reimagine how we integrate information, analyse data, and apply the insights that come in order to improve decision-making since it is a powerful instrument with a wide range of applications (West, 2018).

John Allen and Darrell West had a conversation on the many ways in which artificial intelligence may be utilised across a variety of business sectors (West, 2018). They presented ethical proposals for maximising the advantages of AI while maintaining essential human values, which will be discussed in further detail later on in Chapter 2 of this thesis. In 1956, a group of computer scientists hypothesised that computers might acquire the skills of thinking, learning, and reasoning for the first time. This was the beginning of the notion of artificial intelligence, which has been around ever since. They referred to this idea as "Artificial Intelligence" in their explanation (Choi, 2020)

Artificial intelligence (AI) is transforming how we interact with the world around us. Darrell West and John Allen discussed AI's application across a variety of sectors. They offer recommendations for getting the most out of AI while still protecting important human values (West, 2018).

A computer program that employs artificial intelligence (AI) is more precise and dependable than a human. AI will generate metrics that can be perpetually examined and modeled to enhance the performance of a business process or function.

It is possible that predictive algorithms utilised by the government for the purposes of policing and by the courts for the purposes of punishment unknowingly will contribute to the perpetuating of stereotypes and have unfavourable racial or socioeconomic impacts. It is possible that one unfair criterion that is implemented within a decision tree or survey may lead to the automatic denial of economic opportunities such as school admissions, job hiring, and the acceptance of loans.

The usage of social media platforms like Twitter involves a variety of discrete moments, decisions, actions, and operations, each of which has the ability to lead to repercussions that have the capacity to cause harm to persons. It is possible for errors to be made in the delivery of medical care, which puts a patient's health and potentially their life in jeopardy.

Underneath the apparent 'seamlessness' of an algorithm or data interface lies the AI's complex ecology, which consists of simultaneously functioning systems with a variety of interests, information, and biases. This complexity is hidden by the 'seamlessness' of the algorithm or data interface.

As a result, there is a conundrum regarding responsibility and accountability inside this automated interface. This issue is compounded by the fact that students have a tough time distinguishing ethical considerations and duties when it comes to adopting ethics-by-design in Artificial Intelligence and the technologies that are associated with it (Breytenbach, 2020).

It might be difficult to pinpoint who or what is responsible for ethically questionable behaviour, decisions, or outcomes. Because of this, one requires a foundational framework or code of ethics that is applicable throughout the life cycle of AI data. As ethical frameworks, we will be relying on Kant's deontology and John Stuart Mill's utilitarianism for this investigative thesis.

1.7 RESEARCH DESIGN AND METHODOLOGY

A theoretical overview of research paradigms will be explained in Chapter 3.

These include:

1 Positivism

2 Pragmatism

3 Interpretivism

4 Realism

In Chapter 3, we will also examine and justify other aspects of our research methodology. The rationale behind the use of positivism in this research will also be addressed in Chapter 3.

Aspects of research discussed in Chapter 3 include inductive and deductive reasoning, as well as a full description of the survey methodology utilised. In summary, two questionnaires were used to acquire data for the study: one pre- and one post-intervention. In both surveys, data for comparison analysis were collected from similar cohorts at the same institution. This data is presented in Chapter 4.

As indicated in the diagram below, a theoretical overview diagram has been constructed. This figure represents a mind map of the methods and steps utilised in this thesis. It enhances the process' coherence and rationality. Each step represents a phase in the embedding of IS ethics into Information Systems.

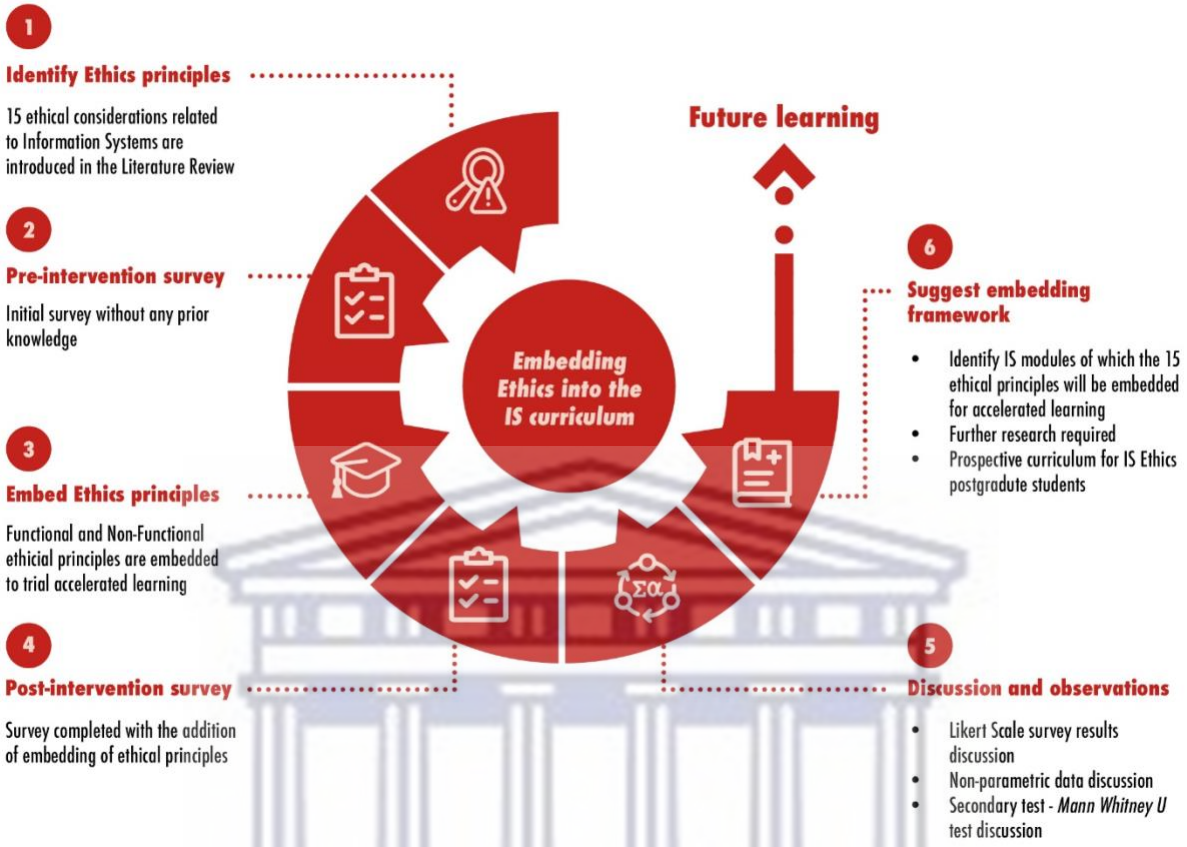

Figure 2 Overview of thesis

1.8 RESEARCH FINDINGS

A pre- and post-intervention survey was administered to determine the efficacy of 'embedding ethical principles'.

As a foundational guide for answering questions about ethics in Information Systems, the post-survey provided students with the incorporation of fundamental ethical terminology. This embedding of information was an attempt to improve the post-survey results through an accelerated learning process.

Figure 3 Embed ethics into all IS modules

Figure 3 above represents the embedding of ethics considerations into all existing IS modules. As will be discussed, reviewed and critiqued

later in chapters 4 and 5, another process of embedding ethics will be introduced.

The accelerated learning process constituted 15 ethical principles to be introduced in this chapter, and discussed in Chapter 2. The first framework splits ethics into either technical or non-technical in nature. These ethical factors were further classified into two categorically distinct and independent frameworks, namely input, process, and output (IPO), and the technology-organisation-environment taxonomy was also included (TOE).

A survey was administered both before and after the embedding process to evaluate its efficacy. Some students were better able to provide accurate responses to questions in subsequent surveys. After exposure to the post-survey embedding, questions particularly on technical ethical considerations yielded better results, Ceteris paribus. The improvement was not consistent enough across the cohort to categorise the embedding process as effective.

The before-and-after survey provided contradictory and incoherent results. The embedding procedure was found to be ineffective and inconclusive, particularly with regard to non-technical ethical considerations. Results to questions on inclusion and democracy ethics were ambiguous and inconclusive.

Survey results will be introduced and discussed further in Chapter 4 and Chapter 5, respectively. Even though the students were provided with the definitions, they did not provide adequate solutions to the questions. The second survey's conclusions involving non-technical ethical considerations were thus inconclusive, mandating a foundational ethics course for all post graduate students pursuing degrees in Information Systems, Computer Science, or Systems Design. These various conclusions, outcomes, and recommendations will be presented in Chapter 5 and Chapter 6.

CHAPTER 2: LITERATURE REVIEW

2

In this chapter, we will first address Ethics in its broader philosophical context, followed by ethics as it is currently taught in the subject of Information Systems. We will next apply these findings to actual ethical dilemmas in the field of Information Systems.

We will expand on the ethical issues covered in Chapter 1 and their applications to IS design projects, which will serve as the foundation for incorporating these ethical principles into the IS curriculum. As a framework for categorising the ethical principles, the theoretical foundations and frameworks of TOE and IPO will be introduced. The chapter will conclude with a conceptual framework and discussion of accelerated learning as a method for introducing ethics into the curriculum.

2.1 WHAT IS ETHICS?

The study of ethics attempts to answer the question: How do we identify a good life, one worth choosing from all the diverse ways of living that are open to us? A moral or ethical statement may assert that particular action is right or wrong, or it may offer a distinction between good and bad (Mackie, 1978).

Ethics are the ground rules by which we live our lives. Ethicists consider emerging ethical beliefs to be legal principles. Following the law of the land is one of the essential virtues of ethics. Values, which guide how we ought to behave, are moral values, e.g., respect, honesty, fairness, and responsibility (Krishnamurthy, 2011).

The goal of the study of ethics is to provide an answer to the question of how a person might best lead a life that is morally commendable and admirable. How can we tell which of the many alternative ways of living is the best, and which ones aren't even

worth considering? This is the question that attempts to be answered by ethical theory.

Applied ethics in the workplace of an organisation presents a wide variety of challenging situations. The term "managerial mischief" refers to "illegal, unethical, or questionable acts of individual managers or organizations", as well as the causes of such behaviours and the solutions to eliminate them. Dealing with moral dilemmas in business usually necessitates actions that are not immediately evident in terms of what is right or wrong (Krishnamurthy, 2011).

In the first chapter of his book on the subject of business ethics, Krishnamurthy (2011) demonstrated how organisational structures that do not have a solid understanding of the ethical principles that ought to be adhered to are more likely to give rise to ethical myths. According to him, individuals who are in positions of authority inside the company and those who are employed by the business consider ethics to be "superfluous". That business ethics only confirms what is already known, which is the notion of "doing good", to which a significant number of people working for the organisation respond favourably.

A clear code of ethics or a set of ethical standards that the entire organisation wants to represent the company's fundamental ideas in their own way is a common fallacy. This narrow ethical approach does not provide the essential framework when applied to some situations, resulting in inconsistency. Krishnamurthy illustrates his point by citing the fact that organisations are 'apparently' ethical if and only if they obey the laws of the Constitution. In many situations, it is possible to behave unethically while yet remaining within the bounds of the company law. Among these unethical behaviours are, but are not limited to, concealing information from superiors, inflating travel expenses, and whining about co-workers. The first step toward breaking the law is frequently engaging in unethical behaviour that has been

allowed to go unpunished. The concept of 'boiling the frog' can serve as a useful allegory in this context: If you place a frog in water that is too hot for it, it will immediately leap out. If you place a frog in cold water and then gradually bring the temperature of the water up, you will finally be able to boil the frog. The frog does not appear to be aware of the detrimental alteration that has occurred in its surroundings (Krishnamurthy, 2011).

This is especially relevant in today's world, when it is essential to comprehend and effectively manage highly varied socio-cultural groups, each of which brings a unique set of values to the workplace and operates within the context of a globalised economy.

2.2 ETHICS IN THE IS CURRICULUM

Ethics and IS studies have traditionally been taught as independent fields respectively (Santoro, 2021). Breytenbach (et al., 2020) speak of most IS students not having any educational foundation in ethics. They are therefore not equipped to express their ideas of morality in any field of ethics. There is also an extremely limited understanding of the responsibilities involved in ensuring ethical use in the design of AI and related technologies. (Breytenbach, 2020).

The study of ethics in the context of IS is an extremely important topic of research because it entails the appropriate application and administration of technology, data, and information in a manner that is congruent with societal and moral standards. There are several different ways that can be utilised in order to successfully include ethics into the instructional content of IS, such as:

1. Integrating ethical considerations into the modules of the IS course: This may involve examining ethical concerns that are connected to certain aspects of IS, such as intellectual property, privacy, and security. A course on database management, for instance, might include a discussion of the ethical

implications of the data gathering and storage processes (Reynolds, 2014).

2. Students can have a better understanding of the practical implications of ethical principles and a context for comprehending and analysing ethical concerns by discussing real-world instances of ethical challenges that occur in the field. This can be done by having a discussion with the students (For further reading, see James D. Klein's article "Ethical issues in IS").
3. Providing opportunities for students to analyse and apply ethical principles to their own research and projects: This can involve assignments that require students to consider ethical issues related to a specific IS topic, such as the use of AI in decision-making (Coeckelbergh, 2021).
4. Having a dedicated course or module on ethics in the IS curriculum: This can provide students with a comprehensive understanding of ethical issues and principles specific to the field of IS (Steinmueller, 2013).
5. Involving guest speakers or experts from the field: This can provide students with a diverse range of perspectives on ethical issues and can help to keep the curriculum current and relevant.

A lack of interaction between STEM (science, technology, engineering, mathematics) and ethics creates problematic challenges in systems design (Verbeek, 2006). According to the Ethics and Engineering design faculty of the University of Twente in the Netherlands, the majority of an engineering ethicist's attention is often devoted to catastrophe situations. This has resulted in an externalist view of technology, which focuses less on the internal dynamics of the processes that lead to the formation of technology and more on the results of those processes. After ethical problems have been raised, ethical factors are only then integrated into system evaluations. Due to its exclusion from the initial design process, ethical design is now considered to be more of a "reactionary" design philosophy as opposed to one that is

inherent and an integral part of the design. This is another argument for embedding an ethics course for graduate students that teaches them how to incorporate ethical concepts into the initial design, better known as Ethics by Design.

In addition, Van der Poel advocates for a shift away from the externalist viewpoint that is now predominant in engineering ethics and makes a contribution to a more internalist and empirical viewpoint on the process of technology advancement. This internalist design will take into consideration the dynamics of the design process itself and will identify any ethical concerns or questions that arise as a result of this setting. Because of this, the ethical design is included as a component of the fundamental design principles and directs the design to think in an ethical manner.

Moore (Moor, 1985) describes ethicists as needing to be knowledgeable about the nature of technology to formulate an empirical basis describing what are and what are not the consequences of the development and use of such technology. Similarly, Feenberg applies the Critical Technology Theory. The Critical Technology Theory considers technology as an environment rather than a collection of tools (Feenberg, 2013). As an environment, technologies shape the lives of its inhabitants, being comparable to laws and rights (Feenberg, 2013).

This thesis focused on Kantian deontology, utilitarianism, and virtue ethics as ethical frameworks that provide a foundation for embedding ethics into the IS design process.

Stahl discusses Kantian deontology and calls for the engagement with moral issues for students in IS. This instructional engagement enables students to not only understand their position but also to be able to formulate and critique their position from a more detached viewpoint. The implementation of a service-learning project within the IS curriculum discussed in (Breytenbach, 2020) will allow learners to

critique their ideas and form better ethical judgements when designing systems.

Information systems have an increasingly incisive presence in everyday activities. Argumentation on the impacts of modern technologies requires theoretical and technical references. An IS design student will therefore intermediate the adaptation of the technology to the specificities of the diverse socio-cultural contexts (Santoro, 2021).

In order for IS students to be able to apply an ethical framework into their systems, their curriculum must include more rigorous ethical instruction. As a result, this thesis emphasises the critical role and duty of the IS designer in the ethical functionalities and technologies used in each phase of IS design. Students need an ethical foundational framework, i.e. a basis for comparison, in order to create an ethical argument or principle. As a result, students will be able to make ethically sound decisions, with awareness of ethical quandaries and a logical method for understanding the ethical consequences in their prospective designs (Bonde, 2013).

In the sub sections to follow, we present fundamental aspects of ethics theory that should be included in the IS curriculum:

The ethical theories discussed in this chapter are shown below.

1 Implicit Morality
2 Explicit Morality
3 Utilitarianism
4 Kantian Deontology
5 Virtue Ethics

2.2.1 Implicit morality

Implicit moral evaluations are the part of human behaviour that we use to judge whether an action or person is morally right or wrong, and they play a significant role in supporting moral behaviour in everyday

life. We use implicit moral evaluations to judge whether an action or person is morally right or wrong (Cameron, 2017).

As a result, it is possible to infer that an implicit system is one that is intuitive, automatic, and unconscious, whereas an explicit system is one that involves a logical and conscious process (Frankish, 2010). The implicit system is "highly contextualised, individualised, and socialised," and the best way to characterise it is to say that it is "quick", "effortless", "automatic" and "unconscious" (Frederick, 2005). Therefore, the automatic contextualisation of problem-solving that occurs naturally can be accounted for by a mental process known as implicit thinking.

Additionally, Fredrick contends that implicit and explicit modes of decision-making are intricately connected with one another. He utilises a test called the "Cognitive Reflection Test", which is comprised of a series of questions that are very simple yet conceptually challenging, and are frequently of a mathematical character. This includes, but is not limited to, mathematical processes that must have "explicit" foundations already in place in order to answer questions implicitly (Frankish, 2010).

A story that Fredrick tells, which he calls "The Bat and the Ball", illustrates his point as follows: "It will cost you a total of $1.10 for a ball and a bat. The baseball bat was an additional $1 in cost compared to the ball. How much does it cost for the ball?"

According to (Frederick, 2005), the majority of respondents respond with "10 cents", which appears to be an intuitively simple alternative, and many people hold to this answer even after long contemplation. To arrive at the correct conclusion, for example, one needs to plug it into the same mental equation that they used previously (X is the ball, 1.10 = X + [X+1.00] --> 1.10-1.00 = 2X --> X = 0.05), and then solve for X. This will allow one to arrive at the correct conclusion (Frederick, 2005).

These kinds of tasks are meant to examine and evaluate the participant's level of cognitive control, which is the primary focus of the investigation and evaluation. It is necessary for two things to take place. The cognitive conflict needs to be identified in the first step, and then, in the second step, the explicit resources need to be made available. It is important to understand implicit morality as having preconceived biases which may be inconsistent for each IS student.

Relationship between implicit morality and computer ethics

Information Systems design are influenced by one's personal preconceived notions, thoughts, and biases. There is a belief that implicit design has its own epistemological foundations, and that designers of IS would lead their actions implicitly (Kruglanski, 1983). These beliefs are the result of personal biases or unconscious conceptions. In IS, even the designers' conversation among themselves can be understood as a participatory activity that incorporates ethical considerations in addition to epistemological or practical ones.

It is difficult to incorporate the concept of implicit morality into an IS course. Nonetheless, IS students must comprehend this notion and recognise that implicit morality, or unacknowledged personal biases, may be difficult to incorporate into IS or relate personal designs to system design procedures. They should recognise that implicit morality contains biases that are unique to each individual and seek a common framework as a starting point. Once all designers adopt the same framework, universal ethical concepts such as utilitarianism and Kantian deontology, which will be studied more extensively in this chapter, can be implemented.

2.2.2 Explicit morality

Following on from implicit morality, an explicit system can be described as slow, effortful, active, and conscious, which serves more controlled processes that can "decontextualise and depersonalise problems" (Frederick, 2005). The definition of explicit morality is implicit agreements about what is good and immoral that have been converted into legal (explicit) statements (Sahlin, 2010).

In ethical theories and frameworks, what is good and bad is defined in great detail. This chapter will consist of a discussion, evaluation, and application of ethical theories to IS design challenges and dilemmas. Thus, our ethical frameworks for IS are derived through a process of deductive reasoning that leads to an 'explicit morality' which is more accurately described as a collection of implicit agreements turned into a legally clear statement, namely an 'ethical framework'.

To better understand how one would exercise implicit and explicit reasoning in an ethical paradigm is to look at an ethical dilemma. 'Trolley' and 'Footbridge' dilemmas were used as examples to better differentiate between explicit and implicit reasoning.
Trolley dilemma: "Five people will be murdered by a runaway trolley if it continues on its current path. The only way to save them is to flick a switch that will redirect the trolley onto a new set of rails, where it will be able to murder only one person rather than five. This is their only chance of survival. Should the trolley be turned around if it means saving five people at the expense of just one? According to Greene, there is widespread consensus and most people will agree." (Greene, 2004, p. 389).

Footbridge dilemma: Reasoning in terms of the footbridge. As previously, a trolley poses a threat to kill five individuals. You are standing next to a huge stranger on a footbridge above the tracks, between an approaching trolley and a group of five unfortunates. The

only way to save them this time is to push the stranger off the bridge and onto the train tracks below. If you accomplish this, he will die, but his body will prevent the trolley from reaching the others. Should you kill this stranger to save the lives of five others? The majority of people say no. According to Greene, most people will inevitably say no. (Greene, 2004).

The distinction that (Greene, 2004) seeks to make is that impersonal dilemmas, such as the Trolley one, involve the risk of harm coming to one individual that is just deflected from the goal of saving five others. This line of thinking is sometimes referred to as utilitarianism, which will be covered in further detail later on in this chapter. The Footbridge dilemma, on the other hand, considers this matter to be more of a personal conundrum. The infliction of bodily damage is an "up close and personal" form of moral transgression because it is carried out by the moral agent himself (Greene, 2004).

Neurologically responding to these instances, the fMRI findings from these studies point to the activation of two very distinct regions of the brain that are separate from one another. A functional magnetic resonance imaging (fMRI) scan may determine the function and activity of various parts of the brain. An fMRI examination can determine which parts of the brain are accountable for specific activities. People who answer 'Yes' to the trolley dilemma activate areas involved with working memory and cognitive control (dorsal lateral prefrontal cortex), which is another way of saying that they engage with the explicit system.

Those individuals who responded to the Footbridge question with a 'No', on the other hand, activated areas in their brains connected with emotion (the ventro-medial prefrontal cortex and the amygdala), or the implicit system. People who answered 'Yes' to the Footbridge problem and pushed the man off the bridge are an even more intriguing group. They stimulate the same emotional processes, in addition to

those linked with the identification of potential sources of conflict (anterior cingulate cortex). Further support for the distinction above can be found in four different categories of people, all of whom are more likely to answer 'Yes' to Footbridge;

(1) patients with damage to the emotional structures of the brain (Koenigs et al., 2007),
(2) people with good scores on Cognitive Reflection Tests (Hardman, 2008),
(3) people with an expressed high "need for cognition" and low "faith in intuition" (Bartels, 2008),
(4) individuals with an unusual high working memory capacity (Moore et al., 2008).

These examples appear to suggest, for a variety of reasons, why the explicit system would probably be stronger in this group of people, and how that would connect to more positive solutions when faced with dilemmas of the Footbridge variety.

Anders Persson, a professor at the University of Lund in Sweden, demonstrates how instinctual bias might prevent one from thinking in an ethical manner. He utilised the social milieu of Sweden as an illustration to demonstrate how various demographics and races are viewed, on average, as having a lower level of success (Teke, 2019).

Anders draws the conclusion that placing a higher emphasis on experience than on inference may result in a personal bias towards implicit morality. To do this requires an active accumulation of experience received through the senses, which leads to the development of tacit knowledge about the world.

It is also possible to draw the conclusion that the postgraduate students who are currently enrolled at UWC (University of Western Cape) are drawing on their own life experiences and histories in order to define their own concepts of right and wrong. One way to look at

discrimination is via the lens of the unconscious bias that is involved. A possible explanation for why we have this perception is that it is the outcome of our prolonged interaction with the society in which we currently live. For example, in Sweden, Arab names or appearances in 'high-ranking' occupations are relatively uncommon; in fact, it is more typical for the situation to be reversed. In contrast, the scenario is quite common when the converse is the case.

As a consequence of this, the implicit system acquires knowledge about what to anticipate automatically as a result of experience rather than actively participating in the process. As a result, if we were to choose between two candidates for a high-ranking position, the implicit system we use would assume that the non-Arab candidate is more qualified for the job. This would be the case even in the event that the Arab candidate was the candidate with the higher qualifications. Even after giving all of the information that we have at our disposal, such as the CV, careful thought and a comprehensive review, we may still have a 'gut instinct' that the candidate who appears to be of Swedish heritage would be the most effective pick.

This implicit judgment is generated through personal experience, which then acts as the foundation for the inherent bias. If students have a greater theoretical grasp of hidden biases and how they operate, they may be better equipped to spot these predetermined biases when developing ethically sound systems and applications that may lead to discrimination.

Learners lack a theoretical ethical theory that addresses these differences in ethical reasoning; hence, they are unable to construct a rational foundation for their design ideas. Students are therefore unable to provide a rational ethical foundation for their design principles.

If students have a theoretical foundation in ethics, they can construct specific systems or algorithms employing Utilitarianism or

Kantian deontological philosophy. Students will design with a deeper theoretical understanding of implicit biases.

In the absence of a theoretical foundation that identifies these implicit differences in ethical reasoning, students are unable to construct a rational basis for their design concepts. Students are therefore unable to provide a rational foundation for their design principles.

2.2.3 Utilitarianism

Utilitarianism is an ethical philosophy that states that aggregate welfare or "good" should be maximized and suffering minimised. It is usually contrasted with deontological philosophy, which states that there are moral rules that do not change depending on the situation. For a utilitarian, the ends justify the means whereas for a deontologist they do not (Laakasuo, 2016).

Utilitarianism is one of the most common approaches to making ethical decisions, especially decisions with consequences that concern large groups of people, in part because it instructs us to weigh the different amounts of good and bad that will be produced by our actions (Bonde, 2013).
Utilitarianism is based on the maximisation of happiness as well as the minimisation of self- and other-inflicted pain. The sacrifice of private interests in favour of public ones is not supererogatory for politicians and high-ranking bureaucrats, but rather a social standing obligation.

According to John Stuart Mill's work entitled “Utilitarianism”, which was published in 2008, there are a few arguments against utilitarianism, which is based on the assumption that the only thing that society needs is ultimate happiness because this is the highest level of achievement. This euphoria was mostly attributable to more

primal factors, such as the existence of pleasure and the absence of pain in the environment. (Mill, 2017).

Happiness merits consideration as one of the moral criteria of utilitarianism; consequently, as one of the goals of our behaviour. However, the occurrence of this fact is insufficient to prove beyond a reasonable doubt that it is the only need for all humans. In the same manner, it would appear that we would need to establish not just that humans desire happiness, but also that they never desire anything else. This would be required to demonstrate that humans collectively share a similar desire for happiness which violates the fundamental concepts of utilitarianism.

At this point, it should be obvious that humans have desires for things which may not be collectively consistent. For instance, they have a want for virtue and the absence of vice, and this desire is equally as real to them as their desire for pleasure and the absence of suffering is to them. The urge to be virtuous is not as widespread as the desire to be happy, but it is every bit as real a fact as the other. Therefore, those who disagree with the utilitarian criterion believe that they have the authority to deduce that happiness is not the only purpose of human existence, and that happiness should not be used as a benchmark to judge what should be approved or disapproved.

When it comes to the ability of utilitarianism to determine how wages are determined, a great illustration is provided. Is it fair or not for a person's talent or competence to entitle him to higher remuneration within the context of an industrial association that operates on a cooperative model?

Utilitarianism states that everyone who does their best should get the same amount of money and that no one should be put in a worse situation for no reason. Critiques of Utilitarianism may argue that a person with more skills gives an organisation a plethora of advantages

that aren't compensated. They might work more efficiently, have more control over people in the organisation through leadership, and push others to do better.

It's possible that utilitarians will argue that even if we don't give everyone a larger share of the income, we still have a responsibility to compensate those who are less fortunate for the unfair inequality of advantages that exists in our society. This is because utilitarians believe that society is unfairly unequal in terms of the advantages it provides to its members and that providing a specific worker a much higher wage may contribute to the maintenance of disparities that have their origins in both birth circumstances and the experiences that a person has throughout their life.

It is maintained, in contrast to the utilitarian viewpoint, that society gains more from workers who are more productive since the services they give are of greater value to society. This is due to the fact that society receives more value from people who are more productive. Because of the better quality of craftsmanship that he/she has produced, society owes him a larger return. Specifically, society owes him more money.

More crucially, most of the joint outcome is truly the product of his labour, and denying one the right to stake a claim to it constitutes a form of theft. If a person who exemplifies excellence is only going to receive the same amount as others or the majority, then it is only fair that they be asked to produce the same amount of work while devoting a lesser amount of their time and effort in proportion to the amount of success they have achieved (Mill, 2017).
Who will make the call between these competing claims based on different aspects of the legal system? One disputant is looking at what it is that is just that the individual should receive, while the other disputant is looking at what is just that the community should give. In this situation, justice has two sides to it which cannot be

brought into harmony, and the two disputants have chosen opposite sides.

Each, from their own vantage point, poses an insuperable challenge, and any decision that must be made between them on the basis of justice must be utterly capricious. The preference can only be determined by the social utility. When it comes to better understanding utilitarianism and designing systems that accommodate it through inclusivity and exclusivity, these questions are absolutely necessary. Thus, those responsible for constructing artificial intelligence must be conscious of the social ramifications of their work when developing certain software.

2.2.4 Kantian deontology

Immanuel Kant was a German philosopher who spent the majority of his time in Königsberg, Prussia (1724-1804) where he studied philosophy and science. He is known for his work on the categorical imperative. It is generally agreed that Kant was one of the theorists who had the greatest impact on the development of modern philosophy. The deontological moral theory, which is one of the key theories that forms the basis of contemporary medical bioethics, was partially developed as a result of his writings, which made a contribution to its development. Additionally, the concept of 'virtue ethics' was conceptualised as a result of his writings (Bernstein, 2004).

According to Kant's theory of deontology, morality must originate not from traditions or authorities, nor from the injunctions of religion, but from reason. Kant began his analysis not with the experience of pain and pleasure but with the observation that the possession of reason is what sets humans apart from other animals. Therefore, it follows that all people have universal reasonable duties to one another, the most important of which is the responsibility to respect the humanity of the other person. He claimed that all morality must derive from such responsibilities, and that these duties must be

grounded in a deontological ethics. It makes no difference whether there are painful or enjoyable consequences.

The word 'deontology' means duty in Greek, and conduct that obeys these rules is ethical, whereas behaviour that does not, is not. Our reason for doing the right thing (which Kant called a maxim) is also important. We should do our duty for no other reason than because it's the right thing to do. One is neither absolutely implicit nor explicit and therefore better understood as having a "Dual-process theory" (Persson, 2012). This theoretical composition of the mind can influence a respective ethical theory. It is a theory dividing the brain in two systems, an (1) implicit system, as intuitive, automatic and unconscious, and an (2) explicit system, as a deductive and conscious process.

Empirical studies seem to indicate that this is how we can understand moral reasoning. It has been proposed that much of our reasoning is executed by our implicit system, and it is argued that the nature of deontology "at its core" is implicit and intuitive (Persson, 2012).

These are the obligations to do certain types of actions. Kant calls this general type of obligation a categorical imperative, that is, the action is imperative because it falls within a certain category. Greene who was discussed earlier in this chapter, suggests that the empirical data he presents explain why we have developed the two moral philosophies of (1) deontology and (2) consequentialism. The debate on which is right, and which is wrong may be explained by psychological natural kinds (Greene, 2004). In other words, Greene proposes the distinction between the implicit and the explicit system, which he calls the "intuitive" and the "cognitive" system.

In the case of politicians and top officials, sacrificing private interests in favour of public ones is not supererogatory (going above and beyond one's responsibility), but rather a duty that is derived

from their position in society. This 'duty' oriented form of ethics is fundamental to Kantian deontology.

The purpose of virtuous behaviour, according to utilitarian ethics, should be to promote both individual and society well-being rather than an absolute duty, which is one of the key differences between utilitarian ethics and Kantian Deontology.

"The patient has no more right to all the truth than he has to all the medicine in the physician's saddlebag...," said Oliver Wendell Holmes, an American physician, poet, and the Dean of Harvard's Medical School from 1847-1853. It is only fair that the patient receives as much as is healthy for him (Bernstein, 2004).

According to the Kantian deontology, it is imperative for health care workers to disclose unfavourable events like complications. This is especially true for surgeons, as the difficulties that patients experience might have dramatic and disastrous repercussions for them. In addition, medical professionals have a moral obligation as well as a moral right to openly acknowledge their own fallibility and to make an effort to devise strategies and tools for reducing the likelihood that patients will experience complications as a result of medical errors. This responsibility and right go hand in hand with the fact that medical professionals have a moral obligation to acknowledge their own fallibility and that they have a moral right to do so.

According to the Kantian theory of deontology, whether or not medical mistakes need to be reported to patients, this will be done regardless of whether or not the mistakes hurt the patient and regardless of whether or not the mistakes are obvious to the patient. This will be done as a duty, regardless of whether or not the mistakes have poor outcomes.

There is a counterargument stating that alerting a patient about a serious but non-obvious medical error may cause more issues than it

solves. This is due to the fact that alerting the patient about the error may cause them to feel overwhelmed and confused, as well as causing them to question whether or not they are receiving appropriate medical care.
A patient who is already psychologically and physically burdened with a significant illness and who has recently undergone major surgery may experience an increase in their level of worry as a result of this. Because of this, it is possible that this could be considered a harmful act.

According to Bernstein, Kant's moral philosophy was not unyielding and inflexible; rather, it may be construed as allowing for compromise in the event that two obligations were in conflict with one another. But since duty and obligation are ideas that represent the objective practical need of specific behaviours, and since it is impossible for two laws that are in direct opposition to one another to both be required at the same time, it cannot be said that duty and obligation exist. It is unthinkable for responsibilities and commitments to come into conflict with one another.

It is possible for a subject to have two bases of obligation in a rule that he prescribes to himself. According to the principles of practical philosophy, when two such grounds are in conflict with one another, the more compelling obligation-based ground takes precedence.

Kantian criticism suggests the necessary commitment to both the patient and the physician may have different meanings or understanding as to what compelling obligation takes precedence. In addition, it's possible that this line of reasoning isn't pure Kantian deontology but rather an interpretation of it. The moral correctness of an action does not depend on whether or not it plays a role, either directly or indirectly, in the achievement of a desirable result; rather, it depends on whether or not the action is of the kind that all physicians ought to perform as a matter of principle because it is fundamental to the study of deontology.

There is nothing in Kant's moral philosophy that would permit a surgeon to try to conceal this kind of error from a patient. This is something that Kant would consider unethical. To restate Kant's viewpoint, the obligation not to lie is morally sound for the simple reason that it adheres to a code of behaviour that satisfies the prerequisites of an overarching principle of duty, despite the fact that this overarching principle of duty is not in any way connected to the generation of a desirable outcome. The moral correctness of an activity does not depend on whether or not it plays a role, either directly or indirectly, in the achievement of a positive result; rather, it depends on whether or not the action is the kind of thing that all doctors ought to do as a matter of principle.

Kant makes it very obvious that the only way for actions to have moral meaning is for the actor to be motivated not by desire but by duty. In other words, if a doctor feels motivated to disclose for whatever reason, this is insufficient in Kant's understanding; in order for the act to have moral worth, it must be done from a sense of duty or obligation. In addition, the categorical imperative mandates that each and every one of us must reveal to any and all patients under any and all conditions.

The ethical theory of Immanuel Kant has been a significant inspiration for the growth of bioethical theory, which is designed to direct the moral behaviour of medical professionals and other people working in the health care industry. Analysis of Kant's writings on moral philosophy makes it abundantly clear that he would have strongly believed that all major errors accidentally befalling patients should be disclosed because the physician is duty-bound to do the right thing.

Doing the right thing entails never treating the patient as a means to an end, never lying to the patient, respecting the dignity of the patient, acting with beneficence, sympathy, thankfulness, conscience,

and without arrogance, and acting without hubris. One could arrive at the conclusion that Kant would approve of keeping information like this from a patient if there was a reasonable belief that revealing the knowledge would be more likely to cause damage than good but there is also a possibility that 'Kantian purists' will not even permit this much leeway in Kant's theses.

A pay raise may seem like a simple institution, but when applied to ethical theories can become complex. The Kantianism and utilitarianism philosophies diverge when it comes to the rationale behind whether or not a wage increase should be implemented. Utilitarianism may question the greater good or how that organisation may profit from this salary raise, whereas a Kantian lens, which applies uniformity and absolute right and wrong to an issue like this, is another way to look at this situation. There is a possibility that the Kantians will argue that the individual should be paid regardless of the degree of financial equity that exists within that company. That he ought to be reimbursed for his performances and the financial concerns of a corporation are irrelevant in this reward; instead, he will be rewarded for his efforts. Those who favour utilitarianism can argue that the business requires more financial transparency which may place a limit on both the minimum and the greatest possible wage. There is also the possibility that a certain company may be experiencing economic difficulties that prevent it from increasing the employees' compensation. Utilitarianism will evaluate the corporation based on what is best for the greatest number of individuals that make up the aggregate population of that organisation.

In light of these contrasting theories, it is essential to have a solid understanding of the fundamental ethical theories which will guide the IS design student.

2.3 ETHICAL CONSIDERATIONS

According to what is presented in Chapter 1.4, the author identified 15 ethical considerations that link to IS. We will now offer an explanation of each of these issues, in addition to some examples taken from the relevant literature.

2.3.1 Accountability

Definition

Accountability is often referred to as the property of technical systems. As a concept, accountability goes back to the early history of liberalism and is suggested as a tool to limit the use of power (Pretschner, 2021). In a paper by Duke University, Ayden R (2004) speaks of the role of accountability in systems design as needing to be elevated. Using a historical perspective, Ayden showed accountability as historically being a sub-property of security system or a secondary attribute of dependability. He also stated that correctly functioning components in an accountable system can provide evidence of their integrity, while dishonest or compromised components cannot hide their misbehaviour (Yumerefendi, 2004).

'I was wrong; therefore, I pay' is a sentence that belongs to ethical Kantian deontology, with multiple social, psychological, juridical, or administrative implications (Sandu, 2015). There is a form of absolute moral strength shown in its core Kantian theory, acknowledging and assuming guilty, with all consequences deriving from it, in other words, in accountability.

In Kantian ethics, there is a simplified approach to understanding or assuming complete accountability. Kant's Theory of Right and Duty holds that every person must act according to the laws of reason, which prevail over the will. Submitting to these laws means submitting to duty, which, in Kantian understanding, is not a constraint, but

freedom itself. Accountability is therefore understood in Kantian deontology as a 'must' for duty to be accountable (Sandu, 2015).

Accountability makes it possible to detect and isolate misbehaviour, contain damage, and assign non-reputable responsibility for incorrect or inconsistent states and actions (Yumerefendi, 2004). Accountability, more concisely, means that we have a natural or legal person, called an agent, that is responsible for some outcome. This responsibility is made transparent, and thus allows a dedicated principal to ask this agent for his, her, or their account and blame this agent for an unwanted outcome (Ball, 2009).

Systems application

The goal of accountable design is therefore to detect inconsistent or incorrect states or actions in a faulty component. A fully accountable system could validate a component's state as a function of the actions applied to it, enabling audits to identify the source of a fault even if its effects spread to other components. In 2018, a deadly crash of an Uber car was an example of the design decision in a system (Ball, 2009).

There are three systems which may be accountable:

1. Ms. Herzberg was pushing a bicycle while crossing a dimly lit road and the software of the car repeatedly misclassified her, ultimately hitting, and killing her. At first, the police claimed it was the pedestrian's fault because, at the site of the accident, crossing the road was illegal.
2. The safety driver on board the vehicle was distracted and did not apply brakes in time, and thus the car's safety driver was blamed because she did not pay attention to the road.
3. The manufacturer of the car's chassis, Volvo, was quick to distance itself from any blame, arguing that its chassis had a collision-avoidance system which would have prevented the crash, but it was turned off by Uber.

2.3.2 Autonomy

Definition

According to Kant, freedom does not consist in being bound by no law, but by laws that are in some sense of one's own making which is opposite to explicit morality (Johnson, 2004). Kant further demonstrates autonomy in how political freedom in liberal theories is thought to be related to legitimate political authority: A state is free when its citizens are bound only by laws in some sense of their own making — created and put into effect, say, by vote or by elected representatives (Johnson, 2004).

Organisational structure as a measure of design autonomy

An important contextual factor that influences the passive and active responsibility of engineers is the type of organisational network in which the systems design work is embedded (Verbeek, 2006).

In their work, Mehalik (2006) and Gorman (2006) provide three distinct organisational structures that are utilised by system designers. Networks are characterised by opposing views that are managed by shared norms and regulations. Networks are arranged in a rigid hierarchical structure. Individuals in a network may exchange mental models yet retain a high degree of independence. The level of design accountability (passive responsibility) that may be placed on engineers varies between these three phases of the network (Verbeek, 2006).

According to Mehalik and Gorman's argument, one more distinction between the network states is the degree to which they encourage moral imagination and, as a result, active duty on the part of engineers. Van Verbeek (2006) argues further that the function of engineers in design and regulation is multifaceted and depends on various aspects (Van Verbeek, 2006). These elements include the social settings in which engineers operate as well as the goods that engineers develop.

Therefore, the level of responsibility in a system is proportional to the amount of creative leeway afforded to the particular engineer or systems designer responsible for developing the system.

Systems application

In policy talks concerning autonomous vehicles, the subject of liability is discussed. When autonomous vehicles are engaged in accidents, determining culpability will necessitate the consideration of unique and in some cases complicated questions. Therefore, integrating autonomy into any automated IS systems will be a challenging task (Yazdanpanah, 2021).

2.3.3 Bias / Discrimination

Artificial intelligence (AI) can only be as good as the data used for its development. High-quality data are essential for high-quality algorithms to develop. AI systems based on incomplete or biased data can lead to inaccurate outcomes that infringe on people's fundamental rights (Focus, F.R.A, 2019).

An algorithm learns its rules based on the examples included in the training data. Training data could be generated from data on internet users, their browsing history, and whether they click on certain advertisements. Data used to learn about the desired outcome are so-called features. The training data is often referred to as the data that are used to build the algorithm.

An algorithm exploring the employment history of unemployed people could be used to predict when they will find a job. Data used to learn about the desired outcome are so-called features. This is the basis of how an algorithm learns patterns and forms the basis for supervised machine learning (Focus, F.R.A, 2019). Training data and data utilised in a system from the internet and social media are limited in terms of coverage of the population. There are many drawbacks to using user-input-generated data. These drawbacks or limitations could easily

infer biases within the results or discriminate against various groups.

These biases in user input might be the result of a wide variety of factors:

I. Because not everyone has access to the internet, social media, or the essential programmes, the preference will be given to those who do have access to these things or can afford the expensive data costs in South Africa specifically.
II. Second, some people have no interest in using social media or downloading programmes designed for use with social media.
III. Individuals who choose not to answer demographic questions raise the possibility of a significant bias being present in the training data.
IV. The decision to withhold a response might have been motivated by both personal and professional considerations, which would have led to the exclusion of specific groups from the data collected over the internet.

Systems application

Location data is only a representative of those who make this information available for use, for example on their portable devices such as smartphones (depending on how individuals manage their location settings). The enormous growth in the use of the internet almost lets one forget how many people do not have access to the internet, and that data are often biased as the data represents only a particular group in the population. While increasing coverage, data from the internet may only reflect a subset of the entire population, which is related to limited access to the internet and various levels of participation in online services, such as social media.

This can lead to invalid applications if applied to other groups who were not included in the training data for the AI application. These applications may include insurance companies using data from social media to create risk scores of potential customers or the development of facial recognition algorithms based on images from the internet. These biased shortcomings potentially limit the use of data from the internet for developing machine learning models that are applied to

the general population and for specific groups. The potential harm of using biased data for AI systems or algorithmic decision-making depends on the purpose of an application.

2.3.4 Accuracy

Definition

Data in computer-based patient records (CPRs) have many uses beyond their primary role in patient care, including research and health-system management. Although the accuracy of CPR data directly affects these applications, there has been only sporadic interest in, and no previous formal review of, data accuracy in CPRs (Hogan, 1997).

According to the Journal of the American Medical Informatics, data collection and production should be more formalised and rigorous to better measure accuracy. Researchers should report numerical measures of both correctness and completeness and use an unbiased sampling technique to select patient records for inclusion in the study. Data accuracy is calculated using two measures - one that measures the proportion of recorded observations in the system that are correct (correctness)* and a second that measures the proportion of observations that are recorded in the system (completeness) (Hogan, 1997).

To ensure data accuracy, two potential steps can be applied. First, by using more rigorous methods, researchers can improve the quality of the literature on data accuracy in CPRs so that the questions posed and unanswered by this review may be resolved. Second, increased uniformity of methods should assist with future syntheses of the literature and might allow researchers to apply statistical methods of meta-analysis.

Systems application

When data needs to be matched from three different sources (lead forms, CRM, and customer support), an online learning company that

charges subscribers must do it. The organisation completes the matchmaking process with the assistance of traditional ETL tools for systems. The findings contain a rate of 3.5 percent for false positives and a rate of 6.8 percent for false negatives respectively. Because of just this one number, the company has lost hundreds of dollars in revenue and countless hours of labour (in manually reviewing each false negative and positive) (Crawford, 2019).

If the organisation had taken a more serious approach to improving the quality of its data, it could have been able to prevent the deletion of 11 percent of the information in its database where .11 percent of one million equals 11,000 total, taking into account that each client spends $100. That amounts to eleven million dollars' worth of lost revenue (11,000,000 multiplied by 100).

That would be a devastating blow to the profitability of any company. In the database for the United States, the format for dates is MM/DD/YYYY, whereas in the database for the European Union and other nations across the world, the format is DD/MM/YYYY. Which of these two dates do you think would be more accurate if it were transformed into content on September 10th, 2020? Which date is it, the 10th of September or the 9th of October? This is a classic case of an issue that compromises the veracity of data: meaning vs form. The primary reason for this is because there is not enough data standardisation and rules in place. Correct formatting knowledge and data categorisation can improve accuracy as a technical ethical consideration for an IS design student.

2.3.5 Accessibility

Definition

Accessibility deals with the right or privilege to obtain data or information from another source. What information does one have a right to obtain from government or business organisation computer systems? What data or information does an organisation own? Data

access is critical to empirical research, but past work on open access is largely restricted to the life sciences and has not directly analysed the impact of data access restrictions (Nagaraj, 2020).

Systems application

Improved data access is much more likely to be valued by scientists, increasing both the quantity and quality of scientific output. More importantly, accessible data, therefore, proved to be fundamental in the democratisation process of making data freely available to researchers with limited financial means (Nagaraj, 2020).

2.3.6 Transparency

Definition

Transparency is usually associated with or misinterpreted with various other ethical considerations. These include but are not limited to accountability. Carolyn Ball defines transparency as manifesting itself in three metaphors. All three are uniquely important in understanding its application: transparency as a public value embraced by society to counter corruption, transparency synonymous with open decision-making by governmental institutes and transparency as a complex tool of good governance in programmes, policies, and systems (Ball, 2009).

Ball defines transparency as well 'intertwined' with accountability. Transparency ensures that information is available that can be used to measure the authorities' performance and to guard against any misuse of powers. A more thorough explanation would show that accountability is achieved through transparency, which makes authorities accountable for their actions. Between a system and those it governs, trust will be lacking in the absence of accountability and transparency. Social unrest and an unfavourable environment for economic development would be the outcomes (Hood, 2010).

Systems application

Accordingly, transparency is the counter to corruption if democracy is not possible. In countries wherein the political environment does not have democracy, information may still be available to the public. (Ball, 2009) This information may include financial budgets and voting results.

Transparency is complex because who decides, what decisions are made, and how to use information are all part of transparency. A policy, organisation, or nation cannot be said to be corrupt or not corrupt, open or not open, transparent, or opaque, because transparency is a continuum. (Ball, 2009). Transparency is therefore not an entire

solution to corruption or eradicating secrecy in an organisation. It is used as a proponent of a good policy within systems design.

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Ball defines transparency as well 'intertwined' with accountability. Transparency ensures that information is available that can be used to measure the authorities' performance and to guard against any misuse of powers. In a more detailed explanation, transparency serves to achieve accountability, which means that authorities become responsible for their actions. Without transparency and accountability, trust will be lacking between a system and those whom it governs. The result would be social instability and a developing environment that is less than conducive to economic growth (Hood, 2010). A paradoxical acceptance of the current state of international affairs, which includes both democratic and undemocratic nations, is contained within the commonly held meaning of transparency as the fight against corruption. This hope for democracy is contained within the shared meaning of transparency as the fight against corruption. Therefore, transparency is the solution to the problem of corruption in situations or countries when democracy is not feasible. Even in nations where a democratic political system does not exist, it is possible for the general people to access some types of information (Ball, 2009). This information may include financial budgets and voting results.

Transparency is complex because who decides, what decisions are made, and how to use information are all part of transparency. A policy, organisation, or nation cannot be said to be corrupt or not corrupt, open or not open, transparent, or opaque, because transparency is a continuum (Ball, 2009). Transparency is therefore not an entire solution to corruption or eradicating secrecy in an organisation. It is used as a proponent of a good policy within systems design.

2.3.7 Responsibility / Responsible use

Definition

In the Metaphysics of Morals, philosopher Emmanuel Kant claims that there can be degrees of responsibility, depending on the magnitude of the obstacles that must be overcome when acting. However, it would be uncompromising to allow for only two possibilities: either full responsibility or none. (Blöser, 2015). The degree of responsibility assumed by engineers is proportional to their freedom of action and ability to influence the outcomes of the design process. Bovens (1998) distinguishes between active and passive design responsibility. Both passive responsibility for something that occurred in the past and active responsibility refer to the virtue of responsibility (Bovens, 1998), In addition, passive responsibility requires a connection requirement. This is a requirement of blameworthiness that implies a person's passive responsibility is proportional to the extent to which he or she was able to control the course of events. Whether someone can be held responsible in this sense depends on factors such as whether there is a causal link between their actions and the outcome for which they are to be held accountable (Pesch, 2015).

Active responsibility is assumed beforehand, most often because someone feels responsible. Like passive responsibility, active responsibility is related to the degree of control someone has, but in a more complicated way. Verbeek (2006) interestingly aligns responsibility with autonomy. Designers are able to assume moral accountability only when autonomy is needed (Verbeek, 2006). The

systems design distinguishing factor is relevant here to making a distinction between prescriptive regulation and performance or goal-setting regulation. Prescriptive regulation prescribes specific characteristics of a design at a detailed hardware level, and goal-setting regulation leaves the designers more freedom.

The idea of performance or goal-setting regulation is that the regulator sets the goal or performance standard to be achieved and that the designer is free to achieve those goals as he or she thinks best. Designers should at least reflect on the question of whether it is ethically acceptable to follow the normative framework that was (implicitly) set out for them. As Van de Poel's and Van Gorp's cases show, engineers sometimes deliberately choose to engage in radical designs that call into question the (ethical) assumptions of existing normal designs.

Systems application

An example is the designers of the lightweight car DutchEVO who call into question existing moral conceptions of car safety and sustainability (Verbeek, 2006). The use of lightweight biodegradable material is consistent with ecological design principles and is environmentally benign. However, the safety aspect is not satisfactory. Therefore, there must be a well-designed ethical framework — one in which the designer may satisfy the minimum standards for an 'ethical' design. These requirements will be consistent with the principles of a given organisation and governed by the laws of the respective nation. Verbeek interestingly attributes responsibility to the user as well as the technologies themselves. (Verbeek, 2006). The example of the seat belt can illustrate this.

Seat belts and airbags make drivers feel safer, which may diminish their sense of active safety duty (both for themselves and other people). Seat belts also affect the allocation of liability (passive responsibility) in the event of an accident. This passive responsibility is assumed by the technological system (the seat belt)

and, ultimately, by the system's designers or manufacturers, as the technology cannot be held morally or legally culpable. Consequently, one must be responsible to be accountable.

This means that the responsibility of designers depends not only on the social contexts in which they work but also on the products they design.

2.3.8 Privacy

Definition

Maintaining privacy may be seen as a social value deeply embedded in our societies. A global privacy survey found that 88% of people are worried about who has access to their data; over 80% expect governments to regulate privacy and impose penalties on companies that do not use data responsibly. (Spiekermann, 2012).

Regarding privacy, a parallel has been made. Spiekermann asserts that system data governance specialists place an excessive emphasis on information practices alone (such as Web site privacy policies). Importantly, additional research should be conducted on how to design client-centric systems that optimise user control and minimise network or service provider involvement. When creating software systems, organisations do not always include privacy measures. When should privacy requirements join the system development life cycle? Who is accountable for protecting consumer data (Spiekermann, 2015), when dividing privacy into two categories to better comprehend their respective systems and develop a formal policy that appropriately regulates input- and output-level interactions.

Input privacy

The following is an illustration of how to use the postal service: you compose a letter to a friend, place it in an envelope, and then hand it over to the postal service. After that, the postal service makes use of its expertise and its ability to coordinate in order to deliver

the letter to its intended location. All of this was accomplished without having to read your letter because of the envelope. In this scenario, 'input privacy' refers to the guarantee that the person delivering your mail won't be able to read the contents of your letter, which are considered to be an input into your information flow.

The term 'input privacy' refers to the guarantee that one or more persons can take part in computation in such a way that neither party learns anything about the other party's contributions to the calculation. This ensures that input privacy can exist when one or more people are involved.

Let us look at a unique circumstance that may come as a surprise to you. What would happen if you addressed the letter to the mailman's mother and had her read it to him? This would not constitute a breach of input privacy because the flow of information had been finished at that point (he had just delivered the mail), and therefore the information could not be rerouted (Spiekermann, 2015).

Important: The guarantee provided by input privacy only protects the inputs to an information flow and the intermediate variables contained within an information flow; it does not secure the outputs of the flow of information.

Imagine that there is a flow of information similar to a network of pipes that transport coloured water from two inputs to one output. The water, which is tinted, stands for sensitive information. Even if an information flow completely respects the requirements of input privacy, it is still possible for it to leak information inside its contents, as this is what input privacy guarantees. Output privacy is primarily concerned with the problem of bundling, in contrast to input privacy, which is more concerned with the copying problem.

Output privacy

This is about making sure that specific subsets of information do not make it through the information flow so that it can be considered complete. How much can I figure out about the inputs of an information flow by examining the outcomes of that flow? I have an information flow with inputs and outputs.

Systems application

An employee of the company enters into a contract with a government agency to process data concerning personal information (privacy) pertaining to children and the parents of those youngsters. The employer asks the worker to copy the data, and the employee complies. This is not prohibited under the employment contract in any way. If I had access to the data of the US census and analysed those results, how much information might I deduce about an individual citizen of the US? When I look at the results of a survey about drugs, is it possible for me to deduce that a certain participant has a particular disease?

The focus is on the content material. Your output privacy is protected by granting you control over the information that is transmitted to other individuals.

It would be ideal if you could conceal the fact that you are currently lounging on the beach while conversing on the phone with your manager. If you want to participate in a medical study, you may desire to disguise your identity so that your insurance provider is unaware of any potential risks linked with your participation. In order to conceal the mess, you are in during a video chat with your friends, you may wish to mask your background. A systems design example of output privacy is photo post-processing that obscures partially or completely sensitive items in the image.

2.3.9 Responsibility / Responsible use

Definition

In the 'Metaphysics of Morals', Kant claims that there can be degrees of responsibility, depending on the magnitude of the obstacles that must be overcome when acting. However, it would be uncompromising to allow for only two possibilities: either full responsibility or none. (Blöser, 2015).

The degree of responsibility engineers assume depends on their freedom in acting and the degree to which they can influence the outcomes of the design process. Bovens distinguishes between design responsibility as active and passive. Passive responsibility for something that has occurred in the past and active responsibility refer to responsibility as a virtue (Bovens, 1998). Passive responsibility further needs a connection requirement. This is a requirement of blameworthiness that implies someone's passive responsibility depends on the degree to which he or she was able to control the course of action. This is whether someone can be held responsible in this sense depends on such factors as whether there exists a causal relation between someone's actions and the outcome for which someone is to be held accountable, whether a norm has been violated in the action, and whether the person can be (morally) blamed for the action (Bovens, 1998).

Active responsibility is assumed beforehand, most often because someone feels responsible. Like passive responsibility, active responsibility is related to the degree of control someone has, but in a more complicated way.

Coeckelbergh (2012) interestingly aligns responsibility with autonomy. Designers are only able to assume moral accountability when autonomy is needed.

As shown in the articles by Coeckelbergh (2012) and by Henderson (2012), the way regulations and technical codes are formulated also influences this division of labour and the distribution of responsibilities. There are systems design distinguishing factors which are relevant to making a distinction between prescriptive

regulation and performance or goal-setting regulation here. Prescriptive regulation prescribes specific characteristics of a design at a detailed hardware level, and goal-setting regulation leaves the designers more freedom.

The idea of performance or goal-setting regulation is that the regulator sets the goal or performance standard to be achieved and that the designer is free to achieve those goals as he or she thinks best. Designers should at least reflect on the question of whether it is ethically acceptable to follow the normative framework that was (implicitly) set out for them. As Van de Poel's (2006) and Van Gorp's (2006) cases show, engineers sometimes deliberately choose to engage in radical designs that call into question the (ethical) assumptions of existing normal designs.

Systems application

An example is the designers of the lightweight car DutchEVO who call into question existing moral conceptions of car safety and sustainability principles and is environmentally benign (Verbeek, 2006). However, the safety aspect is not satisfactory.

Therefore, there must be a well-designed ethical framework — one in which the designer may satisfy the minimum standards for an 'ethical' design. These requirements will be consistent with the principles of a given organisation and governed by the laws of the respective nation.

Verbeek attaches responsibility to both the user and the technologies themselves in an intriguing manner (Verbeek, 2006). The example of the seat belt can illustrate this. Seat belts - and comparable systems such as airbags - make drivers feel safer and may therefore well erode their sense of active responsibility for safety (both for themselves and other people). Seat belts also influence the allocation of accountability (passive responsibility) if an accident occurs. This passive responsibility is taken over by the technical system (the seat belt) and thus eventually by the designers or producers of the system

because the system cannot be held morally responsible nor legally liable. One therefore must be liable to be accountable naturally. This means that the responsibility of designers depends not only on the social contexts in which they work but also on the products they design.

2.3.10 Reliability

Definition

The reliability of IS in the organisation is understood as a measurable property of IS, useful for its control and management, identifying its quality level and pointing out potential problems (Zahedi, 1987). While reliability is a central concern of information systems practitioners at many levels, there has been limited consideration in information systems scholarship of how firms and individuals create, manage, and use technology to attain reliability (Butler, 2006).

Systems application

Routine-based reliability is commonly advocated in the IS literature. Processes are often automated by embedding them in computer systems to increase both reliability and efficiency (Zuboff, 1988). Software is a codification of human knowledge (Conceicao, 1999), and information systems users are implicitly expected to defer to the technology, allowing the embedded routines and standards to determine what should be done next.

The idea that standardising processes, automating routines, and embedding procedures in information systems is the optimal strategy for reducing errors and improving reliability is so well accepted that it is stated as fact in many systems analysis and design texts (Butler, 2006).

2.3.11 Democracy

The amount of data available has been growing exponentially each year, and the conditions of usage have been evolving at a pace faster than the policies are being provided to ensure proper usage. Understanding the impact of big data on democracy can help accentuate democratic institutions which can ensure better governance (Efthymiou-Egleton, 2020).

Big data is a discipline that provides analytical programmes that extract information with data sets that could be considered complex for traditional data processing software. More commonly, the use of big data is to refer to user behaviour analytics, predictive analytics, or specific methods of analysis that utilise personal information.
For billions of people across the globe, the digital transformation has brought with it numerous benefits and anadromous convenience.

`According to Alcott & Gentzkow (2007), Policymakers and market stakeholders are more aware of the significance of the data as they

examine the political and economic implications (Allcott & Gentzkow, 2017). Furthermore, a substantial number of US adults were exposed to false stories before the 2016 election, and post-election surveys suggest that many people who read these stories believed them to be true. Gunther also argues that false stories played a key role in the 2016 election (Gunther, 2018).

Systems application

Gunther makes use of a post-election survey wherein 281 questions were asked. The statistical association between belief in these fake news stories and voter choice in the 2016 election by former Barack Obama supporters is extraordinarily strong. Gunther has inferred a strong statistical correlation between voters who believed the fake news as well as voters who did not.

Among those who believed none of the three fake news stories, 89 per cent cast ballots for Hillary Clinton in 2016; among those who believed one fake news item, this level of electoral support fell to 61 per cent; but among those who had voted for Obama in 2012 and believed two or all three of these false assertions, only 17 per cent voted for Clinton (Tau-b correlation = .50) (Gunther, 2018).

The hindsight they have in this case became more endearing when discussing the influence that Cambridge Analytica and Facebook had in various global events such as the 2016 American elections and the 2014 Brexit campaign (Allcott, 2017).

With the new ability to skew information to fit a specific narrative, it has become quite easy to define the measures intent on defining democratic societies (Bigo, 2019).

2.3.12 Fairness

Definition

When we refer to fairness, we are talking about the ways a system treats people, or groups of people, in a way that is considered 'unfair' by some moral, legal, or ethical standard. The incorporation of fairness as a top goal in IS presents a sociotechnical challenge. It is conceivable that AI systems will perform unfairly for a variety of reasons, some of which are societal, some of which are technical, and some of which are a combination of societal and technical

variables. Some AI systems, for example, perform unfairly because of societal biases reflected in the datasets used to train them, or because of societal biases in the assumptions and decisions made (either explicitly or implicitly) by teams throughout the AI development and deployment lifecycle. These biases can arise for a variety of reasons, including: An automated resume-screening system trained on the resumes of individuals currently employed in the tech sector, where women are already underrepresented, may inadvertently deny women employment opportunities. (Bird, 2020)

Systems application

Online platforms are becoming an increasingly popular location for philanthropic giving. As a result, the suggestion is anticipated to become an increasingly important factor in the funding of charitable organisations. DonorsChoose.org, an educational charity website, takes an expressly "peer-to-peer" approach to such giving. This results in numerous possible gift options for donors to choose from, which necessitates suggestions or sophisticated search to assist match donors and opportunities. Fairness concerns are essential in the development and evaluation of information access solutions for philanthropic organisations, in particular to avoid the possibility of positive feedback loops in which a subset of causes comes to dominate results and rankings. This is because many charitable organisations have a focus on social justice. In the context of charitable giving, we would expect problems of fairness to include the following:

1. Does the system provide fair opportunities for the various recipients/causes to have their needs supported?
2. Are specific groups of recipients under- or over-represented in the recommendation results?

Another unique form of fairness is algorithmic fairness. Algorithmic fairness in general is concerned with going beyond the aggregate accuracy or effectiveness of a system — open, but not always, a machine learning application — to studying the distribution of its positive or negative effects on its subjects (distributional harm) and

the ways those subjects are represented by and in the system (Mehrabi, 2021).

2.3.13 Inclusion

Definition

There is a disparity in access to computers and the internet among members of historically oppressed groups, such as those with physical or mental disabilities, according to recent findings (Chadwick, 2013).

People who have impairments frequently face a variety of hurdles, including those related to economics and language, in addition to those related to accessibility. This inequality in access is often referred to as the "digital divide", which is a term that was popularised in the 1990s to characterise differences between nations but has more recently been extended to differences that exist within nations (Friemel, 2016).

People with more severe impairments gain a far greater benefit from inclusive systems than do people with less severe impairments (Unwin, 2017). People who are already struggling the hardest are the least likely to get access to information and communication technologies (ICTs), but, if they do, it could have the most significant effect on their lives (in terms of enhanced capabilities and functioning). This is the case in a variety of contexts and business sectors (Haenssgen, 2018).

Systems application

Depending on the nature of the disability, traditional written and spoken communications may be unavailable to certain people. Individuals can utilise their preferred means of communication - speech, text, or video - to perceive and convey information in face-to-face and distant conversations (Thompson, 2018).

Text messaging on mobile phones is becoming an increasingly common method of communication among deaf and hard of hearing individuals. According to Thompson, parents of deaf children now have the ability to communicate with their children throughout the day, which provides them with the peace of mind that their children are safe (Thompson, 2018).

Prior to the invention of cell phones, the lack of communication caused a constant state of anxiety and panic. Compared to their richer counterparts, impoverished parents cannot afford to pay for escort services for their impaired children, thus they greatly value the connectivity that mobile phones provide (Kennedy, 2008).

2.4 THEORETICAL FRAMEWORK (TOE) and (IPO)

We shall provide two frameworks for classifying the fifteen ethical considerations. TOE (Technology, Organisation, and Environment) and IPO (Input process and output) are the two examples. Furthermore, we shall open section 2.8 with an explanation of why organisational structure is not only essential for design, but also for locating ethical responsibility within any firm.

2.4.1 Organisational Structure as a measure of design autonomy

An important contextual factor that influences the passive and active responsibility of engineers is the type of organisational network in which the systems design work is embedded (Verbeek, 2006).

Mehalik and Gorman in an article, show three organisational structures of systems designers:

1. Networks are strictly hierarchically organised,
2. networks are characterised by competing perspectives mediated through common rules and regulations, and
3. in networks participants share mental models but have a large degree of autonomy.

These three network states differ in terms of design accountability (passive responsibility) that can be attributed to engineers. Another difference between the network states, as Mehalik (2006) and Gorman (2006) argue, consists in the degree to which they foster moral imagination and therefore active responsibility on the part of engineers. Van der Verbeek argues that the role of engineers in design and regulation is complex and depends on multiple factors, including the social contexts in which they work and the products they design.

2.4.2 TOE framework continuation (Chapter 1)

We now elaborate on the brief introduction to TOE introduced in Chapter 1 and provide more extensive information on this framework. The technical context refers to the firm's internal and external technology. The focus of technological context is on the effect of technology features on adoption decisions. Tornatzky (1982) and Klein (1982) conducted a meta-analysis and discovered that relative advantage, complexity, and compatibility are all strongly correlated with innovative behaviour.

Relative advantage is the degree to which a technical aspect is believed to provide a corporation with a bigger advantage. Al- Jabri (2014) demonstrated that the anticipated benefits of embedded cloud computing services include the following: accelerated corporate communications, efficient coordination among companies, improved consumer communications, and access to market information (Al-Jabri, 2014).

In a survey conducted at King Fahd University, IT professionals who had adopted the technology assessed its relative benefit and compatibility higher than those who had not. This is not an unexpected outcome because organisations that have used cloud computing have realised the advantages and liked the experience. The main relative advantages of cloud computing in comparison to in-house computing

include cost reduction, operation efficiency, rapid application processing, improved customer services, enhanced partnerships with business partners, and an increase in the firm's competitive edge.

2.4.3 Organisational context

Organisational context includes assistance from upper management and organisational preparedness. In contrast to non-adopting organisations, the senior management of adopting firms is extremely supportive of cloud computing projects and interested in them. The non-adopting enterprises have demonstrated a diminished view of top management support. This demonstrates the significance of top-level management support in fostering a conducive environment and providing sufficient resources for the effective adoption of cloud computing.

The organisational preparedness includes the IT infrastructure, IT expertise, and available funds. Adopters valued technology and financial resources more than non-adopters. One probable cause is that non-adopters believed cloud computing required the same number of resources as in-house computing. Another possible explanation is that cloud computing is relatively new to Saudi enterprises. Therefore, non-adopters have had difficulty evaluating the significance of the technical and financial resources necessary for cloud computing deployment. They may not recognise that cloud computing requires fewer resources than on-premises computing.

2.4.4 Environmental context

In a complex business environment, business enterprises are under intense external pressure to find innovative methods to surpass competitors. The competitiveness within the sector and the trading business partners, particularly those utilising the hybrid cloud, exert pressure. If a company's trading partners request or recommend that it use cloud computing, it may experience pressure. An additional source of pressure is the industry. Firms may feel compelled to use

cloud computing to remain competitive if the majority of their peers have already done so.

2.5 ACCELERATED LEARNING

Since the end of World War II, a new approach to education that is known as accelerated learning (AL) has been rapidly gaining popularity. It expressed itself in a number of rapid and rigorous approaches and programmes in both adult and high school education in a variety of nations, as well as in a large number of foreign language classes all over the world, and in particular college offerings in the United States of America (Serdyukov, 2008).

When one considers the fact that we are currently residing in a period that is characterised by widespread economic, political, and social change, massive integration of technological innovations in all spheres of life, soaring growth of information and knowledge in all areas, instantaneous exchange of communication, increasing manufacturing, business, and scientific complexity, and competition on local and global levels that leads to escalating life and death stakes, it becomes clear that we are in the midst of a period of unprecedented complexity.

In some circumstances, the terms 'accelerated learning' (AL) and 'intensive learning' (IL), which is also a trend, are interchangeable. As a consequence of these inclinations, there is a possibility that many people may perceive AL and IL to be fundamentally the same kind of schooling. This could result in confusion. Despite the fact that these two approaches share a number of similarities, there is also a big distinction between them, which will be illustrated in the paragraph that comes after this one. According to the explanation provided in the Journal of Research and Innovative Teaching, which is published by the National University, this distinction may be seen between accelerated learning, which is also known as AL, and intensive learning, which is also known as IL.

There are occasions when AL is connected to intensive learning, which is another tendency. This is due to the fact that several classes, particularly those that are part of more casual educational programmes, use each of these categories to ambiguously describe the same topic. Therefore, depending on the institute or country, the same set of classes could be referred to as either AL or IL, even though they complete the same programme, earn the same number of credits, and take the same amount of time. The fact that certain meanings overlap with one another is another source of confusion.

AL is sometimes associated with the study of foreign languages because this field of study is frequently used as a testing ground for many innovative methods in education. However, many of these applications can be beneficial for any subject area and at every level of study. This is one reason AL is sometimes associated with the study of foreign languages.

According to the Journal of Research and Innovative Training, accelerated learning is attributed to a specially organised short-term course in which the same learning goals can be attained in the same number of class hours as in a typical course, but provided in shorter course duration. This was discovered by the authors of the Journal of Research and Innovative Training. The execution of any specific accelerated procedures is in no way required in order to comply with AL requirements. It is often presented in classes that are longer and more frequent (for instance, four hours twice a week rather than one hour), and one can also refer to it as a condensed course if one so chooses.

This is in contrast to a traditional course, which lasts for a longer period of time (e.g., in 4-6 weeks instead of 15-16). The same material is covered, and the same learning outcomes are achieved, but the course can be completed in a much shorter amount of time using

accelerated learning. This is an essential quality of accelerated learning.

However, in an intensive course, the same or better outcomes can be achieved in fewer class hours than in a traditional or in an accelerated course due to more effective instructional methods and increased productivity of learning. This may be achieved through, but is not limited to, changes in instructional methods such as blended learning.

At the University of Kazakhstan, a qualitative study was conducted to investigate the efficacy of blended learning for students working toward a Master of Management degree. The study focused on students who were taking courses toward that degree. The results of the survey and the study that followed illustrate both the benefits of blended learning and the challenges that are associated with it. In order to help students develop the ability to design and lead educational projects, the class that was investigated for this paper was the first class in Nur-Sultan, Kazakhstan to use a high level of the blended learning approach. The purpose of the class was to help students learn how to lead educational projects. The findings indicated that blended learning is an effective form of education because it combines the most beneficial aspects of the more traditional face-to-face classroom setting and the digital learning environment. This is because blended learning combines the most beneficial aspects of face-to-face classroom settings and digital learning environments (Namyssova, 2019).

In the same way that accelerated learning condenses content into a shorter amount of time for completion, intensive learning does the same thing. A classroom is used in both regular education and intensive learning, which is another similarity between the two. This means that intensive training is carried out throughout periods of time that are both longer and typically more frequently spaced apart (e.g., 4 hours 4-5 times a week).

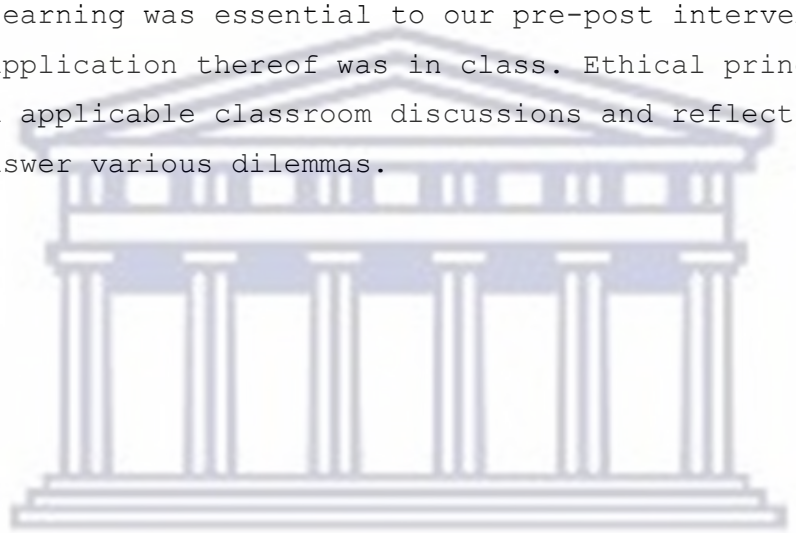
In his work from 2008 titled "Accelerated Learning: What Is It?", Serdyukov defines accelerated learning. The difference between standard learning and intensive learning (often abbreviated as IL) is said to be both quantitative and qualitative. One of the defining characteristics of intensive learning is that it results in changes not only qualitatively but also quantitatively. This is one of the features that distinguishes intensive learning from other modes of education, in particular accelerated learning. When the course is delivered in an intense style, students are able to acquire the same level of vocabulary in a significantly shorter amount of time and in a lower total number of teaching hours than would be the case when the course is delivered in a more traditional manner.

The ratio of two quantitative parameters, specifically the number of words in the learner's exit vocabulary and the number of hours it takes to master them, is used as a measurement of efficiency in this scenario. This ratio, in the end, corresponds to the number of words that can be learned in one hour, making it an extremely simple statistic to use. This comparison reveals that an intensive course is more effective than a conventional course, as well as an accelerated course; 16.6 words per hour as opposed to 4.0 words per hour. According to the results of the calculations, this strenuous workout has an efficiency factor of 4.15. (16.6:4.0).

According to the findings of Serdyukov (Serdyukov, 2006), despite the fact that an intensive course may be seen as the one that is the most helpful or effective, it is also the one that is the most challenging to complete. Because of the high number of classes that are packed into a certain length of time, many English as a Second Language (ESL) and English as a Foreign Language (EFL), programmes in the United States are given the designation of "intense". As was indicated before, this ambiguous definition of intensive results in ambiguity and is the root cause of misunderstanding when attempting to differentiate between IL courses and AL courses.

According to the Merriam-Webster Collegiate Dictionary, the word 'intense' can imply both 'concentrated' and 'constituting or related to a technique that is intended to improve productivity'. One could make the case that 'intensive' signifies both of these things. Furthermore, this notion in learning involves reaching the same outcomes in a shorter time, or better outcomes in the same period of time as in non-intensive, traditional or even accelerated courses.

Accelerated learning was essential to our pre-post intervention survey. The application thereof was in class. Ethical principles were introduced in applicable classroom discussions and reflections on how they would answer various dilemmas.



2.6 SUMMARY (CONCEPTUAL FRAMEWORK)

After having completed the literature review, we will progress to the research methodology, which will be discussed in detail in Chapter 3.

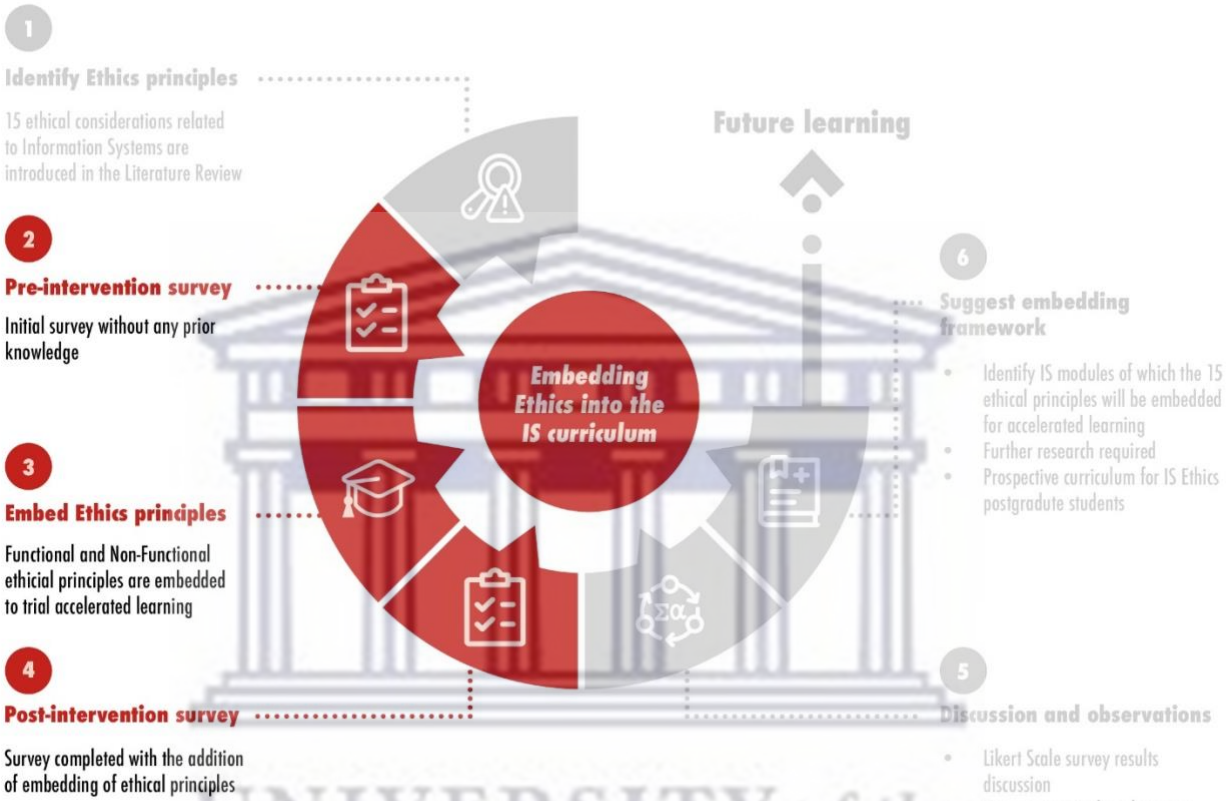


Figure 4 Research Methodology Concept

CHAPTER 3: RESEARCH METHODOLOGY

3

We will discuss theoretical research philosophies in this chapter. Positivism, pragmatism, and interpretivism will be focused on. Following that, we will explain our research strategy as applying an explicit deductive reasoning sequence. Techniques and forms of data collection will be discussed and a Mann-Whitney U test will be presented as a more stringent statistical test.

3.1 RESEARCH PHILOSOPHIES

Every piece of research is predicated on a set of underlying philosophical assumptions about what it means for research to be considered 'legitimate' and which research method (or methods) is most suitable for the process of knowledge acquisition in a specific investigation. Because of this, having a solid understanding of these assumptions is essential to both the execution and assessment of any research project. The research philosophies mentioned below have their own inherent assumptions.

3.1.1 Pragmatism: Mixed methodology

Pragmatism is a mixture of the aforementioned research methodologies. In terms of the method of inquiry, pragmatism encompasses the two extremes often advocated by positivism/post-positivism and interpretivism. Contrary to interpretivists, the former prioritises quantitative methodologies. Therefore, it is not unexpected that pragmatism has been recognised as the basis of mixed-method research (Tashakkori, 2020).

3.1.2 Interpretivism

Interpretivism specifically pertaining to this study measures knowledge and thoughts of students on ethical systems design. Crucial to the interpretivist philosophy is that the researcher must adopt an empathetic stance. The challenge here is to enter the social world of

our research subjects and understand their world from their point of view.

Since the objective of positivism aims to generalise the results of the research to the large degree, there should be a risk that individuals may be neglected whose understanding and interpretation related to any events, phenomena or issues can reveal a lot of truth about reality. Similarly, with the general findings of research outcome, it will be a challenge for researchers to directly apply an understanding of the phenomenon in a particular local context (Johnson & Onwuegbuzie, 2004). Interpretivism is originally rooted in the fact that methods used to understanding knowledge related to human and social sciences cannot be the same as their usage in physical sciences because humans interpret their world and then act based on such interpretations while the world does not (Pham, 2018).

Interpretivists adhere to a relativist ontology in which a single phenomenon may have several interpretations, as opposed to a truth that can be determined by measurement. Instead of seeking to generalise a foundation of understanding for the entire population, interpretivism allows academics to get a deeper understanding of the phenomenon and its complexity in its context.

As was mentioned before, there are a number of perceived constraints associated with a qualitative research methodology. The criticisms brought up there is that qualitative research is merely descriptive and, as a result, is not rigorous, and thus it is excessively impressionistic and subjective (Goulding, 2005)

3.1.3 Positivism

Positivism is a methodological philosophy in quantitative research. In this respect, understanding of phenomena must be measured and supported by evidence (Pham, 2018). Various metric or numerical methods are used within this thesis. Likert scales will be introduced

later in the pre-post intervention surveys. This will quantify the results as a numerical value from 1-10, making analysis seamless. The decile system wherein learners rated their knowledge from 1-10 gave us a quantifiable metric against which we can compare the results of our two intervention surveys.

To illustrate positivism, within the process of analysing the effectiveness of embedding ethics into the IS curriculum, the relationship between an independent variable and one or more dependent variables will be discovered by causal inferences as the results of experimental designs (the intervention surveys in our case) (Marcucci, 2011). Through positivist research used in this thesis, empirical tests and methods such as sampling, measurement, questionnaires and classroom discussions were be used. The empirical insights provided by positivist researchers is said to have a high-quality standard of validity and reliability, Ceteris paribus (Pham, 2018).

3.2 RESEARCH STRATEGY

The research strategy chosen for this thesis was a positivist philosophy with experimentational data and deductive reasoning. The experiment (intervention) consisted of a pre and post intervention survey.

The primary goal of any positivist research is to generate explanatory associations or causal relationships that ultimately lead to prediction and control of the phenomenon in question. In this thesis, we conducted an experiment to determine whether or not the embedding of ethical philosophy into pre-existing modules of information systems was sufficient to enhance the outcomes of the second survey. That is the question of whether or not students are better prepared to answer questions on IS ethics by using their knowledge gained from the embedding process, which is done through class discussions.

The positivist argument for this thesis makes use of the hypotheticodeductive method. This is an example of a scientific paradigm that relies on the formation of a hypothesis that can be tested and the development of an empirical research to either support or reject the hypothesis (Park, 2020).

According to (Soiferman, 2010), for the researcher, "the best way to understand any phenomenon is to view it in context." The study constituted 30 postgraduate UWC IS postgraduate students who participated in a pre and post intervention survey. In 2020 there was a pre-embedding survey done by 34 students, and thereafter the intervention of 34 students post intervention.

The results of the survey generated quantitative interpretational data. This was accomplished by giving the initial group no extra information on the ethical factors that were being considered. The identical questionnaire was provided to the same control group, but this time it also included some fundamental information on ethical considerations. (This is also referred to as embedding through 'accelerated learning').

The goal of conducting an analysis of the data was to establish whether or not the intervention improved the accuracy of results for the post intervention survey.

3.3 DEDUCTIVE REASONING

Trochim identifies inductive and deductive reasoning as two "broad techniques of thinking". Arguments based on experience or observation are best presented inductively, but arguments based on laws, rules, or other commonly recognised principles are best expressed deductively. (Soiferma, 2010).

Through examining the specific outcome of the inquiry, it will either tend to confirm the theory or indicate the need for its modification

with regard to ethics being independently taught within the postgraduate IS curriculum.

The deductive approach will better help us understand the causal relationship between ethical foundational knowledge and ethics in the IS curriculum. A deductive approach implies that you have a prior set of criteria that determines what you want to study. For data collection, this is often a set of hypotheses that will guide what you ask, while an inductive approach would be more exploratory. Similarly, a deductive approach to analysis would start with a pre-existing coding system, while an inductive approach would be guided by the data themselves.

3.4 DATA COLLECTION

3.4.1 Quantitative and qualitative

The compilation and analysis of data focused primarily on quantitative information. The information was derived from the outcomes of the two surveys. The sample size was 30 and the data from the two surveys did not follow a normal distribution. In addition, the data were ordinal rather than interval or continuous; therefore, the Mann-Whiney U test was utilised. The Mann-Whitney U test was applied to non-parametric (non-continuous) data that followed a normal distribution. The surveys also used Likert scales for queries with answers ranging from 0 to 10. This decile system was employed on purpose to produce empirical data that can be readily analysed (Nachar, 2008).

3.4.2 Data collection process

The compilation of the data was founded on the findings of the two surveys, which served as the foundation. The surveys were carried out by means of Google Forms, an open-source application that allowed users to construct surveys and quizzes, as well as communicate with one another on editing and sharing them with other people.

During the survey, we employed Google Forms to gauge not only the students' inherent biases and prior information, but also their comprehension of IS ethics. A combination of Ethical dilemmas and its application to IS Design allowed us to assess the students' general level of understanding of IS ethics. These surveys included questions about the 15 ethical considerations discussed previously in Chapter 1 and Chapter 2.

3.4.3 Instrument development

In order to address the research question, the pre- and post-survey strategy was consciously implemented. The development of a research instrument was informed by previous research. These works were identified by 15 Ethical Considerations as contributing factors to the classification and differentiation of ethical principles within the IS curriculum (Breytenbach, 2020).

The survey contained a total of 27 questions, each of which questioned students on their ability to accurately identify an ethical consideration. In the second part of the survey, students were asked to categorize these 15 ethical considerations according to the phases of the computer life cycle (input, process, or output).

Through 2021, Breytenbach and Van den Berg (2020) integrated ethical concepts into classroom discussions, case studies, and research to integrate ethics into the IS curriculum.

The intervention in the second survey was owing to the disappointing results of the initial 2020 survey, which produced disappointing outcomes related to students understanding of ethics. The poor results indicate that ethics and its applications to IS are inadequately understood, which prompted the intervention and a post intervention second controlled survey with the embedding process of ethics into the classroom.

The Post-Intervention Survey 2022 was administered to a statistically similar pupil population. This is subsequent to the embedding process. In addition to embedding, the second survey's questions included ethical definitions reminding students of the ethics content that had been embedded into their learning content.

Therefore, the data produced is comprised of the results of the two surveys, which were used for a comparison of percentage differences of students' capability to classify ethical considerations correctly into IPO and TOE categories. This cohort comparison was followed by a stringent statistical comparison of the 2020 and 2022 survey responses.

As a consequence of substantial evidence from the post-embedding survey results and overall class participation, it was determined that foundational ethics and ethical theories must be taught in a separate module.

3.4.4 Statistical tests

There were quantitative statistical techniques that were applied to data generated from various metrics. The results of the survey data were initially compared using percentage change tests, followed by the more rigorous statistical Mann U Whitney test (Nachar, 2008). It is often difficult, particularly when conducting research in surveys, to have access to large normally distributed samples. Fortunately, there are statistical tests to compare two independent groups that do not require large normally distributed samples.

In contrast, the null and two-sided research hypotheses for the *nonparametric test* are stated as follows:

H_0: The survey results are not different

H_1: The survey results are different

3.4.5 Resources and tools

This statistical test is implemented in Python 2.7. The NumPy and pandas Python libraries were used for the project for their convenient scientific computing operations and data structures.

Mann–Whitney U Statistical Test

The Mann–Whitney U Test is a non-parametric alternative to the independent sample t-test that is frequently used. It is a non-parametric test that compares the means of two samples taken from the same population and determines whether or not those sample means are equal to one another.

Table 2: represented in Chapter 4 shows the results from the questionnaire. These results are from a comparison between the answers in 2021 and 2022. As mentioned earlier in this chapters, the answers regarding functional ethical requirements improved statistically in in the second survey after the embedding of ethical concerns were taught in their respective modules. The inconsistent and inconclusive results shown for the non-functional ethical requirements suggests that a deeper statistical test in 'Mann–Whitney U' as mentioned in Chapter 3, should be utilised to make further inferences.

It is common practice to consider the Mann–Whitney U test to be the nonparametric counterpart of the student's t-Test for Independent Samples (MacFarland, 2016). The two tests (the nonparametric Mann–Whitney U test and the parametric Student's t-Test for Independent Samples) may have similar purposes in that they are both used to determine whether or not there are statistically significant differences between two groups. However, the Mann–Whitney U Test is a nonparametric test, whereas the student's t-Test is a parametric test. On the other hand, the Mann–Whitney U Test is used with nonparametric data (usually ordinal data), whilst the student's t-Test for independent samples is used with data that match the requirements associated with parametric distributions. Both of these tests are used

to compare two groups of data (typically interval data that approximate an acceptable level of normal distribution).

The Mann-Whitney U Test is applicable in a wide variety of situations, and it should be considered whenever ranked data are used in a survey. The table below shows the results of the Mann-Whitney U test. As discussed earlier in this chapter, the comparisons between survey results across the two surveys yielded incomplete information to hypothesise a difference between the two surveys.

3.4.6 P value

Given the existence of the null hypothesis (the two samples are similar), the p-value is the chance that the selected test statistic would be the same size or larger than what was observed from the data. In the context of this study, significance will be assigned to P values that are lower than 0.10 or less than 10%.

p-value<0.1⇒reject H_0 (Null hypothesis) ⇒accept H_a (Alternate Hypothesis)
p-value≥0.1 ⇒fail to reject H_0

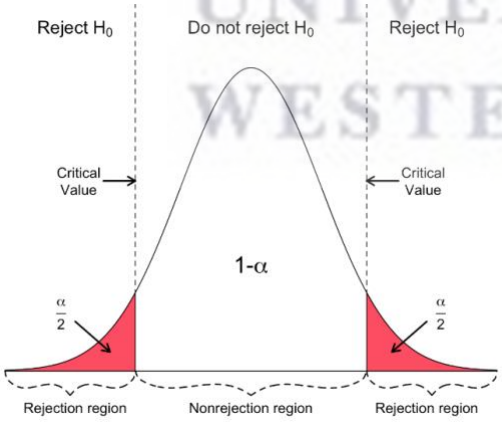


Figure 5 P-Value

As shown in the figure above, the p-value α is often higher than 0.10 in the majority of cases or (p(xZ) = 0.90).

This implies that there is a high possibility of making a type I mistake, or that one is unable to reject the null hypothesis. The greater the value of the p-value, the more it lends credence to the null hypotheses.

3.4.7 Effect size

The common language effect size is the probability that a random value from Group 1 is greater than the random value from Group 2. In addition to the P value effect size was used as an additional statistical parameter.

$$r = \frac{|z|}{\sqrt{n}}$$

Figure 6 Effect size formula

The Mann–Whitney effect size statistics describe the degree to which one group has data with higher ranks than the other group. These statistics are used in the Mann–Whitney test. They are connected to the likelihood that a value originating from one group will be higher than a value originating from the other group. They are not influenced by the size of the sample, in contrast to p-values. One of the most typical effect size statistics for the Mann–Whitney test is referred to as r. This statistic is calculated by dividing the absolute value of the test's z-value by the total number of observations.

The effect size can be anywhere between -1 and 1 using the intervals that are described further down.

1. Effect Size r less than 0.3 -> small effect
2. Effect Size r between 0.3 and 0.5 -> medium effect
3. Effect Size r greater than 0.5 -> large effect

The outcomes of the statistical tests will be discussed in chapter 4 of the thesis. This will be extended by a discussion on the findings, during which statistical indicators such as effect size and P value will be utilized as quantifiable parameters for the discussion.

CHAPTER 4: RESEARCH FINDINGS AND DISCUSSION

4

4.1 CHAPTER INTRODUCTION

The results of the pre- and post-intervention surveys are discussed in Chapter 4, which is followed by a comprehensive analysis of the survey results. The discernible outcomes for functional ethical considerations are clearly differentiated from the results for non-functional ethical considerations. This will form a basis of correct embedding of ethical considerations into functional (technical) and non-functional (non-technical) modules for graduate IS students. Following a more in-depth analysis of these results using a variety of statistical techniques comes a thorough discussion and analysis of survey results.

4.2 FUNCTIONAL AND NON-FUNCTIONAL ETHICAL CONSIDERATIONS

From prior work in this domain done by (Breytenbach, 2020) we categorise ethical considerations related to IS into functional and non-functional as follows for the purpose of this thesis:

A higher post-intervention percentage of correctly classified ethical considerations is interpreted as the intervention (embedding ethics into the IS curriculum) having had a positive effect – an accelerated learning of ethics effect - within the specific module that it was embedded into. If the percentage of correct classifications for a particular ethical consideration did not improve post-intervention, it is taken as an indication that the embedding of that ethical consideration into a specific module had no effect on the students' learning of ethics, and that more work – a different kind or a deeper embedding – would be required to achieve accelerated learning results.

Table 6 Functional and non-functional considerations

Functional		Non-functional	
1	Accountability	1	Democracy (of access, etc.)
2	Autonomy	2	Ecology
3	Bias / Discrimination	3	Fairness
4	Accuracy / Misinformation	4	Human dignity / Human displacement
5	Explainability	5	Inclusion (digital and social)
6	Transparency		
7	Privacy		
8	Responsibility / Responsible use		
9	Security and (technical) robustness		
10	Reliability		

The outcomes of the two surveys combined showed that non-functional needs such as democracy, ecology, and fairness produced mixed results overall. This indicates that there were no conclusive or deducible patterns of change in learner preferences with regard to democracy, fairness, human dignity, and inclusion as being ethical considerations relating to technology, organisation, or the environment. This further indicates that students, on average, indicate bias on a more general or superficial level, as their bias choices are dispersed.

This is significant because it means that there were no decisive patterns of change in learner preferences. While the attitudes of some learners increased, others' perspectives did not shift between the two

surveys. There was not, on average, a significant change in any particular ethical concern significant enough to infer that there was an overall shift across the cohort.

It is possible to draw the conclusion from this that non-functional ethical considerations call for a more specialised approach to learning and instruction in information systems. At the moment, these non-functional criteria are being included into pre-existing classes like Social Informatics (SI) and Digital Innovation (DI). Fairness yielded conflicting findings and was inconclusive across both surveys. By definition, machine learning software is always a form of statistical discrimination (Chakraborty, 2019). Discrimination becomes problematic when it provides systematic advantages to some privileged groups and systematic disadvantages to others. To comprehend when a system or algorithm is intrinsically unfair, it is necessary to have solid theoretical underpinnings for fairness and its application in artificial intelligence.

An elementary or fundamental inclusion of these concepts into already established modules had no noticeable effect on learning acceleration. This may suggest that students are unable to reason and think critically in areas such as ecology and inclusion if they lack a clear knowledge of the fundamentals and concepts involved in these fields. Consequently, students do not learn about these non-functional criteria until much later in their systems design careers. It also demonstrates that when creating systems that incorporate non-functional ethical considerations, students will base their ethical reasoning on experience and anecdotal situations rather than theoretical knowledge.

In a deeper reflection about ethical considerations such as inclusiveness, one way to describe diversity is by the variety of aspects that people are born with. This is one definition of 'perceived diversity' (Rodr´ıguez-Perez, 2021). However, little is known about the ways in which other types of perceived diversity, such

as the age, disability, race, and nationality of software developers, are related to software engineering and systems engineering. The study field that is concerned with perceived diversity in software engineering is one that has to be clarified. These nuances and clarifications can be done through an independent and more comprehensive postgraduate education on inclusion and diversity.

However, there is a lack of understanding regarding the ways in which other types of diversity, such as the age, disability, race, and nationality of software developers, are related to software engineering and systems engineering. One of the research areas that has to be elucidated is the one that is concerned with the appearance of diversity in software engineering. These nuances and clarifications can be accomplished through the pursuit of an independent and more in-depth postgraduate study on diversity and inclusion.

It is reasonable to deduce from this that a more specialised approach to learning and instruction in information systems is required because non-functional ethical considerations need to be considered in a comprehensive manner. This can be deduced from the fact that non-functional ethical considerations need to be considered. By applying the following line of reasoning, one can arrive at the following conclusion: These non-functional needs are already being included into training courses that have already been designed, such as Social Informatics (SI) and Digital Innovation, amongst others. As a consequence of this, one could argue for the inclusion of an independent module that first covers a more solid theoretical foundation to ethics in general, and then moves on to discuss ethics in IS. This foundation would be covered by a separate course of study that would act as a supplement to the functional ethical issues that are, on the whole, better understood.

Learners have a requirement to be given an introduction to ethical foundations and theories like Kant's deontology or utilitarianism, which are covered in chapters 1 and 2, respectively. In addition,

learners at the postgraduate level who have a baseline or theoretical framework to build on will be more equipped to appreciate and reason about non-functional ethical problems. This is because they will have a foundation to work from.

4.3 FUNCTIONAL SYSTEM REQUIREMENTS

Table 7 Post embedding results

	Input			Process			Output			Student classification prior to embedding	Student classification after embedding	Result
Functional System Requirements	**T**	**O**	**E**	**T**	**O**	**E**	**T**	**O**	**E**			
Accountability		X			X			X		T:19.4% O:25.8% E:54.8%	T:12.1% **O:51.5%** E:36.4%	**Improved**
Autonomy				X						T:51.6% O:29% E:19.4%	**T:63.6%** O:21.2% E:15.2%	**Improved**
Bias / Discrimination	X	X		X				X	X	T:25.8% O:35.5% E:38.7%	**T:36.4%** **O:39.4%** E:24.2%	**Improved**
Accuracy / Misinformation	X			X				X		**T:61.3%** O:25.8% E:12.9%	**T:60.6%** O:18.2% E:21.2%	**Consistent**
Explainability							X			T35.5: % O:41.9% E:22.6%	T:24.2% O:54.5% E:21.2%	**Decreased**
Transparency								X		T:38.7% O:32.3% E:29%	T:27.3% **O:57.6%** E:15.2%	**Improved**
Privacy	X							X		T:38.7% O:22.6% E:38.7%	T:27.3% O:21.2% E:51.5%	**Decreased**
Responsibility / Responsible use		X			X			X		T:16.1% **O:58.1%** E:25.8%	T:12.1% **O:57.6%** E:30.3%	**Consistent**
Security and (technical) robustness	X			X	X		X			T:90.3% O:6.5% E:3.2%	T:51.5% O:30.3% E:18.2%	**Improved**
Reliability				X						T:61.3% O:35.5% E:3.2%	T:45.5% O:39.4% E:15.2%	**Decreased**

Non-Functional Requirements	**T**	**O**	**E**	**T**	**O**	**E**	**T**	**O**	**E**			
Democracy (of Access, etc.)		X				X				T:6.5% O:19.4% E:74.2%	T:9.1% O:27.3% E:63.6%	**Mixed**
Ecology				X						T:3.2% O:6.5% E:90.3%	**T:27.3%** O:21.2% E:51.5%	**Improved**
Fairness	X							X	X	T:16.1% O:41.9% E:41.9%	T:12.1% O:36.4% E:51.5%	**Mixed**
Human dignity / human displacement						X				T:3.2% O:48.4% E:48.4%	T:24.2% O:30.3% E:45.5%	**Mixed**
Inclusion (Digital and Social)	X	X	X			X				T:12.9% O:41.9% E:45.2%	T:36.4% O:36.4% E:27.3%	**Mixed**

In general, when compared to the students in the first cohort, those in the second cohort after intervention demonstrated a superior comprehension of ethics as they relate to the functioning of the system. As can be seen in Table 7 provided earlier, students who had participated in the second, post-embedding cohort demonstrated a marked improvement in their capacity to correctly describe and categorise accountability, autonomy, bias, transparency, and security.

4.3.1 Accountability

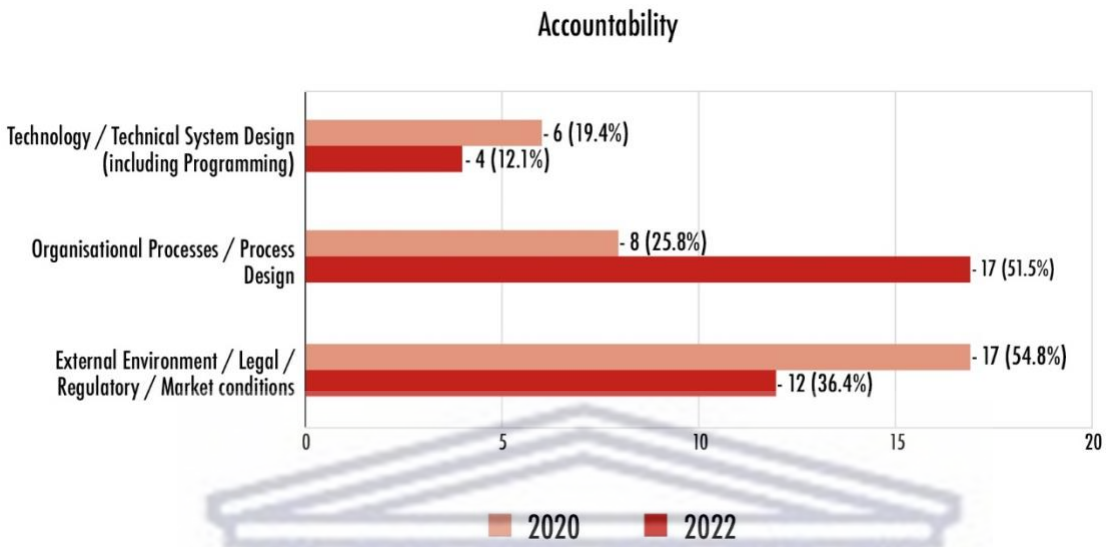


Figure 7 Accountability

In the second survey, students' preference switched to an organisational concern from 25%to 51%, with the environmental concern declining from 54.8 to 36.4%. Initially, more than half of the student population classified accountability as an environmental concern, with over 54% in the first survey. This demonstrates the shift that has occurred in the students' overall perceptions in the post-embedded cohort on the classification of accountability.

4.3.2 Autonomy

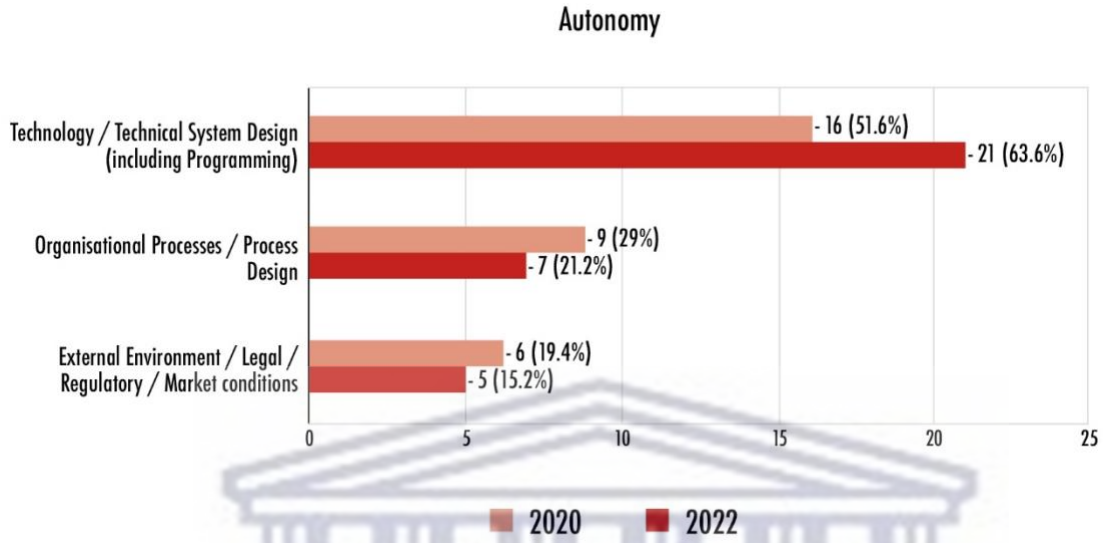


Figure 8 Autonomy

Both surveys found that autonomy had comparable outcomes, with students leaning more toward autonomy as a technology and design instrument from 51.6% in survey 1 to 63.6% in survey 2. Autonomy was not included in either of the polls. The majority of students, comprising 42.4% of the sample, likewise classified autonomy as a process task category. Students from both cohorts showed a consistent level of understanding of accuracy and responsibility, two topics that were already covered in the curriculum prior to the ethics-embedding process.

There was a decrease in students' ability to correctly describe and classify explainability, privacy, and reliability according to IS dimensions. This was a concerning result, because special effort had gone into embedding privacy and reliability into the curriculum. Upon further investigation, the authors found that the learning content for these ethical concerns was not using consistent definitions and examples throughout, with privacy being described as a legal environmental issue in some examples. Inconsistency in definitions and

terminology may have caused the decrease in students' understanding of these topics.

4.3.3 Bias

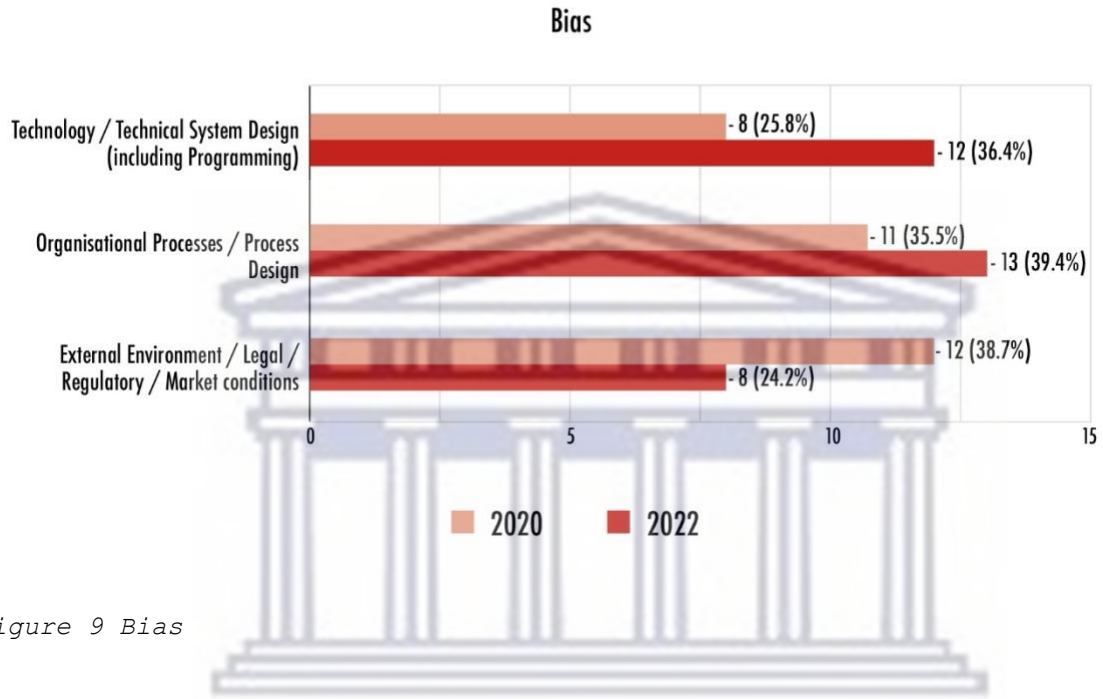


Figure 9 Bias

The weight given to the bias ethical principle of external environment went from being between 38% and 24% to a substantially lower percentage. In the second survey, students were asked to choose one ethical value, and the one that received the overwhelming majority of responses was technology. This demonstrates that more than 10% of the student body underwent a change in their viewpoints as a result of being exposed to new information. The influence of organisations on the ethical principle of bias within their organisations showed a little increase between the two studies, going from 36-39%.

The majority of learners, who accounted for 51%, believe that bias is an issue with the input, whilst a sizeable proportion of learners, who accounted for 33.3%, believe that it is an issue with the process.

4.3.4 Transparency

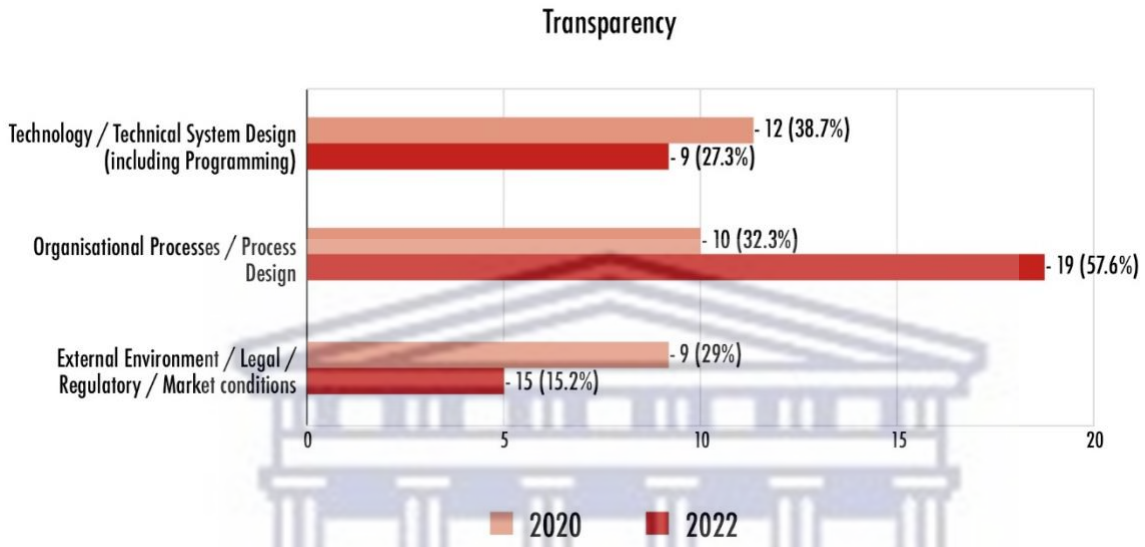


Figure 10 Transparency

When asked to rate how familiar they were with transparency as an ethical value, the learners' approaches underwent a dramatic transformation. The vast majority of students claimed that they have developed a more favourable opinion of the use of transparency as a strategy for lessening the influence of the black box effect. This is reflected in a rise of 1% across the two surveys.

There was also a major shift in the degree of transparency as an organisational process. Across all of the surveys, the percentage of respondents who valued it increased from 32% to 57%. This suggests, on the whole, that a significant proportion of students modified their concept of transparency as an ethical value that has a profound relationship with the structure of the organisation.

Furthermore, the vast majority of students have modified their opinions, shifting from believing that technology is substantially less relevant to transparency as an ethical value (down from 38% to 27%), and from believing that the external environment is also less related to transparency (down from 29% to 15%).
The transition from a technology and the external environment to an improved sense of transparency as being better associated with the organisation when regarded as an ethical standard helps explain the major change that was witnessed and can provide an explanation for why it occurred. This shows an overall increase in fundamental knowledge across the cohort and shows what significant difference can be made with initial embedded knowledge of transparency.

4.3.5 Security

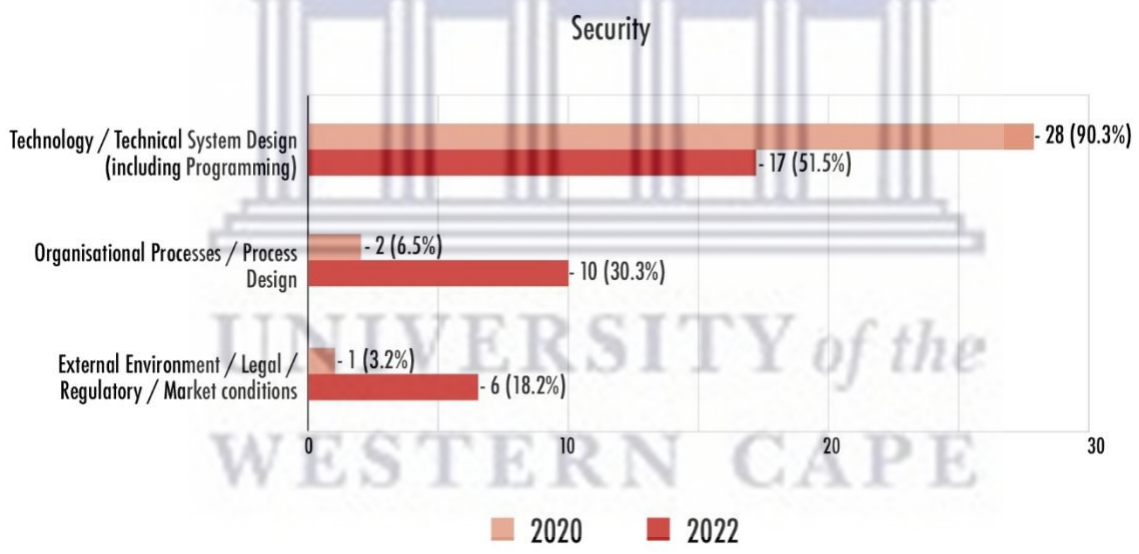


Figure 11 Security

One of the most important developments that took place between the two surveys was in respondents' attitudes about security as an ethical issue.

At the beginning, more than ninety percent of the students thought that security was essentially a technological concern. Just 6% of students considered security to be an organisational process and only 3% considered it to be an environmental process.

However, in the second survey students' attitudes on security as an ethical standard moved substantially. In the first survey, 90.3% of students identified security as a technological concern; however, in the second survey, that number dropped by 40%. The percentage of students who saw security as an environmental process rose from 3% to 18%, while the percentage of students who related security to an organisational issue increased from 6% to 30%.

These striking statistical shifts between the two surveys indicate a significant shift in viewpoint on the part of the vast majority of students with regard to the ethical significance of security concerns.

This demonstrates, once again, that non-functional ethical considerations are more difficult to teach to postgraduate students than functional ethical ones. As was discussed earlier in this chapter, the results of the two surveys regarding the non-functional ethical issues such as democracy, fairness and ecology were inconsistent and did not provide clear inferences or changes.

4.3.6 Explainability

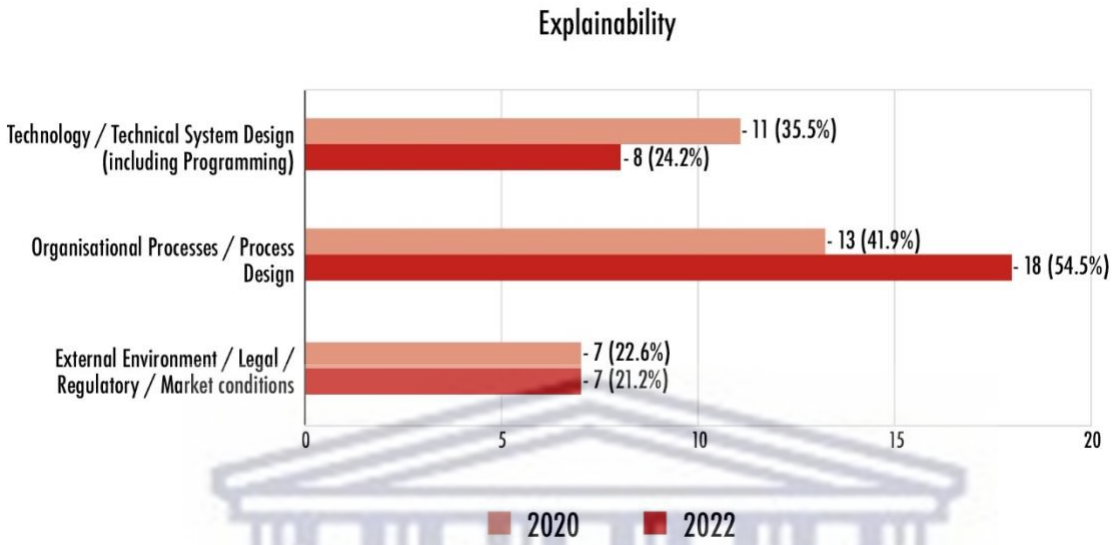


Figure 12 Explainability

Learners modified their perceptions on explainability as a technical system, which resulted in a reduction from 35.5% to 24.2% of their total decisions across all of the surveys. More importantly, they increased their leaning toward explainability as more of an organisational function by an identical increment of 13%, which demonstrates a change in the perspectives held by the majority of students.

This change occurred after the majority of students were exposed to new information and potentially confusing definitions. The respondents' perceptions of the external environment did not shift significantly between the two surveys, moving from 22% to 21% of total respondents. Explainability is still primarily perceived as an output computer function, with the majority of students picking output (66.7%). This perception persists because explainability is a relatively new computer function.

It's probable that there is a misleading definition of artificial intelligence (AI) or extended artificial intelligence (XAI) as explainability is to fault for these contradictory and equivocal findings. Explainability, also known as 'interpretability', is a relatively new idea that refers to the concept that a machine learning model and its output can be explained in a way that 'makes sense' to a human being at an acceptable level. This is a relatively new concept. Explainability refers to the idea that a machine learning model and its output can be explained. Another synonym for explainability is 'interpretability', and both of these names can be used interchangeably. There are certain use cases, such as employing AI to assist in the decision-making process for a loan, that have the potential to present a reasonable tool for the provision of financial services, provided that they are adequately checked for bias. Among these use cases is the utilisation of artificial intelligence (AI). However, the organisation that provides financial services might demand that the algorithm be auditable and explicable in order for it to be able to pass any regulatory inspections or testing and for it to

be able to keep control over the decision support agent. This would serve both of these purposes.

4.3.7 Privacy

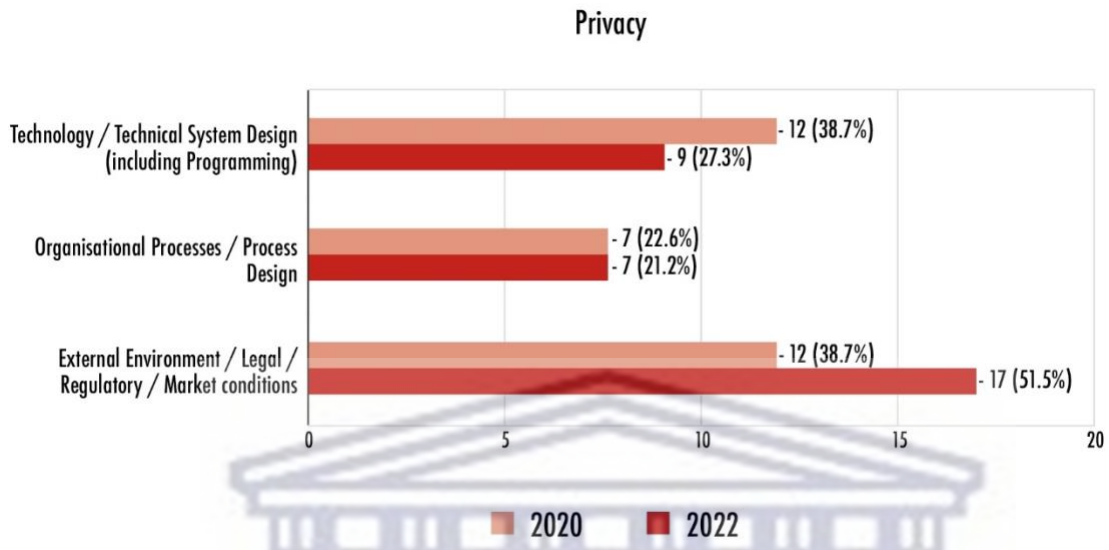


Figure 13 Privacy

The students' general comprehension reduced when it came to classifying privacy as a component of ethical consideration. Learners' focus has shifted from protecting their privacy as a result of technological developments to protecting the environment. This fact is demonstrated by the drop in concern about privacy as a result of technological developments from 38% to 27%.

The processing function is the most prevalent understanding that students have on the connection between computers and privacy (42%), followed by the output function (36%).

Students also underwent a significant paradigm shift regarding their views on privacy, as was the case with transparency. Almost all of the students improved significantly. Learners have shifted their focus from technological to environmental privacy, as evidenced by a decline from 38% to 27% in the first survey and an increase to 51% in the

second. The most common association between computers and privacy is processing (42%), followed by output (36%).

4.3.8 Reliability

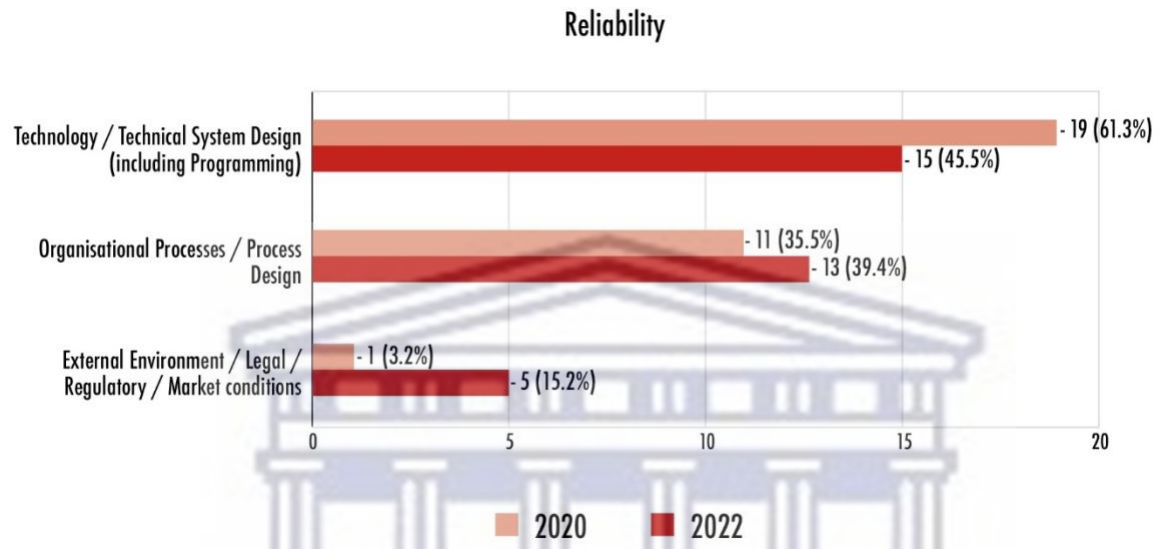


Figure 14 Reliability

Reliability decreased with a 15% drop in technology accounting for a 3% increase in organisational process and a 12% increase in reliability as an external environmental factor. This may infer that reliability is not consistently understood across the cohort of learners.

According to IS dimensions, students' ability to appropriately describe and categorise explainability, privacy, and reliability decreased. This was a troubling result, as privacy and reliability had been integrated into the curriculum with great effort. The authors discovered upon additional analysis that the learning content for these ethical problems did not use consistent definitions and examples throughout, with privacy being portrayed as a legal environmental issue in some instances. It is possible that inconsistent definitions

and terminology contributed to the decline in students' comprehension of these issues.

4.4 STATISTICAL ANALYSIS OF FINDINGS

Table 8 summarises the results of the Mann-Whitney U tests. The Mann-Whitney U test was introduced extensively in Chapter 3 with all statistical indicators such as P value and effect size.
These tests were done as a comparison between the survey results from 2020 to 2022 (with the embedded knowledge included). Careful attention was given to the P value and effect size as indicators of change and differences across the two samples.

Table 8 Mann-Whitney results

	Survey Question	P value	Effect size
1	ACCOUNTABILITY: Do you agree with the following statement: it is important to evaluate the impact of incorrect predictions of an AI system during the design of the AI system?	0.6974	0.049
2	Have you ever encountered ACCOUNTABILITY as a learning topic / area of study in your undergraduate or graduate studies?	0.03615	0.26
3	AUTONOMY: Do you agree with the following statement: individuals should be made aware of when they are impacted by the output/decision of an AI system, and be given the opportunity to decide on an alternative (autonomous) action for themselves?	0.5411	0.077
4	BIAS and DISCRIMINATION: Do you agree with the following statement: the data used as input into AI systems (for training, testing, validation) should be considered for all biases known within the system's context?	0.07462	0.22
5	ACCURACY: Do you agree with the following statement: ACCURATE (correct) input data, computations, and output data (and interpretations) increase the potential positive impact of an AI	0.2922	0.13

	system, and decrease the potential negative impact of an AI system?		
6	EXPLAINABILITY: Do you agree with the following statement: the process followed by an AI system to get to a specific answer, as well as the actual answer, should be EXPLAINABLE?	0.631	0.06
7	TRANSPARENCY: Do you agree with the following statement: AI systems should be developed in such a way that the inner workings of the system is as transparent as possible (minimising the "black box" effect - not being able to explain decisions made by algorithms)?	0.6789	0.052
8	PRIVACY: Do you agree with the following statement: AI systems should be designed to handle data privately [consent, sharing, legal frameworks of context taken into consideration, etc.]?	0.1358	0.19
9	RESPONSIBILITY / RESPONSIBLE USE: Do you agree with the following statement: AI systems should be designed with the obligation and duties related to the AI system's functioning and decisions being on humans - direct human/organisational responsibility?	0.06914	0.23
10	SECURITY: Do you agree with the following statement: AI systems should be designed / developed to be secure - to allow only authorised access, store data securely, and process data securely?	0.9387	0.0096
11	RELIABILITY can be described as the probability that a product, system, or service will perform its intended function adequately for a specified period of time. Rate your personal level of knowledge and understanding of system reliability:	0.3177	0.13
12	DEMOCRACY: Do you agree with the following statement: AI systems should be developed in such a way as to benefit (help / add value / empower) human individuals /as highest priority, before considering corporate or governmental benefit?	0.755	0.039

13	ECOLOGICAL (or environmental) ethics is the study of what humans, individually and corporately, ought to value, ought to be, and ought to do in relationships with all other beings and elements in the biosphere.	0.1274	0.19
14	FAIRNESS: Do you agree with the following statement: AI systems should make decisions based on appropriate criteria and certified standards established from research?	0.3623	0.11

4.4.1 Mann–Whitney U discussion

On average, as shown in the table above, a randomly selected population value of Group 1 is the same as the randomly picked population value of Group 2. In other words, the disparity between the randomly picked values of Group 1 and Group 2 populations is insufficient to be considered statistically significant. A statistically significant difference between cohorts 1 and 2 for most of the questions was challenging to find, and this may be due to the small sample size.

4.4.2 Conclusive results on bias and responsibility as functional ethical considerations

As was mentioned earlier in this chapter, with regard to non-functional ethical considerations, the 'functional ethical consideration' question on 'bias and discrimination' yielded a strong difference in opinion for the majority of students between the two surveys.

The question asked, "Do you agree with the following statement: the data used as input into AI systems (for training, testing, validation) should be considered for all biases known within the system's context?"

Because the p-value is lower than the critical value, the Null hypothesis H0 could be rejected. It has been determined that the value that was randomly selected from Group 1's population does not equal the value that was randomly selected from Group 2's population. Furthermore, the disparity in the values that were arbitrarily chosen from the populations of Group 1 and Group 2 is large enough to be considered statistically significant. As seen from the snapshot overview discussed earlier comparing the graphs on all functional and non-functional ethical considerations, they concur with the secondary more detailed Mann Whitney results.

The p-value equals 0.07462, ($p(x \leq Z) = 0.9253$). It implies that there is a minor chance of making a type I error, which is defined as "rejecting a Null H0" and that is a probability of 0.07462 (7.46%). The lower the p-value, the stronger the case may be made for H1 (Alternative hypothesis).

The standardized effect size that was observed, Z/(n1+n2), is considered to be on the low end (0.22). This suggests that the degree to which the value from Group 1 and the value from Group 2 diverge is not as significant as one may at first assume.

Following the 'embedding' of essential ethical information into the curriculum, the vast majority of students exhibited a heightened awareness of bias and responsibility. Additionally, the majority of students' perspectives shifted as a direct result of a significant shift in their understanding of bias as an external environmental factor, leading to an increase in the students' understanding of bias as primarily a technological component. This shift in understanding was the cause of the majority of the shifts in students' perspectives. This demonstrates that more than ten% of the student body underwent a shift in their perspectives as a result of being exposed to new information, which ultimately resulted in the 'embedding of bias' into their already established IS curriculum.

In addition, a second functional ethical consideration, which was called ‘responsibility’, provided results that were equivalent to one another and had a P value that was statistically significant at 0.0691. According to these findings, questions pertaining to responsibility revealed a significant change in the students’ answers.

The overall findings of the survey reveal that students in both groups had an increased level of comprehension about the ideas of accountability and bias. The first comparison, which was based on the survey data and made use of graphs, demonstrated that the respondents' attitudes on Responsibility had not changed considerably during the course of the study. The more in-depth statistical analysis that was conducted by a Mann-Whitney test showed that there was a change in responsibility that was statistically significant with a P-value of 0.069.

The fact that the Mann-Whitney U test is more stringent in certain circumstances, such as those in which the raw averages and visualisations are unable to reveal any noticeable outcomes, serves as a driver for this test.

In general, when looking at the results across all of the survey questions, the Mann-Whitney U test reaffirms the inconclusive statistical results for most non-functional ethical issues, indicating the requirement for a more specialised approach to learning and guidance.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5

5.1 INTRODUCTION

Following the presentation of a synopsis of the most important findings from Chapter 4, Chapter 5 will conclude with a recommendation based on the findings of the survey. Following this, a pedagogical comparison will be made for an existing local and international curriculum of incorporating ethics into graduate IS curricula. In order to demonstrate how a methodical strategy to incorporating Ethics into the IS curriculum can be implemented, a prospectively designed implementation diagram will be presented.

5.2 FINDINGS OF THE STUDY

According to the findings as a whole, students do not have a firm grasp of the essential ethical considerations required to build and develop ethical systems in the field of IS. These conclusive misunderstandings are evident in the inconsistent and contradicting outcomes of both surveys.

More importantly, it was also discovered that once basic definitions were given to each student, which was the basis of the second survey (post-intervention), students answered the functional (technical) questions more accurately and yielded, on average, better results in the second survey.

This was the finding that formed the basis of the second survey. The second survey with the post-embedding ethical definitions demonstrated a marked improvement in their capacity to correctly describe and classify functional concepts such as accountability, autonomy, bias, transparency, and security.

This improvement can be seen in the graphs and results that were provided in Chapter 4. Functional ethical considerations are better associated with the T in the TOE framework discussed in Chapter 1. These are ethical considerations applied to technical development and technology.

The functional (technical) ethical considerations are:

1. Accountability
2. Autonomy
3. Bias / Discrimination
4. Accuracy / Misinformation
5. Explainability
6. Transparency
7. Privacy
8. Responsibility / Responsible use
9. Security and (technical) robustness
10. Reliability

Non-functional ethical requirements are better associated with the 'OE', from the TOE framework. This is the organisational and environmental application of ethics to Information Systems design as mentioned in Chapter 1.

The post-embedding survey found that responses to non-functional ethical requirements, such as democracy, ecological sustainability, and social justice, varied significantly between the pre- and post-survey (after intervention). For the majority of students, these inconsistent outcomes for non-functional ethical standards do not reflect learning or sufficient comprehension. In addition, the quantitative statistical Mann U Whitney tests suggest that there were no conclusive or deducible patterns of change in learner preferences for democracy, justice, human dignity, and inclusion, as opposed to functional ethical considerations associated with technical IS or technology.

In light of the contradictions that can be found across the surveys and that cannot be refuted, there is a requirement for a course that

is more in-depth and all-encompassing and that teaches the core skills that are necessary to categorise ethical considerations into the TOE framework and have a better overall knowledge of non-functional ethical considerations.

5.3 DISCUSSION OF CURRENT CONTENT DISCUSSION IN IS ETHICS

It should come as no surprise that the field of data science and information systems cannot be meaningfully separated from ethical considerations, as it is already abundantly clear that this is not even remotely practicable. The goal of this accelerated course was to introduce students to some of the ethical issues that arise naturally in the context of information technology. Students will initially need an introduction to fundamental ethical theory, which will later be applied to real-world ethical challenges that arise in the context of data science through the exploitation of contemporary case studies. While we are having this discussion, we will be paying special attention to the South African and African contexts.

5.4 EMBEDDING ETHICS INTO INFORMATION SYSTEMS CURRICULUM LOOKING AT EXISTING LOCAL UNIVERSITY CURRICULA

5.4.1 Current IS ethics courses in South African universities

A particular emphasis will be placed on the South African and African contexts throughout this discussion. Systems ethics relevant to IS are more prominently added as ad-hoc complementary courses or short-courses rather than being a component of an honours or postgraduate systems ethics course, as seen from existing institutes, neither at the University of Stellenbosch nor the University of Cape Town, in that order. It is now abundantly evident that the practice of IS is not studied with effective ethical considerations in any meaningful way. Most universities do not equip students with an overview of core ethical theory, which will then be applied to practical ethical dilemmas that occur in the context of data science, with the assistance of topical case studies.

5.4.2 University in Cape Town

UCT Information Systems has only an elective course module PHI2037F: APPLIED ETHICS which is generalised across various applications and not specific to IS. The course requires students to apply philosophical thinking to problems that arise in everyday life, both practically and morally. Concerns regarding health care, commerce, the professions, the natural world, or even just day-to-day existence could fall under this category. This course is an elective module and not applicable to all IS students.

5.4.3 University of Witwatersrand

Wits similarly does not have an ethics course within the Honours in IS. Similar to UCT, there is an elective ethics module, Ethics - PHIL3002A. This module introduces ethical foundational theory, as mentioned in Chapter 2.

It includes but is not limited to:

I. Kantian ethics
II. Utilitarianism
III. Natural rights
IV. Consequentialism and non-consequentialism
V. Morality and rationality

5.4.4 University of Stellenbosch

Stellenbosch university Postgraduate Department presented a four-day data ethics programme simplified and generalised by the Philosophy Department. There is no undergraduate level course on system/data ethics. This short course presents ethical and philosophical questions teaching critical thinking to data/systems problems. These include privacy, consent and identity.

An introductory course in applied ethics is not sufficient to enable prospective IS graduate students to design in an ethical manner, as demonstrated by the results and conclusions presented in Chapter 4 and

Chapter 5, respectively. There must be stand-alone modules that provide postgraduate students with an introduction to ethics and the systems in which it is applied in sufficient depth and with sufficient examples to equip the students with the fundamental skills necessary.

5.5 EXISTING PEDAGOGIES OF EMBEDDING ETHICS INTO SYSTEMS/DATA COURSES: INTERNATIONAL CONTEXT

5.5.1 Re-Shape case study

This section discusses and evaluates a method known as "Re-Shape", which is designed to educate students on the ethical repercussions that can result from the collection and utilisation of data. (Shapiro, 2020). Students are able to collect, process, and visualise data about their physical movement in a way that supports critical reflection and coordinated classroom activities about data, data privacy, and human-centred systems for data science through the use of Re-Shape, which is a component of an educational environment that is based on the concept of cultivating care. Students are able to do this in a way that supports critical reflection and coordinated classroom activities about data, data privacy, and human-centred systems for data science. Students were able to use their own geographical data to track their current whereabouts and mobility thanks to this applied project, which also gave them the power to do so on their own.

5.5.2 Teaching data ethics in Honolulu University USA

This one-of-a-kind case study was conducted as part of an undergraduate computer science course to investigate the potential and existing constraints of instructional design and technological advancements in education.

According to a paper presented in Honolulu on Teaching Data Ethics, academics and instructors who are working on establishing innovative and effective methods for incorporating ethics into computer science courses are doing so in three separate ways at the moment.

1: The development and application of (a) case studies or modules tailored to certain computer science curriculum areas is often the primary emphasis of these techniques (e.g., computer vision, machine learning);
2: innovative methods for instructing students on proper computer ethics, such as doing so through the use of science fiction, autobiographies, embodied activities, or techniques based on project-based learning;
3: activities based on games, such as role-playing games built specifically for large computer science classes.

Skirpan et al. (2018) provides a synopsis of a topic that is vital to the incorporation of ethics into any computer-science related course. "One of the most important challenges facing the design of computer science curricula will continue to be identifying unique and compelling approaches to teaching responsible engineers in a way that does not compromise the acquisition of technical abilities" (Skirpan M, 2018).

5.6 EMBEDDING ETHICS FLOW DIAGRAM

We propose a dual parallel approach in which we begin incorporating functional systems design elements into already existing curricula. This is due to the statistical improvement from the surveys for questions on technical (functional) ethical considerations.

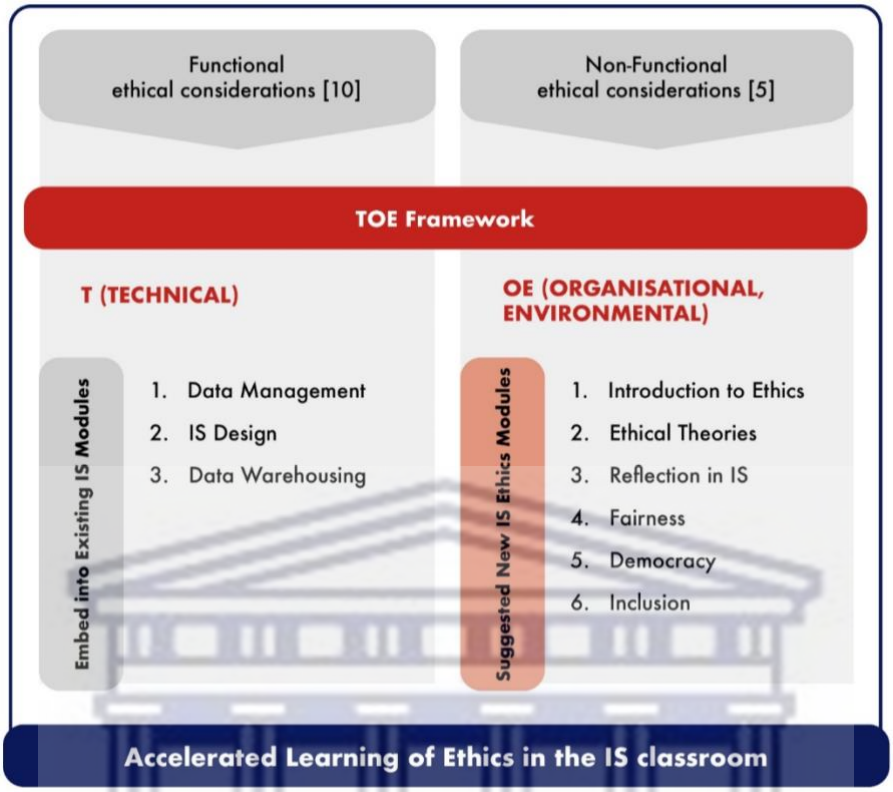


Figure 15 Embedding ethics into the IS curriculum

These ethical considerations would be incorporated into the pre-existing modules for:

I. Data management
II. Information Systems design
III. Data Warehousing

The non-functional ethical factors would be included in the section of the TOE framework known as OE, which stands for organisational and environmental.

For organisational-environmental ethics, in both the surveys taken before and after the intervention respondents showed a lack of understanding regarding them. Even after definitions were explained to the students, their test scores did not show a statistically significant change. As a result, we propose the utilisation of independent foundational ethical modules. These include and are not limited to:

I. Ethical Theories
II. Reflection in Information Systems
III. Democracy, Fairness and Inclusion

CHAPTER 6: A GRADUATE LEVEL ETHICS FRAMEWORK FOR THE HIGHER EDUCATION INFORMATION SYSTEMS CURRICULUM IN SOUTH AFRICA

6

6.1 INTRODUCTION

In order to demonstrate consistency and validity, the title of Chapter 6 is identical to the title of the thesis. This was done intentionally. Following that comes a succinct overview of each of the chapters that came before this one. After that, the answers to the research questions are presented. Along with presenting the limitations of the research, this section also discusses prospective future research topics that might supplement the overall argument of the thesis. This chapter and the thesis come to a close with the general conclusion, in which the beneficial effects of incorporating ethics into the IS curriculum are explained.

6.2 SUMMARY OF CHAPTERS

Chapter 1 Summary

Within the context of the Information Systems (IS) curriculum, the first chapter introduced the ideas of:

(i) General ethics,
(ii) Computer ethics
(iii) Ethics of Information Systems.

In this section, fundamental concepts have been defined, along with an explanation of how ethics, computer ethics, and ethics in the curriculum for information systems differ from one another and should not be generalised.

Moore (1985) and Bynam's (1996) historical narrative, accompanied by key definitions, explains how the area of computer ethics became essential. These definitions explain why it is necessary that computer ethics is taught as an autonomous area of ethics, as opposed to an applied science to general ethics.

The classification of ethical considerations into the 15 categories of an IS framework and Ethics-by-Design (EbD), which means ethics-driven design, concludes the first chapter, and there is a presentation of a statement of the research problem, a discussion of the research questions and objectives, and an illustrated overview of the research methodology.

Chapter 2 Summary

In Chapter 2, we conducted a comprehensive literature review on general ethics, as well as built upon the previous discussions of ethics in the context of the IS curriculum. Fifteen ethical principles were introduced and discussed as a foundation to answering ethical conundrums that present themselves in all stages of an Information Systems design. These theories include and are not limited to:

1. Introduction to ethical principles
2. Implicit morality
3. Explicit morality
4. Kantian deontology
5. Utilitarianism

There was a discussion of anecdotal ethical dilemmas, and the appropriate literature and research papers reviewed for their contribution. In response to these dilemmas, there has been an increasing demand for postgraduate-level ethical foundational studies. These studies are required because they will provide prospective students of IS with a comprehensive foundation in the application of ethical concepts, enabling them to think and design ethically.

The fundamental theories, including utilitarianism, Kant's deontology, implicit and explicit morality, and their interrelationships, were examined. After being discussed and taught in depth, the fundamental theories were analysed through distinct case studies. Consequently, they were applied to a range of IS design problems that each prospective student may confront in their unique working situations.

Chapter 3 Summary

Chapter 3 includes a research methodology which explains the research philosophy as well as the motivation for a positivist research methodology used in this study. The methodologies explained were:

1. Positivism
2. Realism
3. Interpretivism

To demonstrate positivism, causal inferences from experimental survey designs were introduced. Deductive as well as Inductive reasoning were introduced and differentiated. Survey experimentation methods were explained as facilitating changes between the pre and post surveys (This is also referred to as intervention embedding of ethics principles).

Across both of the longitudinal surveys, there is a comprehensive questionnaire on IS ethics as well as a collection of students' perceived ideas that are used as data. The data and thoughts were quantified using Likert Scales from 1-10. Graphs, hypothesis tests, and a stringent Mann-U-Whitney test are examples of empirical statistical approaches. These statistical tools, in turn, strengthen a positive research methodology.

Chapter 4 Summary of research findings

The integration of ethical considerations at a fundamental or elementary level in existing modules did not have a noticeable influence on the acceleration of the learning process.

The vast majority of students displayed a heightened knowledge of the technical ethical considerations that should be considered. These considerations include bias and responsibility. This was because results post-embedding improved substantially for bias and responsibility. In contrast, the responses to the non-functional ethical questions on their post-embedding survey were significantly worse. If students do not have a solid understanding of the fundamentals and concepts that are involved in fundamental ethical philosophy, then it is reasonable to draw the conclusion that they are unable to reason and think critically in ethical subject areas such as ecology and inclusion. This leads one to the conclusion that pupils are unable to reason and think critically in non-functional ethical subject areas. Because of this, students do not become acquainted with these non-functional criteria until a relatively late point in their careers as system designers.

When it comes to the design of systems, this demonstrates that students are more likely to base their ethical reasoning on personal experience and anecdotal evidence than on academic understanding. Therefore, prospective students should be equipped with enough abilities to execute ethics by design if there was a proper educational foundation to ethics in IS.

Chapter 5 Summary

The results of a comparison of the two surveys were presented in Chapter 5 along with statistical inferences that may be drawn from the data. Existing ethics courses in South Africa were introduced followed by a potential curriculum that considers all of the necessary ethical theories and applications. Given the IS postgraduate climate that is specific to South Africa, a prospective graduate course was suggested. This course would cover all of the essential skills required to design ethically, and it would do so through in-depth discussions and research as described in Chapter 2.

6.3 ANSWERING THE RESEARCH QUESTION

6.3.1 Primary research question

How can ethical principles that relate to IS be presented within a common IS framework of input, process, output, and technical/non-technical to foster a deeper knowledge of computer ethics among students studying IS?

According to what was discovered throughout the course of the literature study, there is a demand for universities that teach IS to include an ethics course as part of their curriculum. As was discussed in Chapter 5, the curriculum needs to provide the students with the confidence they need to think ethically about the design principles they use, in the process of gaining an understanding of the 15 ethical concerns and how they align to input, process, and output, as well as how they further align to technical and non-technical systems.

As a consequence of this, they will have a deeper grasp of ethics, as demonstrated by the findings of the second survey in Chapter 4, and they will be able to use this deeper understanding to enable potential students to develop ethical systems.

6.4 LIMITATIONS

The two-part survey that was carried out longitudinally was carried out at a single South African university with the same group of students throughout, and the sample size used to compare the pre and post intervention surveys was relatively small. After conducting an investigation on a global scale, it was discovered that people with postgraduate degrees do not have an adequate understanding of ethics in general. According to the findings of the longitudinal survey, the learners' responses to the two separate surveys were inconsistent with one another. Furthermore, some assumptions are specific to the South African environment. It is possible that the definitive findings are

not as generalisable as they could be because all of the students in the sample came from the same school.

6.5 FUTURE RESEARCH

As was covered in depth via the literature review in Chapter 2, IS ethics has become a phenomenon that is taking place on a worldwide scale, including in Africa, Europe, Asia, and the Middle East. Because of the singular nature of the situation in South Africa, one will need to design a course that is both more specialised and more applicable in order to adequately address the local circumstances. As was just indicated, certain non-democratic administrations have found success in garnering some trust through data transparency through utilising data transparency. This backdrop should demonstrate South Africa's uniqueness in terms of demography, disparities and its uniqueness as a democracy. The social, economic, and institutional efficiency that South Africa possesses will have to be applied into classroom discussions and prospective graduate modules. Therefore, students can design or act in the systems of the economy to improve their functioning if they have a solid understanding of the economic situation.

A unique contextual system design results in less time and energy being spent, as well as an improved alignment between the policies and processes of a social system or organisation and our overall objectives. Using big data, for instance, can help in the construction of better models of processes such as regional traffic patterns in South Africa. One will be able to determine with greater ease, with the assistance of such models, the specific alterations that are most likely to alleviate traffic congestion, as well as cut pollution and reduce the amount of petrol that is consumed. These are important ethical benefits that have the potential to improve not just our enjoyment but also the condition of the local environment.

Furthermore, future potential research to questions such as who owns the data, how we value privacy, how we gain informed permission, and what does it mean to be fair will be fundamental in building ethicising systems through the allocation of responsibility. Classroom discussions of these applications included the use of case studies that reflected on the plethora of different applications that exist within IS where ethical ideas are implemented. When discussing the political side of ethics, one may bring up problems of power, fairness, and accountability. This was made abundantly clear by the manner in which non-democratic nations employ the moral precept of 'transparency' to win over the support of the general populace by making the election statistics accessible to the general public. Therefore, the ethical issue of transparency is utilised by a government in order to 'democratise' themselves. There is therefore a need to include classroom discussions, debates and reflections in prospective non-functional ethical modules. This will in turn promote critical thinking.

6.6 BENEFITS OF REFLECTION IN INFORMATION SYSTEMS

Journaling is commonly recognised and utilised in a variety of humanities-based fields. This is especially true in the case of careers that need some form of on-the-job training, such as teaching, nursing, social work, and pastoral care in religious ministry (George, n.d.).

The simple process of reflecting on our past experiences enables us to draw new insights from those experiences and to make the most of the opportunities and benefits that come with having more experience. The practice of journaling is not nearly as widespread as it ought to be in the scientific disciplines.

On a more individual level, ethics can be found in a person's moral reflection and ongoing efforts to become a better person. This is the personal level of ethics. When applied to the world of work, ethics

most commonly takes the form of official norms or standards that all members of a profession are expected to adhere to, such as those governing medical or legal ethics. In addition, courses specifically devoted to the topic, such as business ethics, often cover professional ethics.

6.7 CONCLUSION

The conceptualisation of information systems has a sizeable bearing on the societies that they influence. Even though widespread usage of information systems can almost certainly result in monetary gains, governments and academia are eager to point out the ethical challenges that are created by information systems (IS). In order to produce IS that serve the common good or can be equated to utilitarianism, the vast majority of academics, legislators, and software engineers are of the opinion that IS and AI should be created in a manner that is more humanist, anthropocentric, and trustworthy (Berendt, 2019).

The overwhelming question of what exactly is meant by the term 'common good' can be most effectively answered by defining it in terms of ethical principles. As a discipline of inquiry, ethics encompasses a vast body of knowledge that may be applied to a variety of contexts and is divided into a wide variety of sub disciplines. It is most commonly associated with the academic subject of philosophy, under which it can be explored either on a theoretical or an applied level as an area of study. In Chapter 2, ethics attempted to answer the question "What is the best theory of the good life?" by delving into the theoretical purist interpretations of ethics. These interpretations were covered in great detail. Furthermore, the interpretations were modelled by Emanuel Kant's deontology against a utilitarianism's philosophical systems.

Application of the learned ethical foundations involved investigating ethics on a level that was more applicable and practical. The

application required students with the tools necessary to provide a more informed response to the question, "How should we act in this or that situation, based upon our best theories of ethics?" (Vallor, 2018). This demand for an ethics expertise as a prerequisite for application was a major motivator that led to the establishment of a more rigorous ethical foundation course as a mandatory requirement for all postgraduate IS students, a course wherein accelerated learning is attained through embedding ethical considerations into existing modules as well as independent core modules.

As was mentioned earlier in Chapter 5, IS ethics, or ethics that are pertinent to IS, are more prominently added as *ad hoc* complementary courses or programmes rather than being a stand-alone component of an honours or postgraduate systems ethics course. This is because IS ethics tends to be more interdisciplinary in nature. More importantly, it is possible to take an elective course in applied ethics while studying for one's undergraduate/postgraduate IS degree; nevertheless, such a course may be too broad and basic to adequately prepare a potential systems designer for the task of efficiently developing an ethical system.

6.8 POSITIVE IMPACT – EMBEDDING ETHICS INTO THE IS CURRICULUM

What kinds of moral questions arise when it comes to protecting the privacy of customers and maintaining control over their information and data, especially in light of the recent large-scale data breaches that have been discovered?

Correct embedding should provide one with a framework to comprehend the challenges created by the ethical and privacy implications of collecting and managing data, and it will do so by providing one with the skill-set to apply in ethical dilemmas of IS design. Students are able investigate and understand the broader impact that IS has on modern society as well as the ideals of fairness, accountability, and openness as one gains a deeper understanding of the necessity of a

shared set of ethical norms (learnt in ethical philosophies). Ethical theories will decrease the prevalence of generalisations and misunderstandings in frequent IS design challenges. Students will better understand whether or not they are required to make voluntary disclosures when using metadata to inform simple algorithms and/or complex artificial intelligence systems.

As can be seen from the results of Survey 2, the addition of fundamental definitions for each ethical concern resulted in a significant rise in the quality of the responses to Survey 2. This demonstrates that fundamental misunderstandings can be easily cleared up with some fundamental education in ethics and their considerations when applied to technology, the environment, and organisations, as well as their application as input, process, and output, which was covered in great detail in Chapter 2. These TOE and IPO frameworks can be used to benchmark and categorise ethical considerations into the correct design stage and agent responsible.

Responsibility relates to the role of individuals in the development, production, sale, and utilisation of IS systems. This includes the ability of IS systems to defend their decisions and identify flaws or unanticipated outcomes. As the chain of responsibility expands, it becomes necessary to relate the IS system's decisions to the ethical use of data and the activities of stakeholders involved in the decision. IS designs would connect moral, societal, and legal values, and they should be susceptible to scrutiny (Dignum, 2018).

The ethical use of data in and through these technologies should receive a substantial amount of critical attention throughout the entirety of the design process. As O'Neil provocatively demonstrates, algorithms and data science systems can be deployed as "weapons of arithmetic destruction" that promote inequality and undermine democratic decision-making when the ethical use of data is not given central importance (Shneiderman, 2020).

It is essential to acknowledge that the political, personal, and professional components of ethics are not distinct from one another; rather, they are intertwined with one another and influence one another in terms of the means by which one seeks to lead a good life in society with others. As a result, the fundamental self-learned interpretation of ethics was insufficient, as demonstrated by the findings of the two surveys taken together.

In community or social life, ethics is pursued through a variety of cultural, religious, or regional principles and practices. It is through these that specific groups provide its members with direction about how to live their lives in the most effective way possible. These ethical predetermined notions were unique to the students in our sample who were pursuing honours or postgraduate diplomas in IS. The findings of the survey and the conversations in class made it clear that many people had predetermined biases towards ethics. Students were naturally drawn to particular replies without explanation, and some mentioned that this was due to the fundamental values they derived from their religion or upbringing.

As mentioned in earlier in Chapter 2, one approach to see discrimination is via the viewpoint of the implicit biases involved. This perspective may be the result of our extended connection with the society in which we presently reside. In Sweden, for instance, Arab names or appearances in high-ranking vocations are rather unusual; in fact, the opposite is more prevalent. In contrast, the situation is prevalent when the opposite is true.

As a result, rather than actively engaging in the process, the implicit system gains knowledge about what to predict automatically through experience. Consequently, if one were to pick between two applicants for a high-ranking post, our implicit system would infer that the non-Arab candidate is more competent. Even if the Arab candidate had superior qualifications, this would still be the case. We may still have a 'gut feeling' that the applicant who looks to be

of Swedish descent would be the most effective choice, even after considering the CV, giving significant thought, and conducting a thorough examination.

This implicit evaluation is the result of personal experience, which serves as the basis for the inherent bias. If students have a higher theoretical understanding of hidden biases and how they function, they may be better able to identify these predefined prejudices while building morally acceptable systems and applications that may lead to discrimination.

To design starting from a point of common logic was the goal of one method, and one method was to base the design on an ethical philosophy. If there was no philosophy involved, then the students' reasoning may not have been consistent with one another. Because of this, participating in group design and discussions could become problematic. In order to choose the ethical principles to use as the foundation for one's system design, it was necessary to have a solid grounding in a variety of ethical philosophies, which further highlights the dire need for a foundation course in ethics. This philosophy or underlying logic of reason will work as a means to humanise or make a system more ethically acceptable.

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