A SOCIAL COGNITIVE ANALYSIS OF GAMIFIED INFORMATION SYSTEMS

by

ARTHUR EMIL VAN DER POLL

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SUPERVISOR: PROF I.J. VAN ZYL

CO-SUPERVISOR: PROF J.H. KROEZE

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DECLARATION

Name: Arthur Emil van der Poll

Student number: 39475964

Degree: PhD (Information Systems)

A Social Cognitive Analysis of Gamified Information Systems

I declare that the above thesis is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the thesis to originality checking software (see Appendix L) and that it falls within the accepted requirements for originality.

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I further declare that I have not previously submitted this work or part of it for examination at Unisa for another qualification or at any other higher education institution.

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KEY TERMS

Information systems; information systems; gamification; first-year university students; decolonisation; social cognitive theory; action research; action learning; design science research; software design; educational technology

ABSTRACT

Gamification is broadly defined as the use of game elements (for example, points, rewards and competition) in non-game settings like education, business and government. In information systems (IS) teaching and learning, gamification should be considered for enhancing students' motivation, increasing their engagement and stimulating their participation. However, there is a limited understanding of the social and cultural dynamics that affect student participation and the adoption of gamification to heighten their motivation for IS learning. Although games are near-universal phenomena, they are fundamentally grounded in the ideologies of the Global North. Subsequently, games often have oppressive qualities that socially exclude students situated in indigenous settings.

I used social cognitive theory as a theoretical lens through which to understand the complex social and cultural dynamics that emerge from experiential learning. In collaboration with student participants and two lecturer participants, I deployed action research as a methodology to construct knowledge of action learning through game-based technologies. I used qualitative data collection methods that entail extensive study of the literature, coupled with field notes, semi-structured interviews and focus groups. In addition, informed grounded theory was used to analyse the collected data. In this study, I particularly engage in IS theorising to build and make a theoretical, methodological and practical contribution to the IS body of knowledge.

I conclude that for gamification to become a viable strategy in addressing concerns related to *indigeneity* as well as to heighten student motivation for IS learning requires students to design their own gamification technologies. I specifically argue for the enactment of *technical conviviality* in the design of student-led gamification technology. In an effort to break away from the oppressive status quo in software design, technical conviviality advances the idea that personal ethical, cultural and social values must be at the centre of software design. I synthesised action learning and design science research to guide students through the process of designing a convivial information system.

Ter nagedagtenis aan mamma
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1956–2021

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Exit normal sage mode, enter Jiraiya's honoured sage mode: The two great sage toads of Mount Myōboku!

Enter Jiraiya's honoured sage style: Bath of boiling oil!

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ACRONYMS

ACM	Association for Computing Machinery
ACM DL	ACM Digital Library
AGI	Artificial General Intelligence
AI	Artificial Intelligence
AIS	Association for Information Systems
AISeL	AIS electronic Library
ANI	Artificial Narrow Intelligence
b⇔e	Behaviour ⇔ environment
C&E	Computers and Education
CCENT	Cisco Certified Entry Networking Technician
CE	Computer Engineering
CHB	Computers in Human Behaviour
c-is	convivial information system
c-IS	The theory of convivial Information Systems
CPUT	Cape Peninsula University of Technology
CS	Computer Science
CSS	Cascading Stylesheets
D&D	Diversity and Design
DAL	Design Action Learning
DSR	Design Science Research
e⇔p	Environment ⇔ personal
EJIS	European Journal of Information Systems
FOSS	Free and Open-Source Software
GUI	Graphical User Interface
HEI	Higher Education Institutions
HTML	HyperText Transfer Protocol

ICT	Information and Communication Technology
IEEE-CS	Institute of Electrical and Electronics Engineers Computer Society
IS	Information Systems
ISJ	Information Systems Journal
ISR	Information Systems Research
IT	Information Technology
JAIS	Journal of the Association for Information Systems
JIT	Journal of Information Technology
JMIS	Journal of Management Information Systems
JSIS	Journal of Strategic Information Systems
MDA	Mechanics, Dynamics and Aesthetics
MELISSA	Measuring E-Learning impact in primary Schools in South African disadvantaged areas
MILLIONAIRE	Who Wants to Be a Millionaire
MISQ	Management Information Systems Quarterly
ML	Machine Learning
p⇔b	Personal ⇔ behaviour
QL	Quizlet Live
S&C	Social and Cultural engagement
SCT	Social Cognitive Theory
SE	Software Engineering
SLR	Systematic Literature Review
U	Usage
UNISA	University of South Africa
UoT	University of Technology
USA	United States of America
WWTPTY	Who Wants to Pass This Year

LIST OF TABLES

LIST OF FIGURES

PUBLISHED RESEARCH

I have presented and discussed some of the content that is included in this thesis in the following papers:

Van Der Poll, A. E., Van Zyl, I., & Kroeze, J. H. (2019). A systematic literature review of qualitative gamification studies in higher education. In L. Rønningsbakk, T.T. Wu & F. E. Sandnes (Eds.), *Lecture Notes in Computer Science*: *Vol. 11937*. *Innovative Technologies and Learning* (pp. 486–497). Cham: Springer. 10.1007/978-3-030-35343-8_52

Van Der Poll, A. E., Van Zyl, I. J., & Kroeze, J. H. (2020). Towards decolonizing and africanizing computing education in South Africa. *Communications of the Association for Information Systems*, *47*(Article 7), 140–163.

Van Der Poll, A. E., Van Zyl, I. J., & Kroeze, J. H. (2021). Social exclusion in gamified information systems. In D. Dennehy, A. Griva, N. Pouloudi, Y. K. Dwivedi, I. Pappas & M. Mäntymäki (Eds.), *Lecture Notes in Computer Science*: *Vol. 1*. *Responsible AI and Analytics for an Ethical and Inclusive Digitized Society* (pp. 774–786). Cham: Springer. 10.1007/978-3-030-85447-8

Chapter 1: Introduction

1.1 Introduction

Gamification means using game elements in non-game settings like education, business and government (Deterding, Dixon, Khaled, & Nacke, 2011). In higher education, it is well understood that game elements can enhance motivation, increase engagement and stimulate participation (Landers et al., 2019). However, there is an incomplete understanding of the social and cultural dynamics that influence the adoption of game elements to increase student motivation in information systems (IS) learning (Mejias, Jean-Pierre, & Burge, 2015). Such dynamics may include social values and cultural norms (Van Der Poll, Van Zyl, & Kroeze, 2021). While game elements are near-universal phenomena, they are rooted in the ideologies of the Global North and their integration is often at odds with localised and indigenous knowledge systems. This results in poor adoption and even opposition to their use in non-game environments (Mukherjee, 2018).

In this research study, I[1] examine the social and cultural dynamics at play in gamified education. I specifically examine the use of gamification to increase student motivation for learning in an undergraduate information systems course. Empirically, I embark on an action learning gamification project with students and lecturers. A main characteristic of action learning is the action researcher socially constructing knowledge with participants to effect positive change in a particular social setting (Zuber-Skerritt, 2015). As such, I seek greater knowledge about the social and cultural dynamics that mediate the use of digital platforms and information systems knowledge. This idea is not new and is discussed in theoretically grounded approaches to technology development such as value sensitive design (VSD) (Friedman, Kahn, Borning, & Huldtgren, 2013).

Value sensitive design considers "social considerations as being inscribed within the technological artifact" (Sarker, Chatterjee, Xiao, & Elbanna, 2019, p. 703). The goal in this thesis is similar;

[1] In this thesis, the first-person singular pronoun 'I' instead of a third-person noun (e.g., the 'author' or 'the research candidate') is used to give expression to subjectivism expected in an interpretivist research study (Oates, Griffiths, & McLean, 2022). In Chapter 3, I discuss subjectivity as being inherent in interpretivist studies.

namely, to consider social and cultural dynamics in the pursuit of increasing student motivation when they learn with technology. Value sensitive design, however, relies on conventional technological solutions. These are limited insofar as being proactive design models or predesigned technology. According to Bennett and McWhorter (2022) and Glass (2018), these technologies are generally imposed on students without their understanding or participation. In this thesis, I argue for student participation in shaping, critiquing and governing gamification technologies.

1.2 Research background

From the introductory discussion, it can be noted that understanding *motivation* in information systems education is key to guiding participatory gamification. In this section, I briefly review information systems research that seeks to capture the motivational affordance of technology, in a South African context. I then give a dialectic perspective to inform gamification in information systems education.

1.2.1 Motivational affordances of technology in South African information systems education

Zhang (2008) refers to *motivational affordance* as “the properties of an object that determine whether and how it can support one’s motivational needs” (Zhang, 2008, p. 145). I draw from Zhang’s (2008) *motivational sources and needs* of ICT (information and communication technology) [2]design and usage to better understand the motivational affordance of technology in South African higher education institutions (HEI). The sources and needs are (i) *autonomy and self*, (ii) *relatedness*, (iii) *competence and achievement*, (iv) *leadership and followship* and (v) *affect and emotion.* Each motivational source is briefly discussed below.

Autonomy affordance

Afford autonomy is a psychological source of motivation and maintains that a user needs to experience choice in the regulation of behaviour. Autonomy supports self-determined motivation, enhanced self-esteem and higher self-worth (Zhang, 2008). According to Zhang (2008), ICT

[2] The terms ‘information and communication technology’ and ‘information systems’ are not used interchangeably in the thesis. I draw a distinction between the terms in Section 2.2.

should support an individual's need to improve self-determined motivation. Basic examples are online avatars, smartphone ringtones, desktop 'skins' and other customisations.

Identity (the social counterpart of psychological self-image) holds information about a particular individual or social group to which they belong (Zhang, 2008). To express themselves effectively in and make significant contributions to an information system, they require proficient soft skills. Additionally, technical skills alone are inadequate for successful participation in and contribution to information systems projects (Taylor, 2016). Soft skills refer to nontechnical 'people skills' that include teamwork, interpersonal communication skills, intercultural communication skills, self-management, time-management skills, accountability, leadership, willingness to learn, ethics, creativity and courtesy.

Taylor (2016) conducted a study at a South African university to investigate the development of soft skills in an IS course. Students, lecturers and IS professionals report that soft skills are not adequately taught during university studies. Although lecturers cite a lack of time to teach these skills, they acknowledge the negative consequences of inadequate soft skills. For example, lecturers opine that students lack a work ethic, basic courtesy for others and innovation (Taylor, 2016). Kroeze, Ponelis, Venter, Pretorius and Prinsloo (2012) link the demand for a broader skill set in South African IS education and industry to modern technology that functions in a global, hyperconnected world.

Mitchell and Benyon (2018) explore digital technology to improve intercultural communication competencies among South African and American information systems students. The positive results of the collaboration are related to preconceived stereotypes and the adoption of digital technology. Regarding the former, students from the USA were surprised that SA students were fluent in English. Concerning the latter, students valued the role of technology in making the collaboration possible as well as the agency that they had been given in selecting the whatever technology (*Skype*, *Facebook*, email or *WhatsApp*) for interacting with foreign peers.

Relatedness affordance

Zhang's (2008) motivational source which offers *relatedness* is evident in a variety of communication platforms in a study by Mitchell and Benyon (2018). The study by Bankole and Venter (2017) on the affordance of social collaboration applications at the University of the Western Cape also supports social relatedness. The researchers illustrate that digital technology platforms like *Google Docs* and *Google Sheets* (online collaboration in real-time), *Google Drive* (file sharing) and *WhatsApp* (social interaction) diminish student isolation. The researchers also found that the internet-based plagiarism service, *Turnitin*, fosters integrity and work ethic.

Competence and achievement

Zhang (2008) emphasises the use of games as a motivational source of *competence and achievement* where the presence of an 'optimal challenge' presented through digital technology is integral. According to Salen and Zimmerman (2004), artificial conflict (a challenge) is a main aspect of digital games. The psychology that underlies the use of educational games is the simulation of real-world challenges that students must resolve with learnt skills and knowledge. Matli and Joubert (2016) administered a crossword puzzle to assess students' information systems knowledge at a South African university. Students responded by indicating that the game's challenges helped to hone problem-solving, collaboration and fast strategic thinking skills.

Ndlovu and Mhlongo (2020) investigated *Kahoot!*—an online gamification platform that consists of a multiple-choice quiz—to increase the interest of IS students in information systems education at the South African University of Johannesburg (UJ). The results are promising; one participant commented, "competing against my friends made me more interested to participate" (Ndlovu & Mhlongo, 2020, p. 4). Despite these positive results, a lack of time and awareness is the reason why games are not widely adopted in teaching, according to Anyango and Suleman (2020). The researchers examined game-based learning for teaching programming at South African and Kenyan universities. The lecturer participants cited limited previous knowledge of the use of games as a learning strategy when they received programming training.

Leadership and followship

According to Zhang (2008), digital technology presents the ideal circumstances for leaders to emerge. For example, blogs and online forums enable people to exert influence over other persons or groups. These individuals might potentially attain symbolic power if their views gain support, thereby establishing a form of leadership. They usually gain a following that is willing to be guided by them. Taylor (2016) observes that leadership, as a soft skill, was not discussed by any of the students, lecturers or industry professionals. Uys (2019) proposes capstone courses (that is, project-based learning like case-based learning, work-integrated training, game-based learning and hackathons) to address the general lack of soft skills in computer science (CS) and information systems.

Uys (2019) reports on experiences following an IS hackathon at a South African university. Hackathons are events during which programmers collaborate in developing a software project over 24 to 26 hours. Hackathons stimulate creative thinking, improve collaboration and expose students to design concepts in a fun and engaging way. Students in Uys's (2019) hackathons took on different roles like developer, analyst or project manager, which introduce a leader and follower relationship. The need for leadership is evident in the students' suggestion that "every group must be assigned a supervisor" (Uys, 2019, p. 8).

Affect and emotion

Zhang (2008) suggests that ICT design should induce desired affective states (emotion) through the cognitive system of a person. For example, a smartphone with an attractive and slick design might evoke optimal entrancement in its usage. I reject this position by Zhang, based on the view that an external stimulus equates to causality, which implies that psychological changes (increased interest or entrancement) are causally contingent on a visually appealing design (causal effect) which leads to the targeted outcome (learning or positive adoption) (Mekler, 2015). According to Mekler (2015), intrinsic motivation does not increase because a person feels competent unless such a feeling is accompanied by a sense of autonomy. A person must experience their actions as self-determined rather than being 'controlled' by external stimuli.

1.2.2 Towards gamification in IS education

The previous section illustrates that information systems research explored the motivational affordance of technology at South African HEI and looked at gamification as a strategy. According to Kenny, Lyons and Lynn (2017), gamification as a strategy to increase motivation for information systems education is relevant because most gamification implementations will include the design of an information system. Notwithstanding the importance of information systems, Deterding et al. (2011) argue that gamification is about the use of game design rather than game-based technology. Furthermore, Landers, Auer, Collmus and Armstrong (2018) argue that game elements can be manipulated to extrinsically motivate people to voluntarily perform a desired behaviour. Successful video games, for example, are effective in triggering intrinsic motivation (Deterding, 2015). Intrinsic motivation emerges from balancing a *challenge* with *skill* and instant *feedback* on progress.

Pac-Man is a 1980 video game capable of invoking intrinsic motivation, according to Bowman (1982). Bowman attributes *Pac-Man*'s progressive balance of skill and challenge as its primary source of intrinsic motivation. *Pac-Man* involves the player controlling Pac-Man, navigating him in an enclosed maze and eating dots, while ghosts (Inky, Blinky, Clyde and Pinky) chase him. Bowman (1982, p. 15) recounts a participant who said, "*Pac-Man* is a skill; I like perfecting skills". Osatuyi, Osatuyi and De La Rosa observes that this is precisely what gamification practitioners in IS try to achieve. The researchers state:

> The main purpose of gamification in information systems (IS) education is to foster the same motivation and engagement that gamers have towards games in students and their approach to learning. (Osatuyi, Osatuyi, & De La Rosa, 2018, p. 96)

For Deterding (2015), games that reflect the mechanics, dynamics and aesthetics (MDA) model can facilitate the balancing skill and challenge. For example, *Pac-Man* mechanics persuade the player to flick the joystick to move Pac-Man toward eating large flashing dots (called energisers), which cause the coloured ghosts to temporarily turn blue and become vulnerable to being eaten by Pac-Man, for bonus points. This leads to the dynamic of a shift in power (the hunters become the hunted), which engenders the aesthetic of success, even if temporarily, against the odds.

Vermeulen, Gain, Marais and O'Donovan (2016) note that the use of game mechanics to effect human motivation is unfounded. Vermeulen et al. observe undesirable outcomes and state that "the fact that unexpected behaviors are surprising to gamification practitioners and that we expect players to behave as we intend, suggests that our assumptions are flawed" (Vermeulen et al., 2016, p. 4). The authors recount an instance of unexpected behaviour from gamification study in a computer science course. Students took advantage of the quiz system's automatic feedback by repeatedly engaging a question to probabilistically eliminate wrong answers. This behaviour suggests a gap between gamification theory and practice. Vermeulen et al. (2016) attribute this gap to assumptions grounded in *dualism*.

Dualistic perspectives relate to dichotomies. A dichotomy refers to two elements that are distinct to the extent that they are incompatible (a duality) (Holliday & Macdonald, 2020). The object/subject dichotomy most notably manifests from the use of a dualistic perspective in gamification (Vermeulen et al., 2016). The '/' notation is commonly used to dichotomise a relationship (see Chambers, Richardson, & Christopher, 2000). An example is Landers et al.'s (2018) ontology of gamification; namely, that game elements are material objects (particularly, digital interfaces) that can affect human subjectivity, such as learner behaviour. In terms of epistemology, the goal is to add game elements to non-game contexts quasi-experimentally, to change learner behaviour towards positive learning outcomes.

I reject dichotomies in gamification. In contrast, I adopt a dialectical perspective to advance the theory that social and cultural dynamics are the primary sources of motivation that affect learner behaviour and cognition in IS learning.

1.3 Towards dialectical analysis of gamification in IS learning

In this section, I advance dialectical analysis to underpin IS research that examines the social and cultural dynamic at play in gamification. Dialectical analysis is closely identified with Vygotsky's (1978) sociocultural theory of learning. Vygotsky suggests that learning behaviour has its origins in social and cultural sources. From this point of view, as learners engage in interactions, collaborate on tasks and internalise the role of collaborating with others, they gain a new understanding of the world and culture. In this regard, Vygotsky is interested in studying the effects of broader historical and cultural environments on these interactions and actions. Examining the history of a phenomenon requires a study of the process of *change*, which is considered the basic demand of dialectical analysis.

The study of change departs from the object/subject dichotomy by examining subject–object interdependence. The '–' notation denotes a dialectic relationship that joins the object and the subject in mutual transformative change (Leontiev, 1978). Game mechanics, dynamics (that is, positive learner behaviour) and aesthetics (for example, improvement in academic performance) denote the object; the students (players) represent the subject (Vermeulen et al., 2016). Vermeulen et al. (2016) discern subject–object interdependence in gamification as follows: The motivational affordance of game objects (conceptual, digital and material) are perceived to be culturally determined. As a result, game design (as a broad representation of the game object) is never static, but rather subjected to continuous dialectic change by the related cultural system.

In Section 1.2.2, I discussed the game and player dichotomy. Below, I add the *play/game* and *game/non-game* dichotomies to the discussion. This expanded juxtaposition increases the focus on the presence of social and cultural elements in games that affect player behaviour. In addition, I extend dialectic analysis to action learning, which is dialectic in nature, owing to the dialectical relationship between action (that is, the concrete application of skill) and learning (that is, understanding knowledge through reflection) (Zuber-Skerritt, 2001).

1.3.1 A dialectic perspective of play and games

In the play/game dichotomy, play is regarded as unproductive and games as productive (Vermeulen et al., 2016). Vygotsky (1978) counterargues that play is indeed productive as it facilitates learning through role-playing behaviour. Children engage in make-believe play by taking on the roles of adults; for example, a child taking on the role of the teacher. Essentially, the child engages *the self*. Mead (1934) suggests the self is a reflexive image of 'I' and 'me'. The 'I' denotes an individual's reaction to the roles that others enact; the 'me' denotes an individual taking on the roles of others. In terms of action learning, examining the different roles players take in games, for example, players competing or collaborating with other players or a combination of both could yield insight into behavioural development (Gee, 2003; Zuber-Skerritt, 2001).

Deterding (2016) demonstrates that play can afford learning through *theming*. Theming involves injecting play into activities to create curiosity. Theming particularly involves labelling activities in a domain that is a recognisable part of a fictitious world. The idea is to transform interactions into memorable activities. An example is Aldemir, Celik and Kaplan's (2018) theming of gamification in an instructional technology development course. The researchers incorporated a theme inspired by the cultural phenomenon, the *Harry Potter* series. The series follows the life of Harry Potter, a young wizard at the Hogwarts School of Witchcraft and Wizardry. Vaughn (2011) accounts for the plot's relevance to education as follows: Harry Potter represents "teaching and learning in and outside of the classroom" (Vaughn, 2011, p. 1).

Deterding (2016) observes several benefits of make-believe play. First, it invokes curiosity (as I mentioned in the previous paragraph). In this regard, make-believe play drives exploration as users are curious about other aspects of the video game that the designers might have themed. Second, make-believe play relaxes users through 'familiarity' and instils a sense of cultural belonging; researchers achieve this by incorporating stereotypes, 'clichéd signifiers' and 'inside jokes' into video game design. Lastly, video game designers enfold learning outcomes in a metaphorical representation of cultural phenomena, which enable users to employ existing knowledge to learn about outcomes (Deterding, 2016).

1.3.2 A dialectic perspective of game and non-game contexts

In the introduction of this thesis, I presented Deterding et al.'s (2011) definition of gamification. Huotari and Hamari (2017) reject this distinction between game contexts and non-game contexts by Deterding et al. (2011). This relationship is dichotomous because player actions in game contexts are seen as productive and actions in non-game contexts are seen as unproductive. Huotari and Hamari (2017) argue that subjective player belief can elevate behaviour that is generally not considered gaming, to gaming status. Players have been observed to perform 'self-improvement' actions that are informed by social, cultural or superstitious beliefs. Players consider such actions *integral gaming activities*. For example, some players blow on a dice to increase luck before they roll it (Roberts, Arth, & Bush, 1959).

Deterding (2013a) suggests that playing a game means that players must align themselves in a mutually intelligible way which, in turn, should align with the general constitutive rules. Based on superstition, a player might reject a game and not play it if their opponent, for example, is cross-eyed. Based on the assumption that no (or some) rules of a wide variety of games prohibit cross-eyed people from participating, Salen and Zimmerman (2004) would argue that their reluctant opponents are spoilsports. On the other hand, one can counterargue that Salen and Zimmerman understate the importance of non-game entities (for example, social or superstitious persuasion) that constitute playing a game.

Knowledge associated with superstitious beliefs and culturally bound conventions is considered *indigenous*. Indigenous means "[k]nowledge that is in one place", which concerns daily living in specific contexts (Dalvit, Murray, & Terzoli, 2008). To this end, all knowledge is indigenous insofar as it relates to a particular geographic location. However, indigenous knowledge is often associated with communities in the Global South and non-Western societies. In this vein, indigenous belief is regarded as non-scientific, for example, the scientific soundness of a method that is not communicated in the English language is often questioned (Bruchac, 2020; Dalvit et al., 2008; Ramírez-Castañeda, 2020).

From a dualistic perspective, indigenous belief is fundamentally at odds with the information systems discipline. As Van der Linde and Liebenberg (2022) note, the computing field inevitably reflects Western epistemology, considering that digital technology is mostly consumed in the West and subsumed in the English language. In this regard, Ramírez-Castañeda (2020) notes that English is not widely spoken or understood in some regions of the Global South, which has implications for information systems learning. Consider the graphical user interface (GUI) list and menu; these terms have different meanings in English but in the African language isiXhosa, the word *uludwe* denotes both list and menu (Dalvit et al., 2008).

According to Scott and Palincsar (2009), language and computers are powerful semiotic means through which humans mediate action. In this light, Dalvit et al. (2008) advance cultural pluralism to address contrasting semiotic domains in computing education. A pluralistic cultural approach favours participatory-based models that require active end-user participation to account for diverse social and cultural elements. I anticipate that non-Western norms and so-called non-game behaviour will inevitably arise in this study's action learning (Zuber-Skerritt, 2001). The dialectic relationship between action and learning can illuminate their effect on IS learning where non-Western semiotic tools and signs assimilate into educational gamification.

1.4 Problem statement

Several gamification studies suggest that game elements can be incorporated into information systems to serve as external motivation for students to engage with IS learning (Bennani, Maalel, & Ben Ghezala, 2022; Limantara, Meyliana, Gaol, & Prabowo, 2023; López & Tucker, 2020; Oliveira et al., 2022; Zatarain Cabada, Barrón Estrada, Ríos Félix, & Alor Hernández, 2020). However, more research is needed to investigate the use of game elements to facilitate an increase in intrinsic motivation for IS learning. In this thesis, I argue that game elements have the potential to facilitate an increase in intrinsic motivation, provided that the social and cultural dynamics that affect the adoption of gamification are taken into consideration (Vermeulen, Gain, Marais, & O'Donovan, 2016).

Furthermore, games and their various elements in the modern digital era are inextricably rooted in Western epistemology. Indeed, computing technology and curricula have been mostly produced by and consumed in Western countries; therefore, they tend to reflect Western values and cultural attributes that can be difficult to understand for students from indigenous cultures. Students from indigenous cultures can be placed at a disadvantage when they encounter computers as a learning intervention, given that they cannot simply draw upon their social and cultural knowledge to understand knowledge and metaphors presented from a Western point of reference (Dalvit et al., 2008).

To focus this inquiry on students' meaningful encounters with game elements in local information systems contexts, I formulated the following research question: What social and cultural elements affect student motivation for gamification in information systems learning? Three sub-questions accompany the primary research question: (1) What are the essential social and cultural factors that affect student motivation for gamification in IS learning? (2) Why do social and cultural experiences affect student motivation for gamification in IS learning? (3) How do social and cultural spaces affect gamification in IS learning?

I draw on Naudé's (2015) criticism of the translation model in decolonisation research to justify the structure of the research questions. The translation model is evident in research studies that use Western epistemic traditions as a point of departure to examine local moral, ethical, social and cultural phenomena in Global Southern regions. An example is the study by Eglash (2006) investigating the deployment of a software simulation tool to create mathematical models and visual representations of beadwork in Native American culture.

Within the ambit of the translation module, the third research question, for example, would probably have been formulated as follows: How does gamification affect social and cultural spaces in IS learning? To avoid an inadvertent adoption of the translation model, Naudé (2015) rejects the idea of examining indigenous or local knowledge as an extension that merely adds an interesting research angle to Western epistemology. Instead, researchers must take an Afrocentric approach where knowledge is contextualised within local viewpoints, irrespective of its origins. Hence, I formulated the research questions for this study to present local social and cultural values as the norms by which gamification should be examined.

1.5 Research purpose

The purpose of this research is to examine the significance of social and cultural elements enmeshed in the play–game relationship that facilitates information systems learning. The research will contribute to what Vermeulen et al. (2016, p. 8) call the "reimagining of gamification". In this regard, I view play and games as two activities that unite in dialectic change to mediate learning actions and behaviour. Vermeulen et al. observe that the gaps between gamification theory and practice emanate from dichotomies (specifically play/game and game/non-game) that have dominated how gamification has conventionally been introduced. Instead, I ground this research in dialectic ontology to account for broader social and cultural dynamics that are embedded in the play–game relationship (De Grove, Cauberghe, & Van Looy, 2014).

1.6 Implications for IS pedagogy

The term ‘pedagogy’ is defined as the science, practice and strategy of teaching (Kirschner, 2009). Pedagogical reasoning constitutes a pedagogy that involves the ‘transformation of knowledge’. In turn, the transformation of knowledge involves using and teaching ICT resources and skills to enable students to learn and develop ICT resources and skills. To transform knowledge in IS courses, ICT affordance should be considered in designing the skills, knowledge and outcomes that are articulated in IS pedagogies. In Section 1.2.1, I demonstrated that South African IS research investigated the motivational affordance of ICT in HEI (Webb & Cox, 2004). Lorenzo and Gallon (2019) argue that simply building the affordance of ICT into pedagogical reasoning would not lead to an increase in student motivation. The authors further criticise this pedagogical model for mostly being instructor-led. Additionally, student knowledge and skills are only evaluated by the student’s ability to reproduce the instructor model (Lorenzo & Gallon, 2019).

Lorenzo and Gallon (2019) argue that in the wake of prolific artificial intelligence (AI), computing education requires a *smart pedagogy*. The term AI refers to computers that seek to reproduce human intelligence (Konar, 2018). Smart pedagogy, in particular, is characterised by AI taking the role of the human instructor to facilitate interaction between students and their learning content. In this role, AI acts as a pedagogical agent that is attuned to the learning needs and affective state of the learner (Lorenzo & Gallon, 2019).

For example, consider Psaltis, Apostolakis, Dimitropoulos and Daras (2018), who investigated the use of Microsoft Kinect sensors to capture students’ emotions, based on various cues from the body, gaze, face or gestures while interacting with a serious game. The researchers espouse the idea that AI designers can adapt game-based learning platforms dynamically based on engagement data. For example, in response to a game challenge that ignites boredom (judged by a player’s facial expressions), the ML model could trigger a more difficult challenge to increase engagement and the overall efficacy of task-orientated behaviour.

Within the ambit of dialectical analysis, a smart pedagogy is not conceivable as it is grounded in a subject/object dichotomy. By solely observing and responding to bodily actions, the meaning that the bodily expression embodies is dismissed. This implies a contrast between a physical expression and what the player might say about it before or after they perform the physical action (Schwartz & Merten, 1971). In Chapter 3, Section 3.9.1, I discuss the specific subject/object dichotomy as it relates to participant observation in detail. Given this discussion, I instead frame IS pedagogy within the dialectical analysis to uncover beliefs about the material, digital or conceptual game elements since these elements are culturally determined.

1.7 Methodology

The methodology chosen to guide the data collection is action research, which focuses on students from the IT course at the Cape Peninsula University of Technology (CPUT), engaging action learning through gamification. Action learning is a derivative of action research. Stringer describes action research as a research strategy based on a localised study that involves "a systematic approach to investigation that enables people to find effective solutions to problems" (2014, p. 24). While action learning means collaborative learning by acting from concrete experience through action research, the focus of action research is on the systematic, rigorous, iterative and reflective processes of taking action. While only the researcher participates in action research, both the researcher and the research participants participate in experiential learning (McNiff & Whitehead, 2016).

Action research involves (i) planning the research (identifying the topic, formulating the research problem, etc.); (ii) the acting phase (implementing the research strategy and analysing the data); (iii) the developing stage (write up and report the findings) and (iv) the reflecting stage (draw conclusions related to research questions) (Mertler, 2017; Oates, 2006). The action learning process breaks out of the *implement actions* phase of action research to start a systematic iterative cycle of its own. This is what Dick (2007) calls *nested cycles*. The action learning phases comprise (i) diagnosing the problem, (ii) planning actions to resolve the problem, (iii) implementing the problem-solving actions, (iv) evaluating whether actions could solve problems and (v) reflecting on the practical outcomes.

Action learning is phenomenological. Therefore, the lived experience and social reality—which are subject to continued negotiation and construction—are considered in formulating gamification.

Action learning comprises four phases. First, participants *plan actions*. It provides a means to gain an understanding of gamification and the extent to which new understandings can help to address problem(s) under inquiry. Second, participants *implement actions*. I will conduct field notes, semi-structured interviews and focus group meetings to obtain views about and evaluate the proposed gamified information system. Third, participants *evaluate actions.* Throughout all the phases, participants negotiate and *reflect* on all actions taken (Stringer, 2014; Vermeulen et al., 2016).

1.8 Contributions

This thesis seeks to contribute to three interrelated knowledge domains: theory, methodology and practice.

Theoretical contribution

In the previous section, I reflected on the social and cultural narrative of play and games. In terms of a theoretical contribution to IS, I will conceptually locate the significance of social and cultural interactions with play and games, to increase student motivation for IS learning. Furthermore, this research project discerns the value of social and cultural elements and lived experience in the incorporation of gamification in information systems education.

Methodological contribution

This research project will materialise as an emergent guide for action research that provides an understanding of the motivational affordances of play and games for IS learning. In this regard, I offer a systematic approach to action research because it acknowledges the social and cultural interactions of play and game, to guide the implementation of motivational experiential IS learning.

Practical contribution

Practically, the outcome of this research project will highlight and emphasise IS students' local encounters with gamification. Notwithstanding the learning opportunities that digital technology makes possible, one needs to recognise that its cultural artefacts, such as digitised games, might reinforce exclusionary practices at the cost of those who are not native to its culture. Hence, this research project seeks to emphasise essential local interaction with gamification that is tailored towards an information systems course.

1.9 Thesis structure

Action research informs and guides the structure and phases of this thesis. I adopted and adapted the action research models proposed by Mertler (2017) to represent the structure of the thesis. The adapted models include the chapters and phases of the action research process (see Figure 1).

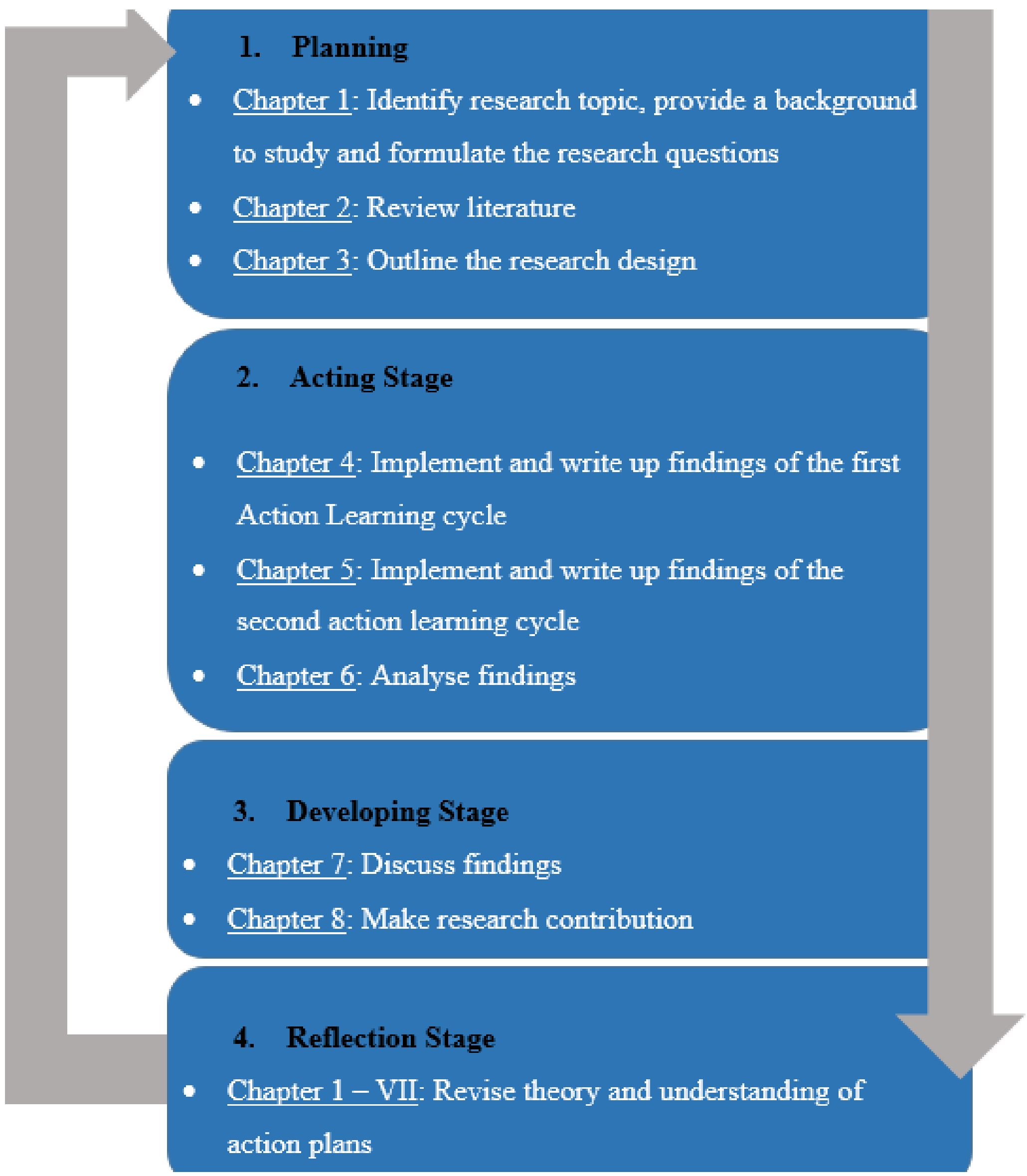

Figure 1. The overall structure of the thesis (adapted from Mertler, 2017).

The phases illustrated in Figure 1 consist of the following:

Phase 1: Planning

The first chapter is the first phase of the action research process; above, I introduced the research topic, its background context, the research problem and questions. Trends associated with dualism are observed to dominate gamification research. In response, I promote play and games as being fundamentally social and cultural artefacts that require dialectic analysis to guide the implementation of meaningful gamification. I discussed the role of action research as the study's chosen methodology. Furthermore, I provided an overview of the theoretical, methodological and practical considerations for the information systems domain. In Chapter 2, I deploy social cognitive theory as a theoretical perspective to observe an affinity between socioculturalism and (digital) games.

Phase 2: Acting stage

In Chapter 3, I describe the philosophical school of thought that I chose for this thesis, namely, interpretivism. I justify interpretivism as a suitable paradigm in which to investigate the sociocultural dimensions of gameplay. I also justify action research as a guiding methodology for researchers, educators and students who jointly strive to improve motivation for information systems learning by deploying gamification. I also provide an account of my personal bias which may influence research findings. I further provide an overview of the study's chosen data collection methods, namely, field notes, semi-structured interviews and focus groups.

In Chapter 4, I present the findings of the first action learning cycle. Vermeulen et al. (2016) observe that the theoretical promises of gamification do not agree with its practices. In this light, I critically evaluate the effect of experiential gamified learning on student motivation. In Chapter 5, I present the findings of the second action learning cycle. Considering both the challenges and successes of the first cycle, I evaluate the effects of collaboration against the deeply rooted social and cultural dimensions of play and games.

In Chapter 6, I lay out a comprehensive analysis of the empirical data that the two action learning cycles have produced. I specifically apply informed grounded theory to elicit themes from the experiential gamified learning experience. I reflect on the suitability of informed grounded theory concerning the philosophical and methodological foundations of the study. A preliminary examination indicates that informed grounded theory is an ideal thematic analysis method that supports exploratory-orientated research instead of hypothesis-driven research.

Phase 3: Developing stage

In Chapter 7, I deploy social cognitive theory as a theoretical lens through which to interpret the critical themes emerging from the empirical data. I discuss how experiential learning through gamification emerged as the play–game dialectical relationship. Commencing with the primary research question, I reflect on the social and cultural elements that affect motivation in information systems education. Interspersed in the discussion, I recommend future research that could supplement the research findings. In conclude the thesis in Chapter 8 by giving a summary of the key findings and discussing the theoretical, methodological and practical contributions to the existing information systems body of knowledge. I conclude with the limitations of the research.

Phase 4: Reflection stage

I conclude this thesis with the first phase of the fourth action research cycle, where I review and reflect on the original (i) research topic and problem; (ii) the procedures by which I collected, analysed and interpreted data and (iii) present the findings and conclusions. Due to time constraints, a fifth action research cycle did not occur. However, inspired by the recommended future research in Chapter 7, I defer subsequent action research and action learning cycles to a future postdoctoral phase of my research.

Chapter 2: Literature Review

2.1 Introduction

In this review of the literature, the arguments set out in Chapter 1. In Chapter 1, I advance dialectical analysis to understand how social and cultural elements affect student behaviour and motivation in IS learning through gamification. I start by defining the sociotechnical perspective of information systems. The sociotechnical perspective is dialectical insofar as people and ICTs transform each other in a bidirectional way. I investigate this reciprocal interaction by using social cognitive theory as a knowledge system. Before discussing social cognitive theory, we provide a discussion that clarifies the terms most commonly used terms in gamification research. I also provide a brief review of related research studies that consider the effect of social and cultural elements on gamification as a tool to change behaviour and motivation. I contextualise these discussions within technology-driven gamification in educational settings.

Thereafter, I discuss social cognitive theory. I discuss social cognitive theory as a theoretical lens through which to analyse learning occuring through gamification amid reciprocal interaction of the person, the social environment and learning behaviour. I locate students as individual social actors whose learning behaviour is reciprocally influenced by the gamification environment. Indeed, in Chapter 1, I advanced the idea that games produce culture and are produced by culture. I closely examine the principles of social cognitive theory to examine how a learning culture which is different to that of the student impacts his/her assimilation of knowledge. As I have noted in Chapter 1, games and gamification have adopted the character of digital games, thus reflecting Western epistemology.

Owing to the ability of (Western) technology, for example, artificial intelligence, to replicate human intelligence, I extend social cognitive theory by invoking Descartes to advance the idea that it is not possible for computers to gain human intelligence. Finally, I embark on a systematic review to advance qualitative methods, to understand gamification strategies that are considered in the social context where learning occurs. Indeed, I observe that gamification studies predominantly make use of quantitative methods in an attempt to measure motivation. In Chapter 3, I argue that quantitative methods are not appropriate for investigating complex social and cultural phenomena such as the impact that games have on human behaviour. In the systematic review, I advance qualitative methods for a thick description of the social and cultural dynamics that influence student behaviour and motivation towards a positive application of gamification.

2.2 Information systems

This thesis is located in the domain of social studies within information systems. The term *information systems* refer to both the academic discipline and the technological infrastructure utilised in organisations. The academic discipline of IS involves multifaceted inquiries into the development, utilisation, human experiences and human perceptions of ICTs in the digital information age (Oates, 2006). In the context of technological infrastructure, information systems refer to a combined design and use of telecommunications networks, software and hardware to gather, create and share useful information—generally, in an organisational environment (G. Davis, 2006). IS as an academic discipline is mainly considered a social science, given its research foci on socially constructed phenomena such as the impact of ICTs on the users of organisations (Averweg & Kroeze, 2012). IS is also categorised as one of five prominent subdisciplines within computing.

The Association for Computing Machinery (ACM), The Association for Information Systems (AIS) and the Institute of Electrical and Electronics Engineers Computer Society (IEEE-CS) define computing as any activity that requires or benefits from the use of computer technology to achieve a goal. Therefore, computing involves building and designing software and hardware systems for multifaceted purposes; discovering, collecting, processing and structuring information on any specific purpose; designing and using multimedia technologies; creating artificial intelligence and conducting scientific research using computers. The other prominent subdisciplines of computing are Computer Engineering (CE), Computer Science (CS), Information and Communication Technology (ICT) and Software Engineering (SE). These sub-branches of computing are described in the next section (ACM, AIS, & IEEE-CS, 2005; ACM & IEEE, 2021).

Computer Engineering focuses on the creation and design of computers and computer-based systems. The discipline includes the study of communications, software and hardware, and how they interact. Computer engineers are furthermore concerned with applying the theories, practices and principles of traditional mathematics and electrical engineering to the challenges associated with digital devices and the design of computers.

Computer Science is concerned with a broad spectrum of theoretical and practical computer-related specialities ranging from computational science, bioinformatics, robotics and other compelling areas such as artificial intelligence. The work that computer scientists perform is located in three classifications: (1) designing and implementing software, (2) inventing innovative ways to use computers and (3) designing new problem-solving techniques for computer-related problems.

Information and Communication Technology carries two meanings: From a broader view, information and communication technology encompasses all of computing; in academia, it is a discipline that involves preparing students to respond to the computer technology needs of organisations. The tasks of information technologists include the design and maintenance of websites, network security and administration, the installation, customisation and maintenance of software applications, and computer hardware.

Software Engineering focuses on building and maintaining software applications that are reliable and not costly to create and maintain. Software engineering specialists infuse computer science and mathematical principles with engineering practices for the development of a physical artefact. Software engineering and computer science share some common traits; in both fields, programming skills are required for the design of software applications. Software engineers, however, are more customer orientated; that is, they assess customer needs and focus on designing software that supports those needs.

I ground my empirical inquiry of gamification in the sociotechnical perspective of information systems. In the sociotechnical perspective, social refers to a system comprising people and experiences, while technical denotes computing software, hardware and data structures. In sociotechnical systems, the social system poses requirements that the technical system must satisfy and vice versa. The system itself changes after the requirement is designed and implemented, which triggers new requirements that can be expected to continue as an endless iterative transformational interaction (Lee, 2004; Sarker et al., 2019). An investigation of the design, properties and behaviour—as emerging from the reciprocal interaction—denotes the knowledge system (Lee, 2004). For Lee (2004), information systems are the mutual iterative transformational interactions between the social, technical and knowledge systems.

I position the gamification team (myself as the research candidate, information systems student participants and information systems lecturer participants) as the social system. I locate gamification as the technical system through which to accomplish learning goals. Lee (2004) observes that the technical system is not necessarily a system of digital technologies, but can be technology in the form of different actions, responsibilities and roles (for example, the division of labour) to help an organisation achieve its goals. Notwithstanding Lee's assertion, I deploy game-based software in the action learning phase of this research study and the students (the players) adopt different roles to better support the gamification of the information systems course. Furthermore, I chose social cognitive theory as a knowledge system (that is, a theoretical perspective, as discussed in Section 2.4).

2.3 Gamification

As I explore gamification more in depth, terminologies related to the domain of games will increasingly surface and become normative in this thesis. Therefore, it is essential to distinguish between the frequently used terms and concepts related to gamification. Osatuyi et al. (2018) observe that many gamification publications do not clearly define terms and use them interchangeably while these terms, albeit similar, are distinct concepts.

Gamification involves deploying game elements in non-game environments such as education, health, government and business (Deterding et al., 2011).
Gamify refers to the process of transforming a process into gamification activity (Lounis, Pramatari, & Theotokis, 2014).
Gamified refers to a state whereby game elements have been incorporated into a process and deployed to help achieve learning goals (Dicheva, Dichev, Agre, & Angelova, 2015).
Playfulness describes the behavioural and experiential qualities of play. Play denotes an improvisational, free-form and expressive activity for enjoyment purposes (Deterding et al., 2011).

Playful design uses three types of playful elements to elicit emotions associated with fun; they are functional, constructive and symbolic play elements. Each element is briefly described below (Tseng & Sun, 2017).

- **Functional play elements** encourage users to explore. They are based on the premise that players enjoy the freedom of choice and alternative ways to play a game with different resources at their disposal. For example, the gamified piano app *Yousician* allows users to choose and advance in three respective curriculum paths, namely pop, classical and knowledge.
- **Constructive play elements** allow users to create or assemble. *Habitica*, a gamified productivity app, enables its users to create a character. Using virtual currency acquired by finishing tasks on a personal to-do list, a user can purchase and fit his/her character with weapons, armour and outfits. Users can present their characters to other users in the virtual world. The appeal, therefore, is to express oneself through decoration which satisfies a fundamental need to make an impact on the world.
- **Symbolic play elements** are also referred to as dramatic play elements and denote a player who 'pretends'. Symbolic play elements are a common occurrence in video games with storylines that make the player the main character. Certain games fit embedded storylines which are stories narrated by game producers to players through gameplay and narrative mechanics. Narratives are alluring in the sense that they give players a purpose, thus inspiring continuous gameplay.
- ***Gamefulness*** is described by Deterding et al. "as a systematic complement to 'playfulness'" (Deterding et al., 2011, p. 3). Gamefulness describes the behavioural and experiential qualities of gaming. Gaming captures playing in a rule-bound and competition-driven system towards discrete outcomes.

Gameful interaction considers artefactual elements, that is, affording gameful enactments and interpretations to elicit positive gamefulness (Deterding et al., 2011).

Gameful design refers to the use of game design elements for designing gamefulness (Deterding et al., 2011).

The ***game mechanics, dynamics and aesthetics (MDA) model*** specifies that a player interacts with a game's mechanics, which leads to game aesthetics. For instance, the **game mechanics** of *Tetris* state that a player clears lines by strategically moving and rotating a procession of tetrominos that descend into a playing field of rectangles. The lines that the player has completed disappear, granting him/her points and allowing him/her to proceed to either fill vacant spaces or possibly finding it increasingly difficult to fill empty spaces, which instead, fill up the playing field (see Figure 2). As a consequence, the dynamics of an increasingly widening gap in information processing speed between humans and computers arise. This, in turn, gives rise to the aesthetic of frustration; that is, the player is bound to lose as the playing field inevitably, fills up (based on Deterding, 2015; Tetris, 2022).

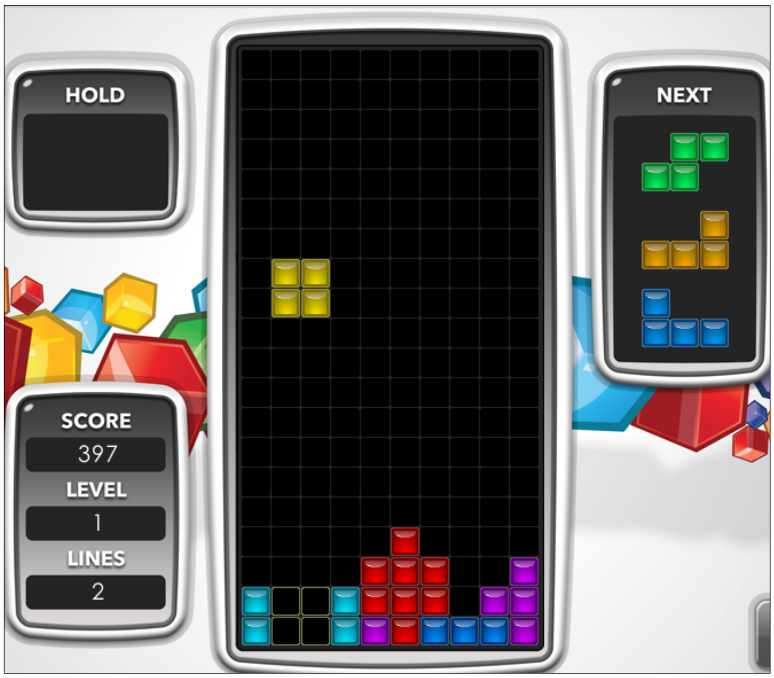

Figure 2. A screenshot from a *Tetris* game that I played at https://tetris.com (Tetris, 2022).

Game elements instantiate the relevant game elements. Game components include stories, badges, levels, avatars, points, progress bars and leaderboards (Mejias et al., 2015). Game components are abundant. Those that are predominantly discussed in gamification literature are explained below:

- **Progress bars:** Give a graphical illustration of players' progress in a percentage, textual or progression-bar format. Progress bars also reflect adaptive difficulty whereby game designers enable players to tailor challenges to fit their skill levels (Dicheva et al., 2015). See Figure 3.

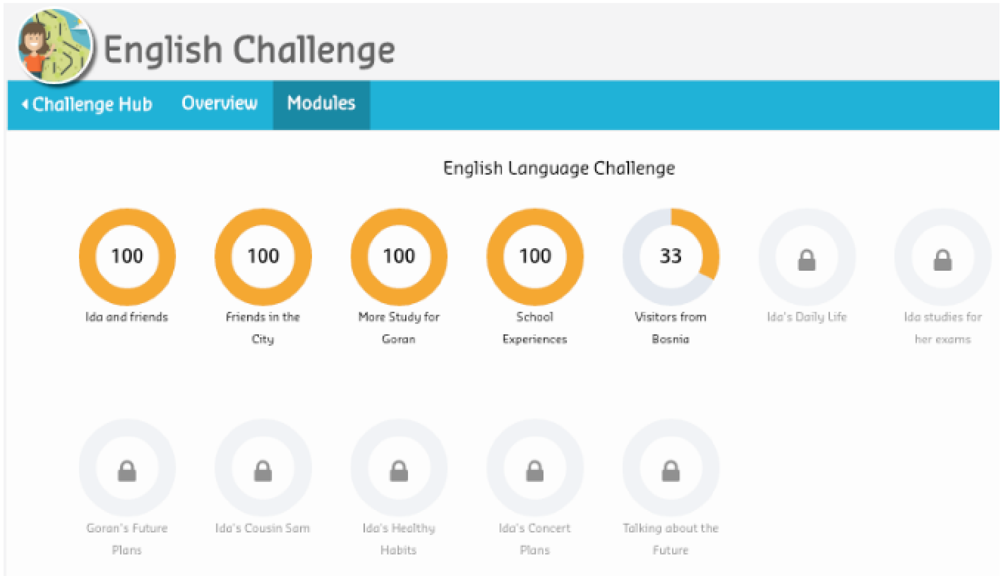

Figure 3. Progress bars (De Freitas et al., 2017).

- **Avatar:** A figure or icon that is a representation of a player in the video game (Raymond, Soutter, & Hitchens, 2015).
- **Points:** A unit of measurement that rewards players by adding a certain number of points for an action or activity completed (De Freitas et al., 2017; Thiebes, Lins, & Basten, 2014).
- **Badges:** A visual icon unlocked for a special achievement; for example, finishing a mission in an allocated amount of time (Dichev, Dicheva, Angelova, & Agre, 2014).
- **Leaderboards:** Players are ranked on leaderboards to compare their performance against others, depending on the number and/or type of badges and points acquired (Dichev et al., 2014). See Figure 4.

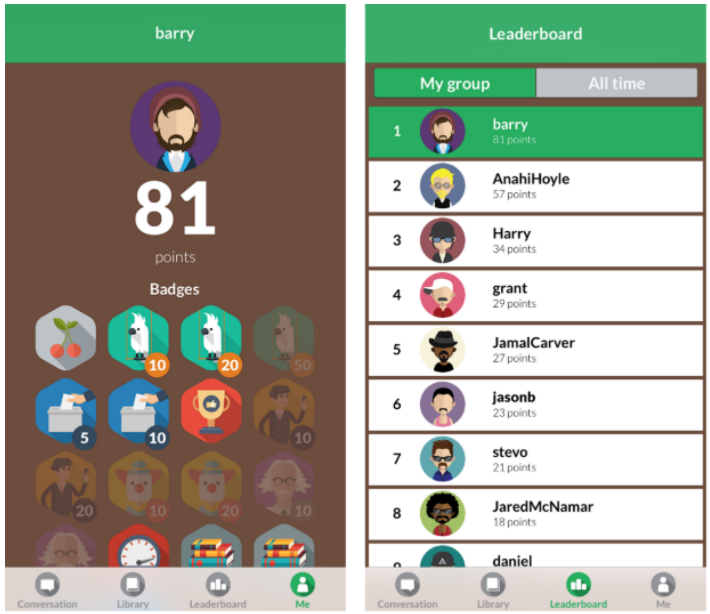

Figure 4. A gamification application reflecting a user's avatar, points, badges and position on the leaderboard (White, Martin, Burns, & Maycock, 2016, p. 7).

- **Countdown timer:** Introduces a challenge by placing pressure on the player to complete a gameplay activity within an allocated time (Hunicke, Leblanc, & Zubek, 2004). For example, the gamification application *Socrative* allows instructors to select how long they want to give their student(s) to complete a quiz. Students' progress is visualised as a Space Race (Socrative, 2018). See Figure 5.

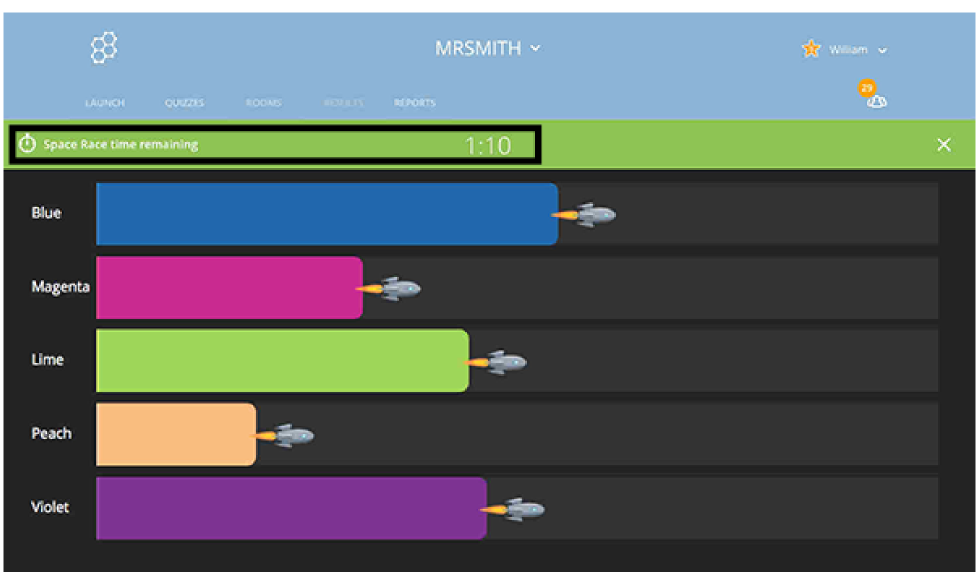

Figure 5. A countdown timer in *Socrative*'s Space Race (Socrative, 2018).

2.4 Related research

Two research studies (AlMarshedi, Wanick, Wills, & Ranchhod, 2017; Noran, 2016) closely relate to this thesis. The conceptual study by AlMarshedi et al. (2017) makes a similar theoretical contribution as this thesis, which is to promote and recognise the influence of social and cultural factors on behaviour and motivation when people are engaging with gamification technologies. Additionally, I discuss a study by Noran (2016), who used action research as a methodology and experiential action learning as a practical approach to underpin gamification in a computer science course. I discuss both studies in more detail below.

2.4.1 The significance of social and cultural elements in gamification research

AlMarshedi et al. (2017) consider the role of cultural and social aspects that influence motivation in the application of gamified applications. The authors argue that gamified applications can incorporate cultural elements to create a familiar experience. AlMarshedi et al. (2017) further suggest employing cultural representation by using metaphors that are encapsulated in popular themes (symbols, jargon, icons, colours and time formats) to evoke familiarity. Familiarity motivates players to perform gamified tasks. In the present study, cultural representation is adapted by appropriating the familiar British game show *Who Wants to Be a Millionaire (Millionaire)* for information systems learning. One could make a strong argument that *Millionaire* is a metaphor for knowledge assessment; that is, in *Millionaire*, general knowledge is assessed through a series of multiple-choice questions.

To understand the effects of social elements on human behaviour and motivation, AlMarshedi et al. (2017) suggest that researchers compare social norms between communitarian and individualistic cultures. The behaviour of people from communitarian cultures is often strongly influenced by the social norms of the group. These people tend to be receptive to gamification strategies that place a strong focus on teamwork to perform gamified tasks. Correspondingly, the adoption of gamification by people in individualistic cultures is likely to be regulated by personal preference, such as the preference to play a game in single-player mode—rarely in multiplayer mode. In light of this, the theoretical contribution by AlMarshedi et al. (2017) acknowledges social contexts and cultural dimensions as key influences affecting user behaviour and motivation through gamified technologies (see Figure 6).

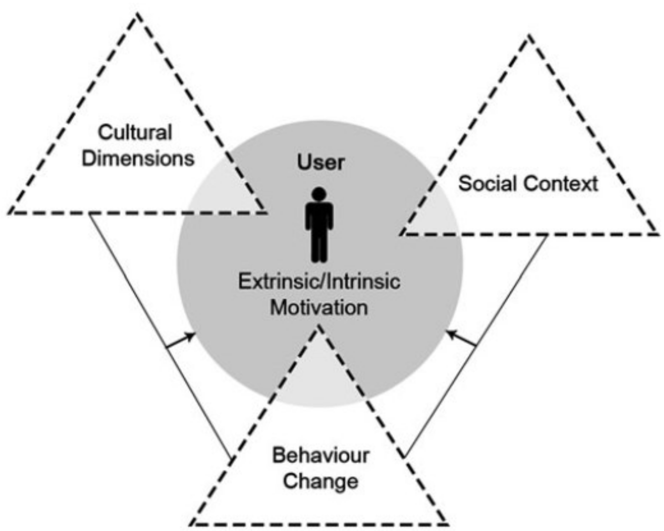

Figure 6. Cultural dimensions, social context and behavioural change as key factors affecting motivation (AlMarshedi et al., 2017, p. 26).

2.4.2 Social and cultural elements that affect experiential and practical gamification

Noran (2016) gamifies action research and experiential action learning in an effort to contribute to teaching and learning theories in computer science. Consistent with the 'action' attribute of action research, the study sought to discover the practicality of gamification to improve teaching and learning in a course on systems analysis and design in an HEI. The study combined various iterative models that characterised processes within which action is taken (see Figure 7). Figure 7 illustrates combined action research (Lewin, 1946), experiential action learning (Kolb, Boyatzis, & Mainemelis, 2001), Deming's plan-do-study-act cycle (Bustard, 2012; Deming & Deming, 1986) and Deming's plan-implement-review-improve cycle (Deming & Deming, 1986).

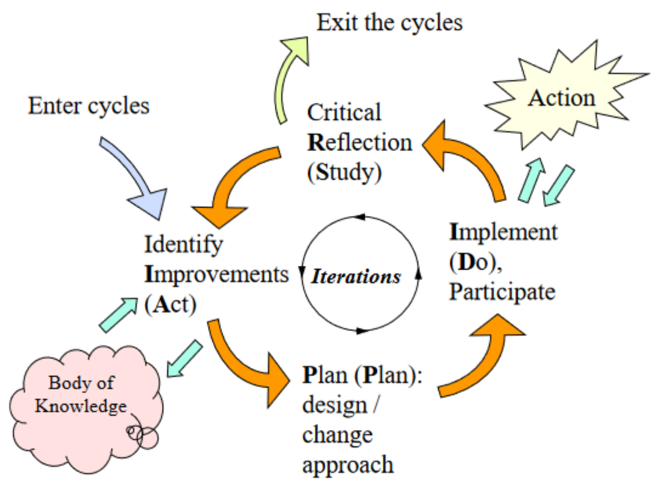

Figure 7. The action research, experiential learning, plan-do-study-act and plan-implement-review-improve cycles combined (Noran, 2016, p. 2).

Identify improvements and plan

The Noran (2016) gamification strategy is consistent with the concept of gamification by Deterding et al. (2011). Under Deterding et al. (2011), gamification is about using game design rather than game-based technology in nongame contexts such as education. Consider Noran aligning the game design concepts of (i) storytelling, (ii) subgoals that focus on risk, (iii) replayability, and (iv) subgoals that focus on rewards to the course content and its assessment items. The idea is to identify any improvements that game concepts might contribute to computer science teaching and learning (Noran, 2016).

i. **Storytelling.** Storytelling (or narrative) is a concept applied across media, such as video games, movies, television and print media. Games incorporate storytelling because they attach purposes to player actions (Palomino, Tota, Oliveira, Cristea, & Isotani, 2019). Campbell's (2004) *The Hero's Journey* is a narrative archetype that is commonly used in games. This narrative involves a hero who embarks on a journey filled with adventure and peril, learns a lesson, applies their knowledge to win a decisive battle, and returns home transformed (Campbell, 2004). Noran (2016) applies storytelling to the purpose of the systems analysis and design course. The story follows a fictitious organisation in its objective of (re)designing some of its important systems. The scenario is aligned with learning objectives using a constructivist approach.

ii. **Subgoals that focus on risk and rewards.** Games typically evaluate player progression using badges, points and rewards that can be obtained through ranking risks. Risks in games refer to the player taking on quests and missions that increase in difficulty. Player skill is typically rewarded with achievement badges or virtual items that the player can trade. In teaching and learning contexts, the 'increasing risk' is emulated by increasing the level of formative and summative evaluations. Furthermore, the concept of rewards in the game is represented by assessment results (e.g., assessment score, positive instructor feedback).

iii. **Replayability.** The nonachievement of subgoals in modern games does not mean automatic failure. Instead, the player incurs a penalty or is allowed another attempt. By analogy, learning and teaching can allow students to make risk-free assessments.

iv. **Reflection and observation.** Players' reflections on their familiarity with the elements of a game make a significant difference in how they experience the game. Therefore, extensive knowledge of in-game components such as strategies, maps, character abilities and unwanted occurrences (like glitches) gives the player a sense of agility insofar as they can influence the game to their advantage. Similarly, reflecting on the results that occur from action research cycles could lead to the improvement of teaching and learning methods. However, observing student behaviour during live gamification lessons provides valuable feedback (Noran, 2016). The following can be observed about players' behaviour during a game: A player may let a game run on (even while not playing) to acquire 'playing hours' towards unlocking a higher level; they may exit a game before being defeated, thereby preventing the defeat from being recorded; or engage in the unethical action of 'stacking', which is using messaging and other 'backdoor' ways to assemble an overtly skilled team. Within a teaching and learning context, the example of Vermeulen et al. (2016) in Section 1.2.2 is a case in point; to reiterate, the authors observed students misusing the automatic feedback mechanism of the gamified system by engaging in repeatedly attempting a question to discern the right answers from the wrong answers probabilistically. According to Noran (2016), it then becomes difficult to determine a player's skill just by analysing statistics; several objective and subjective elements can affect the accuracy of the information.

Implementation and reflection

i. **Storytelling.** As mentioned, the researcher implemented storytelling to explain the purpose of the course. The study adopts storytelling in the form of a diagram that illustrates the life cycle to avoid excluding students based on language and culture: “This was preferred to text [as] due to a variety of factors such as language, culture, etc.” (Noran, 2016, p. 6). The study implemented experiential action learning, which involved students taking lessons that focus on using a software tool to design a computer system according to the system development life cycle.

ii. **Subgoals focusing on risk and rewards.** In Noran’s (2016) study, students were introduced to low-point assessments to reinforce the need for continuous study. Low-point assessments cause a student to feel accomplished and encourage engagement. The associated risk is low; the student only loses a small number of points if they fail the assessment. However, a significant loss of points can be a consequence if the student repeatedly fails the low-points assessments.

iii. **Replayability.** In the Noran (2016) study, replayability is applied by converting assessments the students have taken into self-assessment items. Therefore, the solutions to the self-assessment items must not be released immediately but must rather first be solved by the students. In addition, the solutions include explanations instead of a set of succinct text to describe the correct answer.

iv. **Reflection and observation.** Noran (2016) reports that many of the students, although they had previous experience with games, were sceptical of gamification as a teaching and learning strategy. Students’ scepticism is also experienced by the hero in Campbell’s (2004) book because the call for adventure is into the unknown. Indeed, Noran notes that gamification is a novel approach. However, Landers (2014) would reject Noran (2016) equating games with gamification based on previous experience with games. Subsequently, in Section 2.11.2, I discuss Landers (2014), who distinguishes between games and

> gamification. However, Noran (2016) further reports that opinions were polarised regarding game concepts that should not be included in the experiential learning (implementation) phase. Polarised opinions may be linked to the idea that the motivational affordance of game elements is culturally determined (Vermeulen et al., 2016). For example, during the sixth century before the common era (BCE), the Chinese military implemented the strategic board game, Go, to teach the principles of war (Deterding, 2016). Lastly, Noran (2016) reports that his practical experience as an expert in system analysis and design promoted deep learning and incited interest in the course. In Campbell (2004), the archetypical hero is uncertain about the journey, but a mentor or guardian imparts wisdom, expertise and knowledge to encourage the hero.

Noran's (2016) methodological contribution leverages the iterative nature of action research to facilitate the social and cultural appropriation of game elements for positive teaching and learning outcomes in the field of computer science. Furthermore, that study is an example of the implementation of action research to plan and align game concepts (e.g., narrative archetypes such as the hero's journey) with desired computer science learning outcomes. On a practical level, Noran's study demonstrates that participant observation can check the veracity of purpose, feeling and intent. It is observable that the misuse of game elements compromises the integrity of gamification as a teaching and learning strategy. To this end, practical adjustments can be made to both the social and technical systems to ensure that the game elements are used according to their intended purpose.

2.5 Social cognitive theory

I adopt social cognitive theory as the study's theoretical lens. By deploying this theory, I seek to gain a closer understanding of the impact of social and cultural elements on students' engagement with gamified information systems. Social cognitive theory was created in 1986 by Albert Bandura (1986). The theory rests on an agentic perspective, which holds that humans are self-regulating, self-organising, self-reflecting and proactive beings whose behaviour is shaped by a broad array of social and environmental influences. My selection of social cognitive theory is inspired by the work of Mejias et al. (2015). Mejias et al. advance a convergent exploration of gamification, social cognitive theory and computing science to mediate an interrelationship between institutional culture and games as a social and culturally-based practice. Mejias et al. state:

> [On] creating an ecosystem that can be used to influence a department's culture both inside and outside the classroom. Social cognitive theory states that social interactions act as response-consequence contingencies that help to model appropriate behavior, beliefs and attitudes … Social interactions, the environment and the cognitive models of members of a community, all have reciprocal relationships on each other and influence the culture of a community. Gamification can be used to guide the enculturation of new students to the CS community while giving feedback to current members of the community about the needs and values of other members. Understanding the current culture of the community and its environment is critical to influencing change through gamification. (Mejias et al., 2015, p. 13)

In light of the above, I regard social cognitive theory as an appropriate theoretical lens through which to investigate gamification from a dialectical perspective. I anticipate that in the process of change (trying to effect improved motivation for information systems learning at a university of technology), motivational aspects, demotivational aspects or a mixture of both will emerge in such a context-bound setting. Regardless of the outcome, I also expect that social cognitive theory will produce new knowledge about the participatory aspect of gamifying an information systems course. In the sections below, I examine the central tenets of social cognitive theory as they relate to digital games and information systems.

2.6 Reciprocal determinism in information systems learning

The social and environmental influences on human behaviour are conceptualised in reciprocal determinism. This posits that learning behaviour operates in a dynamic and interactive social setting where personal, environmental and behavioural factors dynamically and bidirectionally exert influence on each other. Bandura schematises this relationship as a triadic causation model (TRC) (see Figure 8).

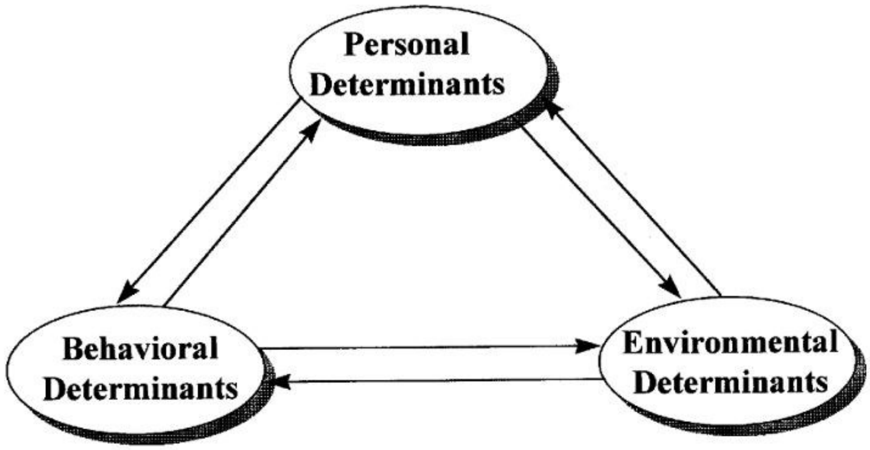

Figure 8. The triadic causation model of social cognitive theory (Bandura, 2001b, p. 266).

The model produces the following types of reciprocal causations: personal ⇔ behavioural, environmental ⇔ personal and behavioural ⇔ environmental. In the next paragraph, I define the three components and additionally draw from Schlebusch (2018) to contextualise the components within IS education.

Personal ⇔ behaviour (p⇔b) maintains that a person's expectations, experiences and beliefs affect their behaviour. In turn, the effect of their actions and behaviour influence their actions and thought patterns, at least partially (Bandura, 2001b). For example, students who enter higher education—regardless of their online skills or experience—generally display positive attitudes toward the internet as a main source for gathering information. Upon discovering that they have inadequate online skills, a student might regard the internet as being less valuable as an information sourcing tool (Schlebusch, 2018).

Environment ⇔ personal (e⇔p) holds that cognitive competencies and human expectations are affected by environmental influences and vice versa (Bandura, 2001b). For example, a lack of sufficient online and computer skills can be attributed to limited access to digital technology (Schlebusch, 2018).

Behaviour ⇔ environment (b⇔e) denotes that a person's behaviour alters environmental conditions; in return, behaviour is partly influenced by the very alterations it causes in the (social) environment (Bandura, 2001b). For example, a student does not gain online skills unless they engage in some form of training or have consistent, reliable computer and internet access (Schlebusch, 2018).

The triadic model can be considered an overarching framework which encapsulates the other principles (behavioural capability, observational learning and efficacy) of social cognitive theory. In the forthcoming sections, I engage with these principles in the context of deploying gamification technology to influence behaviour.

2.7 Behavioural capability

Behaviouristic principles maintain that external and internal stimuli control human action (Bandura, 1977). External stimuli refer to changes in physical contact, smells, tastes, sounds, sights and temperature that can influence the mind and body. For example, noisy learning spaces reduce clarity regarding tasks, to the detriment of learner performance, especially in the case of hearing-impaired learners (Cassidy, 1997). In a gamification context, Nike's immersive fitness app *Zombies, Run!* is an example. The app places players in an apocalyptic scenario where they must complete missions and collect supplies to survive. Players can activate an option that alerts them that they are being chased by zombies and must run 10% faster to avoid being caught and risk losing their supplies (Clarke et al., 2016).

In terms of internal stimuli, behaviourists advocate the view that forces residing inside an individual that can explain behaviour, that is, internal determinants in the form of impulses, drives and needs impel man's diverse list of actions and motives. For example, a hostile impulse would be surmised from an antagonistic behaviour, which is then ascribed to the action of the underlying impulse (Bandura, 1977). Ghaleb, Popa, Hortal, Asteriadis and Weiss (2018) designed machine learning to recognise and predict the affective states of students (frustration, engagement and boredom) while engaging with a gamified platform. Affective state recognition can ostensibly enable the personalisation of gamification for an optimal learning experience. For example, if machine learning detects that a player is bored, it increases the difficulty level of the game.

While Bandura (1977, 2001a) acknowledges the influence of both internal and external stimuli on behaviour, he cautions against dogmatic belief in these two behaviouristic principles. Bandura argues that such theorising implies one-way causation whereby people are reduced to passive receivers of rewards and punishments. Bandura furthermore argues that people are confined as agents of encounters instead of only passive receivers of encounters. From a social cognitive vantage point, these internal determinants cannot possibly account for the variety of behaviours and roles that an individual might exhibit in a different social context and towards different social actors. For example, some games are avoided because of ethical issues such as games depicting strong language, violence and prejudice which are against a belief system.

2.8 Observational learning

Behaviourist principles maintain that change in a person's behaviour is an indicator that learning has occurred (Nabavi, 2012). This inference is based on the perspective that knowledge acquisition is rooted in direct experience, with either punishing or rewarding consequences. Bandura (1977, 1989, 2001b, 2005), however, is of the view that learning can also occur through observation (what he terms *vicarious capability*) and not only through direct experience. Through vicarious learning, the observer perceives the consequential results that accompany the actions of other people. Bandura calls this informative feedback, which guides further behaviour. In other words, informative feedback enables the observer to formulate thoughts about different modes of behaviour and outcomes.

Consider role models, where individuals observe actions and behaviour that can be helpful in learning new skills and norms (Bandura, 1994). Moreover, individuals observe the consequential results (both positive and negative) that accompany the actions of other people. Marsan (2012) opines that the founder of Microsoft, Bill Gates and the founder of *Facebook*, Mark Zuckerberg are not good role models for aspiring tech executives. Despite their success, both these two affluent technologists are college dropouts. Marsan further states: "It would be very difficult for me to encourage my son, who is a freshman in college, to drop out and start a company" (Marsan, 2012, para. 6).

Marsan (2012) found that most prominent tech founders hold a degree. Furthermore, the chief executive officers (CEOs) of tech companies were, in part, appointed contingent on the degrees they held, ranging from undergraduate degrees to PhD degrees, "It appears that the motto for aspiring high tech CEOs should be: the more formal education, the better" (Marsan, 2012, p. 10).

Tim Cook, the present CEO of Apple, holds a Master's of Business Administration (MBA) degree. The actions of the observed—which Bandura (1989, 2001b) calls modelling—comprised three subfunctions; namely, symbolic modelling, retention processes, behavioural production processes and motivational processes.

Symbolic modelling and behavioural production processes

Symbolic modelling means that vicarious experience, on a global scale, transcends the confines of local social environments due to technological advances in video, pictorial and audio material. Behavioural production processes mean that the symbolic conceptions, formed during the symbolic modelling process, are rendered into suitable courses of action. Symbolic modelling is both perilous and advantageous for IS and broader computing education. As a consequence, the conception of symbolic reality by people is subject to remarkable change. The tremendous reach of technology mediums enable vast amounts of information regarding human behaviour patterns, thoughts, values and views to be shared from one society to another. Conversely, certain dominant knowledge systems are perpetuated and sustained through technology (Bandura, 1989, 2001b).

The game industry amplifies symbolic modelling. Game content of virtually unlimited variety is concomitantly transmitted to vast populations across widely dispersed locations. Newzoo (2022) predicts that the games market will globally grow from 2.9 billion players in 2020 to 3.5 billion by 2025. Despite world-wide success, popular and commercial game culture struggle to gain a firm hold in some social settings. In a study conducted at a South African university, Geyser (2018) seeks to decolonise and diversify a game design course. In contrast with players who are firmly established in game culture (skilled players), novices struggle with gaming *registers*. Gee (2003) defined registers as vernacular that is used for a particular purpose, for example, the language used by gamers.

Geyser (2018) identifies novices as second-language English speakers; having English language skills is one of the main requirements for the game design course. Additionally, novices tend to be students who have no or limited access to digital technology, no or limited technical skills and are from resource-poor backgrounds. In contrast, skilled players have extensive gameplay experience and studied the subjects Visual Arts and Information Technology (IT) at the wealthier high schools they had attended.

Retention processes

Observing an event will not have much effect if it is not remembered. Here, the observational learning subfunction, *retention*, is relevant. Retention is the act of absorbing and transmitting information communicated by modelled events through memory representation (Bandura, 2001b). Two representational systems denote observational learning: the *imaginable* and the *verbal*.

Imaginable representation means that a person who is exposed to modelling stimuli produces images of modelled arrangements of behaviour that are relatively retrievable through a process of sensory conditioning. Subsumed in conditions where stimulus activities are strongly associative, a name that is consistently linked to a given individual, place or object almost inevitably invokes imagery of some physical characteristic when it is seen. Consider the GUI of a computer's desktop environment that includes icons of files and folders through which users can browse; the GUI is a metaphor for an office desk. In the West, offices are common knowledge and can serve as a point of reference when learning to operate ICT via the graphical user interface. However, this metaphor might be meaningless for those in developing countries (Dalvit et al., 2008).

The verbal representational system refers to the verbal coding of observed activities. Memory representation that regulates behaviour is mainly verbal, as opposed to visual (Bandura, 2001b). To reiterate, it might be difficult for non-native English speakers to understand gaming registers subsumed in the English language (Geyser, 2018).

Motivational processes: A toyification perspective

Two types of observational learning processes have been discussed earlier: direct and vicarious. Bandura (2001b) identifies a third behaviour type that affects motivation: self-produced behaviour. Self-produced behaviour holds that people conjure intrinsic motivation to steer their behaviour, not only internal stimuli (impulses and emotions) and external stimuli (rewards and punishment). In terms of vicarious learning, the activities that a person chooses to pursue are, therefore, regulated by self-approving reactions that they generate from their own behaviour. Therefore, the activities that people wish to pursue are satisfying for them and evoke a sense of self-worth. Conversely, they reject the activities of which they disapprove.

Bandura's (2001b) conception of motivation aligns with Mead's (1934) conception of play and Zhang's (2008) autonomy and self motivational source (discussed in Chapter 1). Similar to Mead (1934) and Zhang (2008), the self is the principal tenet. While play is primarily undirected and spontaneous (Deterding, 2013a; Stenros, 2015), Tseng and Sun (2017) suggest that play can be cultivated, that is, computer scientists can design for motivational affordance. In Chapter 1, I relied on Zhang (2008) to transfer this theory to IS contexts. To repeat, Zhang (2008) states that the design digital technology must be able to adopt expression of the self.

Digital hardware and software that (besides other uses) are also used for gameplay are material configurations of play and game. That is, a digital application becomes toyified or acquires a toyish function (Thibault & Heljakka, 2019). A toy can serve as a conduit for the self (that is, self-expression); for example, a child who is talking to her doll is probably interacting with the self. In Chapter 1, it is stated that the design and use of digital technology are apparent in gamified IS; however, central to gamification is the process being followed to heighten motivation, not the technology which supports the process (Bíró, 2014). In a similar vein, Thibault and Heljakka (2019, p. 5 emphasis added) state that "toyified entities *invite* [to] playful use both in a metaphorical and practical sense".

For the concept of toyified digital technology to be self-sufficient, it requires examination of the definition of toy. A toy can be an object (for example, a doll, clay or a gadget) or treating another person as a source of amusement or pleasure. A toy, however, cannot be defined only by its exterior qualities (Thibault & Heljakka, 2019). Thibault and Heljakka (2019) offer the concept of toy semiotics to broaden the interpretation of what defines a toy. For example, a doll as a present from a mother to her daughter is merely an object to keep them entertained but in the fictional world of play, the doll 'comes to life' for the child.

Toys, furthermore, "are cultural objects, designed to appeal to a specific audience and therefore rooted in a specific context" (Thibault & Heljakka, 2019, p. 9). An individual who is computer illiterate, for example, might struggle with the use of a game joystick to control a character or object (Naidoo & Raju, 2012; Prensky, 2001, p. 3). Self-reactiveness (or self-regulation) is inevitable to avoid more unwanted outcomes, augment desired outcomes or not address an outcome at all (Bandura, 2001a).

2.9 Efficacy

Self-efficacy is a person's beliefs about their ability to exert a degree of influence over their actions, to produce specific performance outcomes. Individuals with high self-efficacy take on challenging tasks as obstacles to overcome rather than threats to elude. High self-efficacy cultivates strong intrinsic motivation and intensifies engagement with activities. These people set challenging goals, are generally relentless in the pursuit of such goals and if obstacles arise, persevere. After setbacks, individuals with high self-efficacy tend to recover their modes of efficacy (Bandura, 1993, 1994, 1997).

In contrast, individuals with low self-efficacy avoid challenging tasks and consider them personal threats. They show low ambition and exert little effort to achieve goals. When difficult tasks confront them, they tend to reflect on their shortcomings and the possible adverse outcomes instead of focusing on positive performance. They will also be lax in their performance or give up in the face of adversity. Following such setbacks, they tend to be slow in regaining their sense of efficacy. Due to a lack of confidence in their abilities, they consider poor performance as an indication that they are not good enough to accomplish set goals. This, in turn, makes them susceptible to failure (Bandura, 1993, 1994, 1997).

I mentioned earlier that students from underresourced schools indicate a stronger inclination to study computing-related courses (Calitz, Greyling, & Cullen, 2018; Jacobs & Sewry, 2010). These students, therefore, have high IT self-efficacy. IT self-efficacy is regarded by Johnson, Stone and Phillips (2008) as a person's belief that they can pursue a successful career in IT and its related sectors. Lotriet, Matthee and Alexander (2011) caution against the assumption that high IT self-efficacy translates into an intended ICT-related career at the time. Self-efficacy does not always correlate with aspired computer competency, with students (mostly males) overestimating their ICT learning capabilities. According to Bandura (1994), self-efficacy comprises four sources: (i) *enactive mastery experiences*, (ii) *vicarious experience,* (iii) *social persuasion* and (iv) *physiological and affective states*. The subsections below contextualise these four sources within gameplay.

Enactive mastery experiences

Bandura considers the mastery of experiences to be the most effective means of cultivating high self-efficacy. Successful experiences contribute to a robust sense of personal efficacy and in contrast, failures subvert it, especially if those failures occur before firmly constructing a strong sense of efficacy (Bandura, 1993, 1994, 1997). In games, players achieve mastery when they overcome the challenges of the game. That said, a challenge that is too difficult could evoke anxiety; conversely, a player might find a challenge boring if it is too easy (Mejias et al., 2015).

Generally, game designers give players the option to control the game's difficulty level; for example, difficulty levels are presented on a scale of easy/beginner, standard/medium or expert/hard. For educational gamification, Mejias et al. (2015) suggest that instructors gradually increase the difficulty level of tasks. An example is Fotaris, Mastoras, Leinfellner and Rosunally (2016) who used *Millionaire* to examine the effects of gamification for increasing students' engagement in a software development course. *Millionaire* is a television game show that awards a top price of £1 million for correctly engaging in consecutive questions that gradually increase in difficulty.

Vicarious experiences

When people encounter others similar to themselves who succeed in their goals by resilient effort, it tends to heighten their conviction that they, too, can acquire the skills and knowledge that are required to succeed. Correspondingly, seeing others similar to themselves fail despite their best efforts lowers the observer's evaluation of their efficacy and subverts their efforts. "For example, peers higher up on the leader board may serve as 'role models' or targets to which to strive" (Adams, 2016, p. 67). However, people are self-regulatory; hence, they are 'self-models'. For example, a low rank on a leaderboard might evoke a low academic self-concept (Hanus & Fox, 2015).

Social persuasion

Persuading someone that they are capable of mastering activities toward goal fulfilment will likely result in them applying considerably more effort towards desired goal outcomes. This might prevent feelings of self-doubt and dwelling on personal deficiencies after experiencing setbacks (Bandura, 1993, 1994, 1997). I locate the attachment of a leaderboard to a gamified learning task as a form of social persuasion. A leaderboard might increase student motivation to attend to learning content which, in turn, improves effort and consequently, improves learning (Landers et al., 2018). However, as cautioned in the preceding passage, the risk is that a low standing on a leaderboard might demotivate students (Hanus & Fox, 2015).

Physiological and affective states

People perform physical activities that generally involve stamina and strength to judge their physical durability (fatigue, aches and pains) (Bandura, 1994). An example in the context of gamification, is Nike's immersive fitness app *Zombies, Run!* (Clarke et al., 2016) as discussed in Section 2.7. Similarly, people would partly judge their abilities by their emotional states. They rely on tension and reactions to stress to assess the strengths or weaknesses of their performance. Mood, for example, influences the evaluation of efficacy; a despondent mood lowers personal self-efficacy, while a positive mood raises efficacy. An example in the context of gamification, is the use of machine learning to recognise emotions by Ghaleb et al. (2018), which the researchers claim could allow the design of personalised gamification.

The perceptions and interpretations of reactions are more important than the sheer intensity of physical and emotional reactions. Individuals with a strong sense of efficacy probably perceive a positive state of mind as a catalyst for performance, whereas those beset by self-doubt view feelings of dejection as an inhibitor (Bandura, 1994).

Collective efficacy

Bandura (1994, 2000, 2001b) acknowledges that humans do not live their lives with individual autonomy. Indeed, many of the problems that societies face cannot be solved individually, but rather require collective action to produce significant change. A key ingredient of collective efficacy the shared belief of a group of people in the achievement of desired results. In addition to shared skills and knowledge, members of a group need to reach and maintain an equilibrium of interactive, coordinative and dynamic synergy. For example, it is not unusual for a group with well-skilled members to underperform due to their inability to collaborate effectively as a unit. Likewise, Bandura (2000) argues that collective efficacy is an emergent level property rather than the mere sum of individual members' efficacy beliefs.

Collective efficacy in game-based learning materialises in a multiplayer intragroup or intergroup approach. An intragroup involves playing together in a group or competing against other groups. Players in an intragroup seek to achieve the group's goals through collaboration between group members; for example, outplaying other groups. The intergroup seeks to play according to rules and goals that constitute the collaborative game-based learning environment; for example, the intergroup collectively seeks to enhance learning processes (Moccozet, Tardy, Opprecht, & Leonard, 2013; Romero et al., 2012).

Collaborative game-based learning has advantages and drawbacks. An advantage is that players develop and enhance interpersonal competencies, decision-making and creative problem-solving with no significant real-life risks (Romero et al., 2012); that is, games instil the concept that students can fail at a task and replay it without serious risk (Han, 2015). The 'free rider' problem is a drawback of collaborative game-based learning; that is, a single score awarded to all members could feel unfair, based on personal effort being attributed to group work or general collaboration (Moccozet et al., 2013).

2.10 A social cognitive analysis of 'intelligent' information systems

Bandura's (1977) criticism of early behaviouristic principles set the tone for his agentic perspective. To reiterate, internal stimuli and external forces are not the only determinants producing behavioural change; to some degree, social interaction and self-interaction allow an individual to control or alter their behaviour. Before Bandura's espousal of this view, doctrines that depicted behaviour as prompted by internal forces were likened to computational abilities. With the advent of computers, the human mind was a metaphor for a biological calculator and the functions that computers were capable of performing were representational of the actions that the human mind inspires. Thus, a perception was formed, supported and promoted that computers are capable of regulative human thought and cognitive operations, to exhibit problem-solving behaviour (Bandura, 2001a).

This quest of man to immortalise his intellectual thought in computer technology culminated in the creation of artificial intelligence (Konar, 2018). The phrase AI is defined by Konar (2018, p. 15) as "the simulation of human intelligence on a machine, so as to make the machine efficient to identify and use the right piece of 'Knowledge' at a given step of solving a problem". Computers in the domain of AI replicate human capabilities by using, for example, biometric systems (for example, facial and speech recognition software) and autonomous systems (for example, self-driving cars and chatbots). To accomplish these impressive feats, AI uses machine learning. Computer applications apply rigid algorithms written by humans, whereas ML algorithms can analyse a dataset, learn from it and perform actions. In this sense, AI is—to some extent—capable of mimicking cognitive tasks that humans commonly undertake.

2.10.1 AI and gamification

Bandura (2001a) acknowledges that AI is capable of emulating cognitive abilities. Moreover, Kim and Baylor (2006) criticise the tendency to characterise social cognitive traits as if they are unique to humans. In agreement, Strasser (2017) promotes a less human-centred perspective and is critical of biological constraints that dismiss agency in AI. Strasser suggests that socio-cognitive abilities—even if only in a minimal sense—can be expanded to AI as well. In this vein, compelling arguments view AI as a means to instil strong efficacy beliefs in their human counterparts. Where AI converge with gamification, a strong focus is on the predictive capability of ML to personalise gamified learning processes. Examples include Ghaleb et al. (2018) as discussed in Section 2.7. Other similar studies include Barata, Gama, Jorge and Gonçalves (2015) and Knutas, Granato, Van Roy, Kasurinen, Hynninen and Ikonen (2017).

Barata et al. (2015) apply an ML method, in particular, cluster analysis to cluster students' performance in an IS and computer engineering course. Students are clustered in gamified tasks according to four distinct student types, namely *achievers*, *disheartened*, *underachievers* and *late* *awakeners*. The tasks were gamified insofar as students, for example, would earn experience points for finding software bugs. Experience points were displayed on a leaderboard. Cluster analysis discerns distinctive patterns, revealed from accumulated experience points and plotted over time to identify student types. Based on this feedback, gamification can be personalised to cater for different student profiles.

To make gamification more user-centric, Knutas et al. (2017) apply the creation of ML rules with AI. AI trains the algorithms of computer-supported collaborative learning platforms to provide personalised gamified tasks. AI suggestions of personalised tasks are triggered by different player types and actions. For example, a student who fits the philantropist player type is motivated by purpose, is altruistic and inclined to assist other players without the expectation of a reward. AI then customises the gamified task in a way that requires the player to help low-skilled players; for example, it creates a quest (a game element commonly used in video games) that involves helping another player with an unsolved task.

This brief review emphasises the contribution of AI to facilitate motivational outcomes (Baylor & Kim, 2004). Baylor and Kim (2004) regard AI as artificial agents rather than mere computational tools. In this vein, the social cognitivism that ML expresses above accords with Bandura's (2000, 2001a) concept of *proxy agency*. In proxy agency, an individual (in part) relies on those who either have expertise or resources at their disposal or the influence to help them reach a desired outcome. As shown, AI researchers train ML to optimise learning goal attainment by structuring context-driven, personalised games and gamification.

While Bandura (2001a) recognises the success of AI in replicating human cognition, he rejects bolder inferences that computers can become conscious in future, that is, become capable of replicating the human mind. Bandura briefly draws from Descartes to argue against the idea that the human mind can be mapped digitally onto a computational system. Proponents of this idea view human thought as separate from corporeal existence. However, ML remains dependent on computer hardware (Versace & Chandler, 2010). I explore these views in more detail (in the following section) by examining the notion of a 'conscious' information system based on the

Cartesian perspective. I conclude with a social cognitive stance of gamified information systems within the realm of AI.

2.10.2 Intelligent information systems

In this section, I rely on Descartes (1985a, 1985b) to argue that the sociotechnical perspective of information systems is not feasible in the field of AI. Descartes (1985a) pondered whether it might be possible for machines to evolve to the extent that they are phenomenologically indistinguishable from humans (Nath, 2010). I draw on Goldstine (1977) to trace the evolution of machines, culminating in current advanced computers like AI.

The first computer was invented by a German professor, Wilhelm Schichard, in 1623. Schichard designed the first mechanical calculator that could execute the operations of addition and subtraction and (partly) the operations of multiplication and division. Oblivious to the existence of Schichard's device, the French mathematician Blaise Pascal also created a machine for addition and subtraction in 1642–1644 (Goldstine, 1977). Inspired by Pascal's ideas, the German mathematician Gottfried Liebniz invented the Liebniz Wheel in 1673. Liebniz added a divider and multiplier unit. In 1823, the English mathematician and mechanical engineer Charles Babbage built the Difference Engine, a machine that could compute tables of numbers to construct a printed nautical almanack (a set of tables generated annually that include, among others, indicating a position in longitude at sea) (Goldstine, 1977).

In 1833, the English mathematician Ada Lovelace witnessed Babbage demonstrating his Difference Engin. Lovelace attended further lectures about the engine by Professor Dionysius Lardner, an Irish scientific writer. In addition, Byron studied Babbage's engineering drawings (Hollings, Martin, & Rice, 2017). Lovelace collaborated with Babbage on a new mechanical computer called the Analytical Engine. In 1843, Lovelace published extensive notes identifying the machine's potential for performing algebraical operations, detailing them in complex mathematical programs. Her work led to her being characterised as the world's first computer programmer. Since then, several engineers have further developed and improved the computer (Goldstine, 1977), which culminated in today's AI.

In light of the above, I juxtapose Cartesian dualism with AI's attempt to replicate human intelligence. Cartesian dualism takes the perspective that the mind is not a physical object. In this view, the mind and body is separate. Furthermore, the mind is considered to be consciousness, which is apart from the the brain, which is considered to be the seat of intelligence. This description alone would be enough for Descartes to reject the notion of 'conscious AI'. For example, Descartes would reject Versace and Chandler's (2010) concept of 'thinking ICT', which draws from the notion that ICT can be designed to mimic intelligent behaviour. Indeed, the researchers describe their "brain-inspired micoprocessor" as "a mind" (Versace & Chandler, 2010, p. 35).

Inferring AI computers with minds suggest we can attribute free will, knowledge and belief to a computer. AI scientists regard mental attributes such as intelligence and thinking as mere properties of complex brain functions. That is, these properties are algorithmic features executed by the brain. To wit, that non-biological systems can give rise to conscious experience. For AI researchers, rich causation occurs in the mind; what they refer to as *computational processes*. Each neuron in the brain has a causal link with other neurons, thus, the causal pattern between neurons constitutes consciousness (Versace & Chandler, 2010).

I draw from Bundy (2017) and Fjelland (2020) to argue that the concept of concious AI is not conceivable. First, AI is also labelled 'strong AI'—also known as artificial general intelligence (AGI). These concepts derive from perspectives that consider human intelligence to be a general phenomenon that ICTs can replicate. Strong AI is contrasted with weak AI or artificial narrow intelligence (ANI). These concepts are based on the observation that AI's abilities are limited to specific actions, activities and tasks. As an example, consider the chess-playing AI *Deep Blue.* In 1997, Garry Kasparov—a chess world champion—was defeated by *Deep Blue* in a chess match. *Deep Blue*'s reproduction of intelligence is formidable and outstanding but one can hardly suggest that it had acquired human intelligence (Bundy, 2017; Fjelland, 2020).

A set of broader views emanates from mind–body dualism such as the relationship between subject and object (Descartes, 1985a, 1985b). Subject–object dualism can also be observed in Versace and Chandler's (2010) brain-inspired microprocessor. The researchers ponder whether these chips will "'experience' vision and emotions by simulating and appropriately connecting the brain areas known to be involved in the subjective experience associated with them?” (Versace & Chandler, 2010, p. 37). The authors promptly conclude that it is too early for such questioning; however, they insist that their goal “is not to replicate subjective experience—consciousness—in a chip”; instead they seek to build an intelligent machine that are not restricted by human emotions and feelings (Versace & Chandler, 2010, p. 37).

Cartesian dualism regard subjectivism and thought the same as the "thing that thinks" (Descartes, 1985b, p. 18). Moreover, the necessary condition for thought is consciousness, which the *I* posesses. According to Descartes, the *I* is "a thing that thinks; that is, I am mind, or intelligence, or intellect, or reason" (1985b, p. 18). Therefore, I’s experience of reality is subjective. As a consequence, it is impossible to map the mind onto a computational system. Similarly, the theory of the *I* invalidates the notion of the computational mind. In this regard, Descartes suggests that the human mind has inherently ingrained proclivities that are not reproduced by the senses (Nath, 2010).

Descartes (1985a) distinguishes language as an innate ability of man. Whereas AI shows strong potential to mimic human actions as accurately as possible for practical purposes, two definitive means allow us to recognise that the most advanced machines are not human (Versace & Chandler, 2010). First, intelligent information systems would never be capable of formulating words or other signs like humans can in articulating our thoughts to others. Descartes (1985a) successfully predicted that machines would advance insofar as they would be able to utter words, even to the extent that uttered words correspond with bodily actions that initiate a response in their organs. For example, if one touches it in a specific way or in a specific spot, it asks if you want something from it or expresses pain as an indication that you are hurting it (see Tian et al., 2017).

Second, despite the humanlike behaviour described above, Descartes (1985a) maintained that these machines are incapable of formulating various arrangements of words to give a meaningful response to human dialogue, not even to the extent that the dullest of humans are able to (Nath, 2010). Consider parrots, they can utter words as well as humans do, yet they are incapable of thinking about what they are saying. In a related vein, humans who are born deaf and therefore deprived of using their speech organs, generally invent and adopt their own signs to interact and communicate their thoughts. For Descartes, it is important not to confuse speech with the natural interactions that animals and machines can imitate; indeed, both entities display more skills than humans in certain areas, yet it is important to concede that both display none at all in many other areas (Descartes, 1985a).

In areas where animals and machines demonstrate 'intelligence' that exceeds that of humans, external stimuli exert influence on the animal's organs or the machine's parts. For instance, an analogue clock is constructed of only springs and wheels yet it can measure time better than we can with all our wisdom (Descartes, 1985b). AI might perform as well as we do or even better; it is, however, inevitable that it will fail at some tasks. As mentioned, the subjective mind cannot be replicated in digital format. Consistent with Descartes, Fjelland (2020) points out that AI is not participating in the social, subjective world. Instead, artificial intelligence is an assembly of numbers and algorithms. Thus, acquiring knowledge about the subjective mind does not warrant a thorough investigation and measurement of the chemistry of the brain. Instead, learning about another person requires engaging with their subjective lifeworld.

2.11 Qualitative exploration of gamified information systems in higher education institutions: A systematic review

2.11.1 Introduction

In Chapter 1, I advanced games (and play) as fundamentally social and cultural products. However, existing gamification literature mostly focuses on studies deploying quantitative methods to measure user experience and motivation (Landers & Landers, 2014). I reject the use of quantitative methods in gamification studies, based on the view that subjective phenomena such as social and cultural experiences are not measurable (Wells, 1996). In this systematic literature review, I call upon gamification researchers to deploy qualitative methods to obtain an understanding of the value that social and cultural views on gamification can contribute to the study of motivation. As stated in Chapter 1, social and cultural influences inform student motivation and action in learning (Vygotsky, 1978).

Osatuyi et al. (2018) conducted a systematic review of gamification in Information Systems teaching and learning, and found that although qualitative methods in gamification research produce more in-depth analysis, few publications deployed qualitative methods. The present review summarises the benefits (and shortcomings) of research studies taking a qualitative approach, to obtain new insights into the impact of gamified information systems on student motivation. Note that qualitative methods, which are situated in the philosophical assumptions of interpretivism, are of interest here. In addition, I recognise that qualitative methods can also be deployed for positivist research (Hovorka & Lee, 2010; Munkvold & Bygstad, 2016). This positivist/interpretive debate, as it relates to qualitative research, is discussed in additional detail in Chapter 3.

This review aligns the social and cultural dynamics that are interwoven in gamified information systems with the concept of information ecology. Nardi and O'Day define an information ecology as "a system of people, practices, values, and technologies in a particular local environment" (1999, p. 1). In information ecology, the relationship between people and technology is codependent (Nardi & O'Day, 1999) and is congruent with Lee's (2004) explanation of the relationship between the social system and the technical systems (information systems). Examining the values that emerge from the mutual transformational interaction produces an improved understanding of people's actions (practices) and understanding of technology (Nardi & O'Day, 1999). I ground this review in the following research question: How do qualitative IS studies approach gamification implementation within an information ecology?

Hermeneutics (to be discussed in Chapter 3) is the theoretical lens for gaining insights into the social and cultural dynamics in the information ecology of gamification. The review proceeds as follows: (1) an overview of the process I followed to determine the studies to be excluded and included in the review; (2) an overview of the process I used to select the relevant database and additional exclusion criteria applied to narrow qualitative papers; (3) I articulate my formulation of 'units of analysis', based on the parts of information ecology, to classify the enactment of qualitative methods in gamification; (4) I then describe how social and cultural dynamics are implemented in qualitative gamification and (5) the review concludes and contributes to IS knowledge on gamified information systems.

2.11.2 Inclusion and exclusion criteria

I applied selection criteria to determine which studies to exclude and include in the review, based on the following criteria (Kitchenham & Charters, 2007): whether the search string is an accurate representation of the review's research question and whether the papers to be extracted properly address the review's research question.

I only selected 'gamif *' as the search criteria, thus discarding its antecedent 'game *' from the search criteria. If I include 'game *' in the search criteria, it would imply that the use of games and gamification to increase student motivation are the same, which they are not. I agree with Landers (2014, p. 754) that the two phenomena differ insofar as "games incorporate a mixture of all game elements, whereas gamification involves the identification, extraction, and application of individual game elements or limited, meaningful combinations of those elements".

Elsewhere, Landers and colleagues (2019) abandon the term *non-game context* in favour of the terms *non-game*, *less gameful* and *not gameful*. The authors present a continuum in which there are gameful systems, ranging from less gameful to fully gameful (see Figure 9). Hypothetically, the extraction and application of individual elements of the game in non-game contexts produce no gameful experience; for example, the use of a progress bar to monitor the completion status of non-game tasks such as filling out a survey. In contrast, games (for example, video games) are 'completely gameful', providing a (full) gameful experience (Landers, 2014).

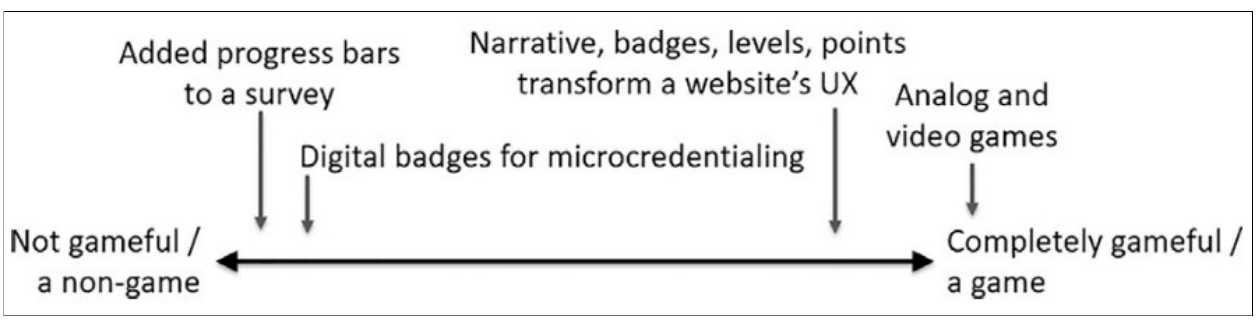

Figure 9. A continuum of gameful systems. UX = User Experience (Landers et al., 2019, p. 85).

Pelling (2002, para. 1) was the first to use the word 'gamification' when he established the company Conundra in 2002. Conundra invoked Moore's (1965) law to proclaim that in the age of rapid technological advancement and technology development processes "every device will become like a game". One can observe the application of gamification before and after Pelling

(2002, para. 1) created the term. Indeed, earlier examples of gamification appear to be no different to incentive schemes. An example is Chang, Kannan and Whinston's (1999) study on online marketers offering reward points, cash and discounts in exchange for customer reviews of a product or client tips on a product and other consumer information. However, neither researchers nor online marketers explicitly refer to the term gamification. Indeed, a pilot search indicates no use of the term in academic publications prior to 2010.

In 2008, Brett Terril referred to the term 'gam**e**ification' in a blog post covering his attendance at the 2008 Social Gaming Summit. Gam**e**ification is defined by Terril as "taking game mechanics and applying them to other web properties to increase engagement" (Roncone & Massari, 2022, p. 3). A pilot search of the literature indicates only one reoccurence of 'gam**e**ification' in a study by Landers and Callan (2011). In light of that, I limit the search string to the term 'gamif*', searching for papers published from January 2010 as the starting year when the term gamification became widely adopted in academic publications (Thiebes et al., 2014). The papers that were found are predominantly quantitative and persist with incentivising gamification. For example, several gamification studies (Davis & Klein, 2015; McDaniel & Fanfarelli, 2016; Wallis & Martinez, 2013) investigate the use of badges to reward students for gaining new skills and knowledge.

Bogost (2011) rejects the term gamification, based on its incentivisation characteristics; he argues that it suggests easy replication of game design features. Bogost remarks, "-ification involves simple, repeatable … you can purify, beautify, falsify, terrify, and so forth. … [j]ust add points" (Bogost, 2011, para. 11). Bogost regards the allocation of game rewards such as points as exploitationware and decries the exploitation of players via the use of external rewards (points, badges and leaderboards) as the main motivational source. From this, Bogost concludes that the addition of gamification (individual game elements) to a process or thing does not mean the process or thing is a game or game-like. By excluding "game*" from the search string, I dissociate this review from perspectives that conflate games and gamification.

Furthermore, some papers were discarded based on additional exclusion criteria and papers that mention "gamif*" but do not apply or embark on an extensive gamification process. An example is a study by Wardrip, Abramovich and Kim (2016). First, the term *gamification* appears only three times in the text. Second, the authors state that "badges can be considered a game mechanic or a type of gamification" (Wardrip et al., 2016, p. 240). Bogost (2015) notes that gamifiers are oblivious to game designers' idea of incorporating purpose-built features to afford fun and motivation and its mutual transformational link with game components such as game dynamics. Bogost criticises gamifiers for '-ifying' and promoting game elements as a solution for low motivation and engagement.

I further excluded papers not written in English (Donnell, 2017); studies that investigated fully-fledged or serious games; papers that are a workshop, keynote, review, panel discussion, work-in-progress, dissertation or book (Schlagenhaufer, Amberg, & Michael, 2015); nonempirical research (Kitchenham & Charters, 2007) and studies that did not focus on higher education. I do not immediately exclude gamification studies using the quantitative or mixed-method (the use of both quantitative and qualitative methods) approaches. This is simply for comparative purposes, insofar as I seek to observe whether quantitative methods remain a dominant approach in gamification research (Osatuyi et al., 2018).

2.11.3 Database searches

I limit this review to gamification studies in the IS discipline. Webster and Watson (2002) note that the seminal work of a discipline is likely to be published in its leading journals. According to the Association of Information Systems (AIS) (AIS, 2018), the eight top information systems journals (listed from highest to lowest ranking) are the *Management Information Systems Quarterly (MISQ*), *Journal of the Association for Information Systems* (*JAIS*), *Journal of Strategic Information Systems* (*JSIS*), *European Journal of Information Systems* (*EJIS*), *Information Systems Journal* (*ISJ*), *Journal of Information Technology* (*JIT*), *Journal of Management Information Systems* (*JMIS*) and *Information Systems Research* (*ISR*).

These journals published little gamification research. I also found that studies lacked focus on educational settings. Indeed, studies predominantly focus on gamifying business and marketing processes. I followed Webster and Watson's (2002) suggestion of including "conference proceedings, especially those with a reputation for quality" in my search (2002, p. xvi). According to Webster and Watson (2002), such inclusion strengthens the dataset and expands the reach of selection criteria. Therefore, I queried conference proceedings that are stored in the AIS electronic

Library (AISeL) and the ACM digital library (ACM DL). The AISeL and ACM DL also contained little gamification research and lacked focus on higher education institutions. Therefore, I decided to include the journals *Computers in Human Behaviour* (CHB) and *Computers and Education* (C&E) stored in the *ScienceDirect* database, which in turn, is published by Elsevier. To further strenghen the dataset, I included peer-reviewed book chapters hosted in the *SpringerLink* database. Table 1 summarises the gamification studies in reputable IS journals and conferences from 2010 to 2022.

Table 1

Publications that published gamification studies from 2010 to 2022

Journals / Conference proceedings	2010–2011	2012–2013	2014–2015	2016–2017	2018–2019	2020–2022	Total
ACM	3	40	78	60	56	20	257
AISeL	0	5	16	36	18	2	77
C&E	0	1	4	6	10	0	21
CHB	0	1	4	23	8	2	38
EJIS	0	0	0	0	0	0	0
ISJ	0	0	0	0	0	0	0
ISR	0	0	0	0	0	0	0
JAIS	0	0	0	0	1	0	1
JIT	0	0	0	0	0	0	0
JMIS	0	0	0	1	0	0	1
JSIS	0	0	0	0	1	0	1
MISQ	0	0	0	1	0	0	1
Springer	1	1	6	5	12	15	40
Total	4	48	108	132	106	39	437

The diminishing number of research studies from 2018 in IS publications, ACM and AISeL is noteworthy. Swacha (2022) attributes such decline to practitioners realising that gamification more often produces unwanted outcomes than it produces the desired outcomes. Despite diminishing gamification studies in the IS field, Swacha (2022) expects gamification to remain a research topic of interest owing to IS researchers who seek better understanding and to tease out the success factors that can help produce successful gamified IS. Nevertheless, I discarded the papers that employed both quantitative and mixed-method approaches. In Chapter 3 (Section 3.5.1), I draw on the symbolic interactionist, Herbert Blumer (1986), to reject the use of quantitative methods in gamification studies. Although a mixed-method approach includes qualitative data, the approach is problematic insofar as the quantitative methods being used to analyse qualitative data.

2.11.4 Concept classification scheme

I rely on the *concept-centric* matrix Webster and Watson (2002) to summarise the remaining qualitative gamification studies. Webster and Watson (2002) argue that a systematic review is concept-centric. The authors recommend that reviewers use their *concept matrix augmented with units of analysis* approach when compiling a concept matrix. As an example, Webster and Watson (2002) invoke Te'eni (2001) to demonstrate the matrix. Te'eni suggests that the meaning of 'communication strategy' varies across organisational, group and individual levels. Webster and Watson (2002) demonstrate each respective level as a unit of analysis that links to key concepts which relate to communication strategy. In turn, the literature can be summarised by units of analysis to discover a recognisable phenomenon (see Figure 10).

Table 3. Concept Matrix Augmented with Units of Analysis

Articles	Concepts														
	A			B			C			D			...		
Unit of analysis	O	G	I	O	G	I	O	G	I	O	G	I	O	G	I
1					✖				✖						✖
2	✖				✖	✖		✖							
...								✖	✖			✖			

Legend: O (organizational), G (group), I (individual)

Figure 10. The concept matrix augmented with units of analysis (Webster & Watson, 2002, p. xvii).

I position the parts of Nardi and O'Day's (1999) information ecology as the units of analysis for this review (see
Table 2).

Table 2

The parts of an information ecology (Nardi & O'Day, 1999)

Parts	Description
Diversity	The design and use of technology in diverse social settings.
Locality	The design of technology to meet local needs.

Keystone Species	People with unique skillsets to facilitate and support proficient technology use.
System and Coevolution	The importance of interconnectedness amongst the different constituents of an information system; through an iterative process, collaborative reflection on the impact that changes have on ICT occurs between constituents.

I observe strong concepts of 'design' (abbreviated as '*D*'), 'use' (abbreviated as '*U*') and 'social and cultural' aspects (abbreviated as '*S & C*') of technology in the diversity and locality parts. I assigned 'participatory design' as a subconcept to the keystone species part, signifying the involvement and input of end-users (for example, teachers and students) in information system design for sustainable use, not only that of system designers. Such species do not necessarily need to be technology proficient but can be individuals who have a propensity to teach others. For example, Nardi and O'Day (1999) support the idea of software and network product companies hiring technical support staff with little or no previous ICT experience (for example, cocktail waitresses, social workers, teachers); these individuals are called natural teachers and often outperform highly skilled technical workers in helping others solve problems.

Keystone species need to repeatedly and continuously reflect on whether technological innovation is systematic, that is, whether the information systems improve their technical, social and knowledge systems. For example, students, teachers and ICT designers must evaluate whether technological innovation transpires into improved student engagement. From the coevolution part, I observe and offer the concept of end-users who collaboratively engage in an iterative process to improve information system design and usage. This concept is inspired by the cyclical nature of action research (this dissertation's methodology, discussed in in Chapter 3). Table 3 illustrates the concept matrix based on information ecology parts, the authors' conception of units of analysis and found studies.

Table 3

Concept matrix supplemented with units of analysis (Webster & Watson, 2002)

				Concepts							
				Diversity			Locality			System and coevolution	Keystone species
				Units of Analysis							
Article	Journal/ Conference	Publisher	Year	*D*	*U*	*S & C*	*D*	*U*	*S & C*	Iterative process	Participatory design
(Wallis & Martinez, 2013)	SIGUCCS	ACM	2013	x	x		x	x			x
(Chakraborty, 2015)	C&C	ACM	2015		x		x	x			
(Kaiser & Schmitz, 2015)	PerDis	ACM	2015		x			x	x		
(Talaei-Khoei, Kerr, & Motiwalla, 2018)	AMCIS	AIS	2018		x		x		x		x
(Van Roy, Deterding, & Zaman, 2018)	CHI	ACM	2018		x		x	x			
(Aldemir et al., 2018)	CHB	Elsevier	2018	x	x	x	x	x	x	x	x
(Khan & Zhao, 2021)	I3E	Springer	2021		x			x			
(Van Der Poll et al., 2021)	I3E	Springer	2021	x	x			x		x	x
(Zhang & Chen, 2021)	ICBDE	ACM	2021								

2.11.5 Discussion

Table 3 illustrates that few evidence-based qualitative papers have been published to analyse the use of gamification in the IS field between 2010 and 2022. In 2013, only one paper was published. In 2015, two papers were published. In 2016, no papers were published. In 2018, three papers were published. In 2019 and 2020, no papers were published. In 2021, three papers were published. In 2022, no papers were published. It is also noteworthy that only nine of the 437 papers in Table 1 are qualitative studies, highlighting the insufficient number of qualitative studies in gamification research. Below, I synthesise the relevant papers to the concepts of an information ecology (Nardi & O'Day, 1999).

Diversity

To strengthen the relevance of diversity in gamified information systems, I reconcile the concept with Klein and Myers's (1999, p. 77) hermeneutic "principle of multiple interpretations" in IS research. This principle maintains that Information Systems inquiry should devote attention to the multifactorial aspects that emerge in the adoption of digital technology. Wallis and Martinez (2013) juxtapose the design of proprietary gamified software with open-source gamification platforms; i.e., although proprietary software provides better technical support, practitioners can customise open-source platforms according to user needs.

Khan and Zhao's (2021) study provides an example of diversifying usage. The authors deploy a game called *Cities Skyline*. *Cities Skyline* is a simulation game enabling players to develop functional cities by managing public transport, developing roads, zoning districts and so forth. Although *Cities Skyline* is not an educational game, Khan and Zhao (2021) attempt to employ it as a teaching tool. Specifically, that study involves leveraging the game's platform to assess the knowledge of students of an Urban and Regional Planning and Real Estate Management course. Cities Skyline only offers single-player mode, hence, restricting collaborative learning. To address the issue, Khan and Zhao (2021) assigned students to groups of two to allow knowledge exchange before providing training on installing and playing the game.

Locality

In the context of gamification, locality means that game elements should fit the situated context of learning. Klein and Myers's (1999, p. 77) "principle of multiple interpretations" is relevant for drawing a correlation between locality and information systems. This principle holds that research must be receptive to many and diverse narratives that stemmed from the same sequence of phenomena. The study by Aldemir et al. (2018) can be aligned with the design, usage and social and cultural aspects of locality. The researchers examine gamification as a strategy to help foreign language education and early childhood education students gain digital literacy to support learning. The authors reorganised learning objectives by integrating narrative into game elements. The narrative is inspired by the popular cultural phenomenon, the *Harry Potter* series. For example, a 'school of magic' was created. In this school, students progress from apprentice (from the start of semester) to master (end of the semester). Students are furthermore given quests to complete for which they earn a set of badges called The Way of the Apprentice.

However, the locality concept also highlights that the role of indigeneity cannot be ignored in the process of gamifying information systems. In Chapter 1, I point out how indigenous traits are often at odds with Western epistemology. Gamification, being a derivative of digital games, reflects Western epistemology. This is the case in a study by Zhang and Chen (2021) where game elements cannot deal with student anxiety relating to a lack of proficiency in English. A participant in Zhang and Chen's (2021, p. 3) study felt anxious because of insufficient English skills. The student states, "even if I am given a large number of magic stones, I still do not want to answer questions. It is not the matter of the number of stones in each task. I am just not willing to do that" (Zhang & Chen, 2021, p. 3).

Keystone species

This thesis assumes that designers, educators, researchers and students are important role players in a proficient gamified information system. Nardi and O'Day (1999) emphasise participatory design for the successful adoption of digital technology in a local context. Keystone species are consistent with Klein and Myers's (1999, p. 81) "principle of interaction between the researcher(s) and the subjects" in IS research. The principle espouses the interaction between interpreters of digital technology with the social actors who encounter technology as a means of co-analysis and interpretation.

Five studies (Aldemir et al., 2018; Loos & Crosby, 2017; Talaei-Khoei et al., 2018; Van Der Poll et al., 2021; Wallis & Martinez, 2013) offer or consider gamification environments where both student and instructor contribute to gamification implementation. The open-source platforms some of these studies utilised enable customisation for player needs. Open-source platforms, therefore, are valuable, considering that game practitioners and users rarely co-design technical systems with designers. In such instances, designers should, at least, provide technical support and customisable features for a localised, user-centred gamification strategy.

System and coevolution

To reiterate, for Nardi and O'Day (1999), the system part is marked by interdependencies, if one element changes the change is felt throughout the ecology. Khan and Zhao (2021) highlight a disconnect in *Cities Skyline*'s information ecology. For example, a student remarks how players cannot implement their knowledge about car-free zones in *Cities Skyline* because the game does not provide the option to create car-free zones.

Thus, keystone species emphasise the importance of participatory design for sustainable gamification. Participatory design should not be a one-off endeavour but should be marked by many or endless iterative processes to coevolve user needs and deal with ongoing changes. For qualitative research, Klein and Myers (1999) promote the use of the hermeneutic circle in qualitative IS research. The iterative nature of the hermeneutic circle is consistent with the conception of iteration in information ecology, that is, the bidirectional interaction between the whole and parts.

Methodologies like action research and design research are apt, for they involve multiple iterations. Aldemir et al. (2018) utilise an iterative approach, the 6D gamification design framework (see Werbach, 2014). Aldemir et al. (2018) claim that the framework helped to refine gamification process and adapt to changes. Van Der Poll et al. (2021) deploy action reseach as a methodology with the objective (among others) of improving team collaboration. For example, in the first action research cycle, team formation, was random. Random team formation resulted in poor team communication because team members did not know each other, despite being in the same class group. To address this problem, students were given the option to select their own teammates for the second cycle. This team formation style is inspired by the idea that a student will interact better with a friend they trust.

2.11.6 Summary: The proposed whole and parts of qualitative gamification studies in information systems education

I drew from the principles of hemeneutics to highlight the value of qualitative approaches to produce positive outcomes from gamification (see Figure 11). First, qualitative studies include diverse points of view aiming to tailor a customised gamification setting to their contexts. Second, these studies advocate for a participatory and collaborative relationship between all stakeholders (designers, educators and students) for inclusive gamification. Lastly, an iterative process could help stakeholders sustain the ongoing use of the gamification information system. While this review reveals that qualitative research techniques and methods cultivate conditions to produce meaning for successful gamification, it also indicates that IS research lacks knowledge of cultural and social dynamics that influence the effectiveness of gamification. I believe that qualitative approaches can shed more light on the social and cultural aspects affecting the outcome of gamification as a learning strategy in IS education.

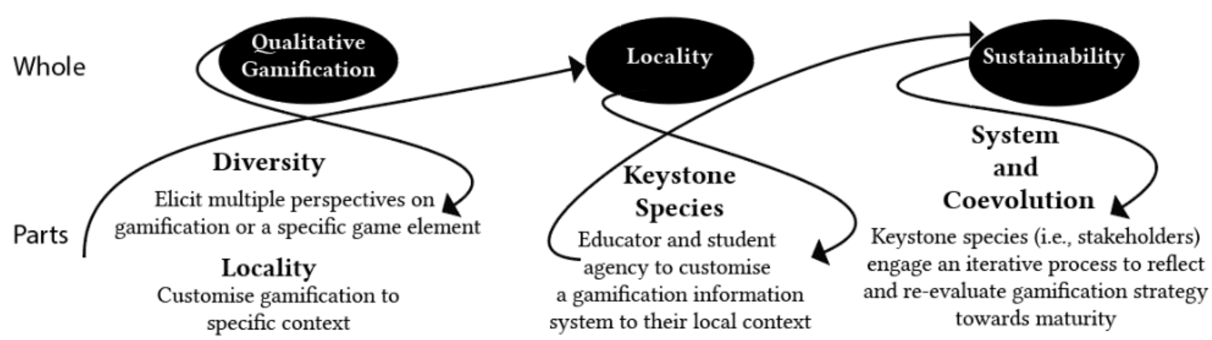

Figure 11. Hermeneutic interpretation of a gamification ecology.

2.12 Chapter summary

This chapter extended the dialectical analysis of gamification in information systems learning. I contained dialectical analysis in the sociotechnical perspective of information systems and social cognitive theory, the theoretical perspective of this thesis. Both perspectives account for social factors and contexts when a student engages in learning through digital gamification environments. As the literature review demonstrates, social cognitive theory looks beyond game elements as external influence behaviour and recognises the impact of social elements on behaviour. For instance, I referred to machine learning that is capable of monitoring affective states such as boredom or enjoyment and in response, alters gamification to offer more compelling gameplay to address boredom. I also referred to social factors that determine the extent to which a student finds gamification useful. For example, if AI detects that a student is not enjoying gamification, it might simply be because the student lacks efficacy, which can be attributed to not having previous experience, skills or knowledge of playing digital games.

Throughout this review, I reiterated gamification as a cultural artefact belonging to Western epistemology. This implies that gamification might be meaningless as a learning strategy in non-Western educational settings. Such conjecture does little to deter technology designers from offering gamification as a solution for low learner motivation. This review relied on Descartes to reject bolder claims of intelligent ICTs (and by implication, virtual game elements) that might one day fully account for human motivation. This assertion is based on the objectives of a computational mapping of human consciousness onto a computer. Such objectives of quantifying motivation are prevalent owing to quantitative methods being taken as the predominant approach in gamification research. I conducted a systematic review to draw attention to the low number of qualitative research in gamification. I demonstrated how a qualitative approach uncovers the social factors and subjective viewpoints that explain behaviour. I revert to Zhang and Chen (2021) illustrating that game rewards are insufficient for reducing students' fears of engaging in gamified exercises that assess English-speaking skills.

Chapter 3: Research Design

3.1 Introduction

In this chapter, I provide a detailed overview of the research design that informs the chosen action research methodology. Creswell (2014) describes research design as modes of investigation within qualitative, quantitative and mixed-method approaches that direct specific processes in a research study. Schwartz-Shea and Yanow (2014) hold that the specific research process that underpins the research design of a study provides direction for data collection and analysis. I structure this chapter according to the six layers (or stages) of the research onion (Figure 12) by Saunders, Lewis and Thornhill (2019). I organised the chapter as follows: First, I give an overview of interpretivism, the chosen research paradigm of this thesis; next, I describe and justify action research and conclude the chapter with an overview of the multi-method approach that underpins this study's data collection process.

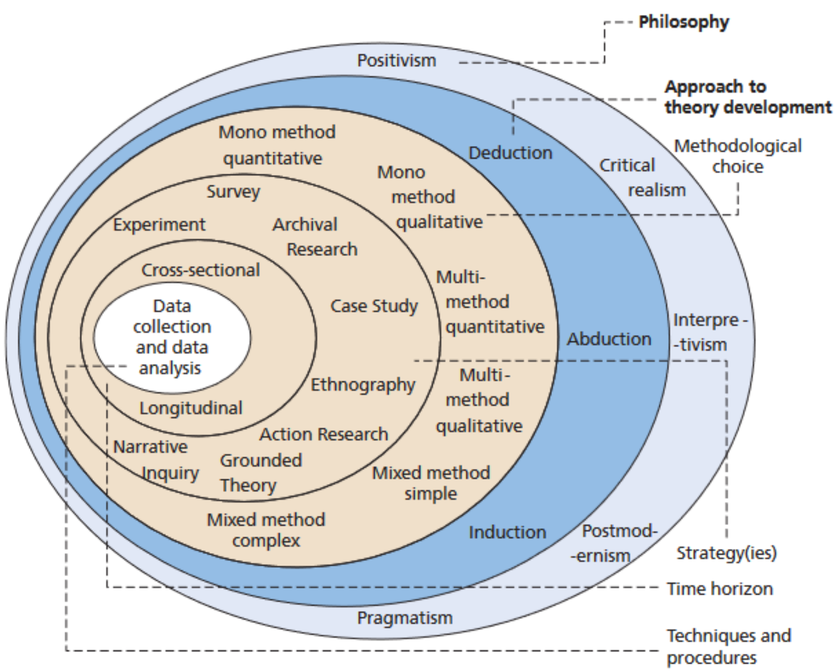

Figure 12. The research onion (Saunders et al., 2019, p. 130).

3.2 Philosophical reflections

Philosophy is defined as the "development of knowledge and the nature of that knowledge" (Saunders, Lewis, & Thornhill, 2007, p. 101). Philosophy embodies a particular means of understanding the nature of reality, that is, 'what is' (ontology) and how we can understand it, i.e., 'what it means to know' (epistemology) (Crotty, 1998). Figure 12 illustrates five major philosophical traditions: positivism, critical realism, interpretivism, postmodernism and pragmatism. The paradigm that a researcher adopts embodies significant assumptions about his/her worldview. Moreover, these assumptions underline the chosen methodology and often lead to taking on a quantitative, qualitative or mixed-method approach. This, in turn, informs the data collection and analysis techniques that a researcher can deploy. In Table 4, I summarise the ontological assumptions, epistemological assumptions and methods that underpin each philosophical tradition (Saunders et al., 2007).

Saunders et al. (2007) present ontology and epistemology on a continuum with a set of two extremes: objectivism and subjectivism. Objectivism is typically the ontological underpinning of positivism. Ontologically, objectivism is rooted in realism, which considers social reality to exist independently of the consciousness of social actors. Epistemologically, objectivism seeks to collect and analyse data that can be measured with quantitative methods. Two basic assumptions constitute good quality data: (i) The world is not random, but rather, it is regular and ordered; for example, physicists can precisely measure the strength of gravitational pull and (ii) we can investigate reality objectively; for example, gravitational force can be measured external to scientists' personal beliefs or values (Oates, 2006; Saunders et al., 2007).

Table 4

Five major philosophical traditions (Saunders et al., 2007)

Philosophical tradition	Ontology	Epistemology	Methods
Positivism	Social reality is external to social actors. Social entities are grounded in *realism,* existing independent of social actors' conception of them.	Social reality is observable and can produce law-like generalisations.	Deductive: Makes use of large samples; quantitative data collection.
Critical Realism	Social reality is external and independent but cannot be accessed directly through human observation and knowledge.	Knowledge is socially constructed and generated by investigating the history of a phenomenon.	Retroductive: Makes use of methods that best describe knowledge from a historic point of view.
Interpretivism	Reality is socially constructed and mediated by culture and language. Interpretivism produces multiple interpretations of reality that are always in flux.	Knowledge is constructed from perceptions and the interpretation of reality produces new understanding.	Inductive: Makes use of small samples; qualitative data collection and analysis.
Postmodernism	Reality is seen as originating from power relationships and language. The order that governs the social world is classified through the dominant language, thus excluding those not skilled in the language.	Knowledge is embedded in dominant modes of thinking, which may not always be the best mode of knowledge. Therefore, the focus is on eliciting repressed meanings.	Deconstructive: In-depth examination of text to identify contradictions; qualitative methods.
Pragmatism	Reality is an amalgamation of practices, ideas and processes that are in a constant state of flux.	Knowledge is embedded in practical meaning. Additionally, knowledge is considered to have value if it can contribute to problem-solving.	Based on a research problem and question(s); seeks to contribute practical solutions; mixed methods.

Subjectivism asserts that social reality (how we percieve the world) are constructed from the views, subsequent actions, behavioural patterns and experiences of social actors. Subjectivism is inherent in the philosophical assumptions of interpretivism. Ontologically, subjectivism adopts nominalism. Nominalism takes the epistemological position that social phenomena are constructed by people through perceptions, language, concepts and consequent action. This is a perpetual process mediated by social interaction where meaning that emerges is in a continual and evolutionary state of change. Subjectivism typically deploys qualitative data in specific contexts to generate a thick description of the social phenomenon under investigation (Saunders et al., 2007).

3.3 Epistemological assumptions in gamified information systems

Information systems is an interdisciplinary field (Kroeze & Van Zyl, 2014); therefore, researchers turn to methods that are distinct to both the social and natural sciences in understanding gamification within the information systems discipline. Gamification has mostly been studied via post-positivist methods (Aldemir et al., 2018; Van Der Poll, Van Zyl, & Kroeze, 2019) which are typically deployed in the natural sciences (Oates, 2006; Scotland, 2012). Landers et al. (2018, p. 4) submit that "gamification science can be defined as a social scientific, post-positivist subdiscipline of game science", based on gamification's focus on human behaviour. Post-positivism is distinct from positivism. Positivists believe that reality is objective and objectively measurable. In contrast, post-positivists suggest that objective reality can be interpreted through a subjective lens; hence, knowledge is a subjective and therefore, a social construct (Creswell, 2014).

Post-positivists assume that various truths of a phenomenon exist. Landers et al. (2018) highlight the distinction in a gamification context: phenomena investigated in the positivist sciences continue to exist irrespective of human measurement; in contrast, post-positivists expect gamification to change its users. These changes are causally contingent on scientific intervention. For post-positivists, gamified systems change its users through social experience and consider this changed state as the new truth for the information system. Post-positivists then use numerical models to analyse the data and present results. Therefore, post-positivists focus on the social reaction of human behaviour that results from the invention of a gamified information system. At first glance, post-positivism and interpretivism appear similar. Interpretivists also assume that reality is a social construct and interpret the multiple meanings, i.e., the various truths, that subjects assign to a phenomenon (Walsham, 2006). Oates (2006) describes interpretive research in IS as follows:

> Interpretive research in IS and computing is concerned with understanding the social context of an information system, i.e., the social processes by which it is developed and construed by people and through which it influences and is influenced by its social setting. (Oates, 2006, p. 308)

Hovorka and Lee (2010) argue that social processes are part of the real world, which is essentially an objective reality from the vantage point of the social actor. To this end, both post-positivism and interpretivism regard subjective experience as objective reality. In addition, both paradigms are based on causal relationships although causality in post-positivism is uni-directional, based on the stance that change is causally contingent on a probabalistic antecedent. Conversely, causality in interpretivism is bidirectional, based on the stance that social contexts affect and are affected by social actors. To shed more light on and clarify the differences in the approaches to causality, I draw on Hovorka and Lee's (2010) reframing of postpositivism and interpretivism as the understanding–explanation distinction.

Hovorka and Lee (2010) argue that the introduction of independent variables in post-positivist research cannot produce scientific understanding. Postpositivists assume that independent variables (also called predictors) causally relate to dependent variables (also called the criteria). For example, in gamification research, post-positivists hypothesise that a predictor (for example, a badge or leaderboard) might result in an improved criterion (for example, improved examination results) (Landers et al., 2018). In this light, Hovorka and Lee (2010) infer that independent variables are created by the post-positivists and are not part of social actors' (players') experience. In this vein, post-positivists provide a causal–mechanical explanation by identifying causal predictors, not understanding (Hovorka & Lee, 2010).

Instead, Hovorka and Lee (2010) allot understanding to the interpretivism paradigm. It is termed *subjective understanding*, based on the phenomenological stance that interpretivists interpret the meaning that subjects assign to a phenomenon. Moreover, interpretivists regard human action as voluntary, stemming from a constellation of present and historic beliefs, reasons, motivations and intentions as opposed to probabilistic antecedents that are unvolitional. However, interpretivism emphasises the interpretation of the researcher as paramount instead of the social actor's lived experience. In this sense, interpretivism is vulnerable to the same researcher bias that is attributed to post-positivism; that is, 'understanding' is that of the interpretivist and might not be part of the social actor's experience (Hovorka & Lee, 2010).

Consider a common phenomenon in IS, information system implementation resistance. Resistance might be an attribution that can be typically observed in the body of theory in which the interpretivist is immersed, not a reflection of the factual situation from the social actor's frame of reference. However, interpretive researchers never conclude (at least not initially) that user behaviour linked to information systems implementation is counter-productive, irrational and so forth. Either the user's behaviour is irrational or understanding of what the user's behaviour means to the user themselves is still in the process of being elicited. Therefore, to acquire an understanding of another person's experience, interpretivists must detach themselves from personal bias that might influence the observation of the social phenomenon (Hovorka & Lee, 2010).

3.4 Interpretivism in IS research

To guide this interpretive study, I invoke seven principles to conduct and evaluate interpretive inquiry into IS by Klein and Myers (1999). These principles are (1) "the fundamental principle of the hermeneutic circle", (2) "the principle of contextualisation", (3) "the principle of interaction between the researchers and the subjects", (4) "the principle of abstraction and generalisation", (5) "the principle of dialogical reasoning", (6) "the principle of multiple interpretations" and (7) "the principle of suspicion" (Klein & Myers, 1999, p. 72). In Table 5, I align this and the forthcoming sections of this chapter with the study's research design and Klein and Myers's principles for interpretive research.

Table 5

Mapping the chapter structure, the interpretivist research design of this study and the principles for interpretive research (Klein & Myers, 1999, p. 72)

Section no.	Thesis Research Design	Principles for interpretive research in IS
3.4	Interpretivism in IS research	"The fundamental principle of the hermeneutic circle"
		"The principle of abstraction and generalisation"
		"The principle of contextualisation"
3.5	Inductive research	"The principle of interaction between the researchers and the subjects"
		"The principle of dialogical reasoning"
3.6	Methodology	"The principle of multiple interpretations"
3.9	Research method	"The principle of suspicion"

3.4.1 The principle of the hermeneutic circle

Klein and Myers (1999) advance the use of hermeneutics as a theoretical lens for interpretive research in IS. Gadamer (1976), a principal exponent of hermeneutics, conceptualises it as the practice of interpreting and re-interpreting textual resources. Gadamer views hermeneutics as an intersubjective process whereby the interpreter of the text is required to fuse his/her horizon with the horizon of the text. Horizon is a collectivity of all knowledge that can be gained and that a person can cognitively process at a historical point in time within a particular culture. Klein and Myers (1999) provide the following example of a hermeneutical approach to translating the meaning of text:

> Consider the sentence 'they are playing football'. In order to understand the individual parts of the sentence (i.e., whether a football is a round ball, an egg-shaped ball or no ball at all) we must attempt to understand the meaning of the sentence as a whole. (Klein & Myers, 1999, p. 71)

Gadamer and other thinkers like Martin Heidegger and Paul Ricoeur later extended the narrowly dogmatic interpretation of textual resources to the interpretation of social behaviour and phenomena (Gallagher, 2004). The terms *whole* and *parts* were extended to a more liberal and broader interpretation. In this expanded interpretive realm, historical contexts denote parts and a proper historical perspective of these contexts are the product of the whole. In the researcher and participant interrelationship, the preliminary understanding of the phenomena which both parties hold could be conceptualised as parts, while the shared meaning that materialises from bidirectional interaction between them defines the whole. The hermeneutic circle (Figure 13) illustrates the parts and the whole in bidirectional interaction.

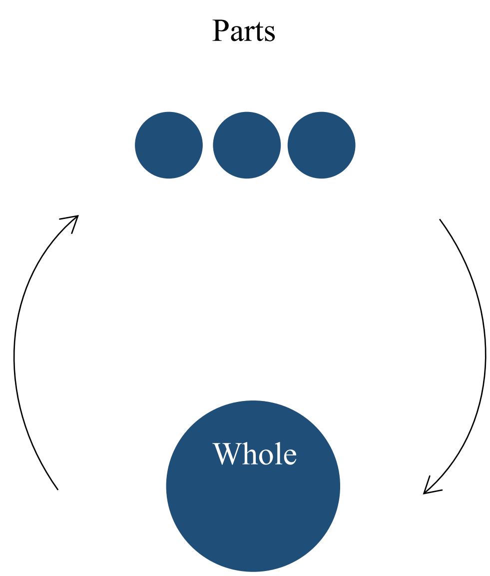

Figure 13. The hermeneutic circle illustrates bidirectional interaction between the parts and the whole (adapted from Gadamer, 1975).

3.4.2 The principle of abstraction and generalisation

Abstraction suggests that researchers relate the idiographic information uncovered through data interpretation to theoretical concepts. Researchers then use this theoretical concept to explain the nature of social action and human understanding (Klein & Myers, 1999). This process is called generalisability. In post-positivism, generalisability means that the statistical results of a study are applicable to and can be predicted for a broader sample and other situations. Walsham (1993), however, argues that generalisability is not contingent on the representativeness of statistical data, but instead on the validity of the logical argumentation applied in describing and drawing conclusions from the results of a research study. In other words, the results from interpretive research can be carefully related to the concepts and ideas of multiple, abstract situations.

Walsham (1993) suggests that a concept as a type of generalisation is possible from an interpretive research study. As an example, Oates (2006) cites Zuboff (1988) who created the term *informating* which became a generalisable term insofar as becoming part of the vocabulary of the information technology discipline. To informate is to advance the concept of technical systems generating information for a social system and illuminating visible events, activities and objects through the information generated about them. By the same token, Pelling (2002, para. 1) is the first to use the phrase gamification in a business context. The term became more broadly used in game research to include sectors such as education and health with the business sector as non-game contexts.

3.4.3 The principle of contextualisation

As stated above, Gadamer's (1975) hermeneutics seeks to actively facilitate the fusion of horizons. A meeting of horizons is difficult due to historical distance—that is, the interpreter's horizon of meaning is not identical to the lifeworld of the social actors. The problem is compounded as horizons are subsumed in metaphysical, scientific, cultural and social views, which are generally not articulated or revealed. However, it is possible to bring horizons closer together through *the history of effects*. This necessitates that the subject matter is contextualised within a sociohistorical context. The history of effects is the cornerstone of Klein and Myers's (1999) principle of contextualisation. The authors propose that interpretivists locate IS inquiry in a sociohistorical context for the intended audience to discern how present circumstances under investigation emerged.

Post-positivists also examine the past trends of an organisation. They seek to replicate past truth that benefits the research population (Klein & Myers, 1999). Their basis for replicating truth rests on the principle of *falsification*. Falsification holds that knowledge is antifoundational and absolute truth can never be discovered (Creswell, 2014). Wells (1996) contends that such present knowledge would not be anything more than a working hypothesis. Positivists surmise that reference to undesired past truth is error recognition and avoidance. Error avoidance involves controlling experimental conditions (independent variables) which are constantly reasserted against the past to technically perfect knowledge (Hamati-Ataya, 2012). In this vein, Landers et al. (2019) do not see the need to position experience (a historical product) as a key variable. The authors suggest that a gamification intervention will be ineffective with individuals who have limited or no game experience.

In contrast, interpretivists treat research populations and samples as producers and not just products of history, according to Klein and Myers (1999). An example illustrating the principle of contextualisation is Van Zyl's (2013) MELISSA (Measuring E-Learning Impact in primary Schools in South African disadvantaged areas) experience. MELISSA was an extension of the Khanya programme, which was launched by the Western Cape Education Department in 2001. The objective of the Khanya programme was to equip every Western Cape primary school with ICT infrastructure by the start of 2012. Beyond physical ICT implementation, Khanya also sought to teach teachers digital literacy skills. Van Zyl embarks on a brief historical overview of events and circumstances that led to ICT implementation into the pedagogy of primary schools. Van Zyl reports (amongst others):

> A lack of new entrants into the teaching profession, and a continuous decrease in qualified teaching staff. The Khanya model, then, would address these shortages through the provision of technology. This was not intended to replace educators, but rather to help them conduct their professional duties more effectively. (Van Zyl, 2013, p. 85)

Despite its ambitious objectives, Khanya was hindered by the same problem it endeavoured to solve: Weak adoption of technology among educators despite educators' enthusiasm for the project. Khanya learnt that more effective execution of professional duties cannot be the result of ICT implementation alone, with little regard for the varied and multiple views that stem from technology encounters in an educational development context. At the time, for example, the current curriculum was outdated insofar as teachers felt that it does not encourage them to embed ICTs into the curriculum. Thus, the Western Cape Department of Education's history of using old curricula, not only educators' inexperience with technology, influenced technology uptake (Van Zyl, 2013).

3.5 Inductive research

This section synthesises Klein and Myers's (1999) principles of interaction between the researcher(s) and subjects and dialogical reasoning with the inductive research approach. Scientific inquiry distinguishes the inductive approach from the deductive approach. Whereas inductive research formulates theories and thematic patterns based on observed data, the deductive approach tests a concept that is familiar from theory through investigation of the hypothesis derived from it. Hence, inductive reasoning tends to operate more within the interpretivist paradigm, while the positivist paradigm is more distinctly inclined to deductive reasoning (Bhattacherjee, 2012; Creswell, 2014; Saunders et al., 2007).

3.5.1 The principle of interaction between the researcher and subjects

This abstract is consistent with inductive research: Rather than departing from a theory (like post-positivists), interpretivists develop a theory by interpreting meanings that others assign to phenomena. Here, research subjects are seen as co-interpreters insofar as they submit their horizons to change, by appropriating the concept used by the IS researcher and an analyst such that their actions might be changed due to their altered horizons (Gadamer, 1975). However, this effect is lessened if there is no interaction between the researcher and research subjects; that is, the researcher relies only on historical secondary data (Klein & Myers, 1999). Such research practice is noted in post-positivist studies that formulate hypotheses based on existing theories or by isolating the independent variable in an experimental group, to determine its impact (Oates, 2006).

Post-positivists counter-argue that interpretivists are inherently biased by their worldviews and the cultural experiences of their researchers and subjects. Hence, post-positivists deploy numeric models to objectively measure subjective reality (Creswell, 2014; Munkvold & Bygstad, 2016). For example, Landers et al. (2019) espouse psychometric measurements to evaluate gamification experience. Landers et al. (2019) suggest that the link between game elements (predictors) and target outcomes (criteria) is causally contingent on different psychological changes (mediators) in an individual; that is, post-positivists believe that a gameful system that translates into positive results (for example, improved examination marks) is causally contingent on a positive gamification experience. From a symbolic interactionist point of view, Blumer (1986) contends that the meaning—which encapsulates experience—is not quantifiable.

Blumer (1986) argues that meaning is either a product of social interaction with others or a phenomenon; hence, a product of social experience. An example is Prasad's (1993, p. 1414) study of employees who are receptive to ICT implementation insofar as they view it as a symbol of professionalism; one participant opines, “it look[s] so, well, professional”. Blumer (1986) argues that mathematical data analysis models are not part of the empirical world in which experience occurs. In contrast, interpretivists co-construct and negotiate multiple and varied meanings rather than the narrow meanings that independent variables produce. Interpretivists forge meaning through interaction (for example, discussion) with participants. In acknowledgement of their own bias, the interpretivist’s experience of the phenomenon in which social actors immerse themselves is considered part and parcel of subjective understanding (that is, research findings) (Creswell, 2014; Klein & Myers, 1999).

3.5.2 The principle of dialogical reasoning

This principle obliges a researcher to clarify and represent their own ethics, preconceptions and values which guide the research design. My interest in the topic of this thesis originated from personal observations in the position of an IT lecturer at a college. I frequently conversed with students about their progress and competence with learning outcomes. As expected, the responses of students from low-income backgrounds revealed that achieving the goal of completing the programme is challenging. For example, questions delving into students’ reasons for failing to submit an assignment on the due date yielded the following anecdotal account, “I did not have extra time like the others to work on my assignment at home because I do not own a computer”. Oblivious to these types of experiences, the resulting poor grade that the student had received added to stereotypes of him being lazy or lacking the intelligence to cope with the course.

Such labelling expressed by some students (and even lecturers) without a full understanding of the historical and sociocultural background typify the imbalanced power relations regarding ICT teaching and learning. Prensky’s (2001) conceptualisation of the ‘digital native’—with little regard to how these terms have a disparaging connotation to formerly colonised countries—comes to mind. In a follow-up article, Prensky (2009), not satisfied with the metaphors of colonialism, reflect on the evolution of digital technology by constructing a metaphor of human evolution, *Homo sapiens digitalensis*. The term, in short, means that ICTs not only make us smarter but indeed wiser. Brown and Czerniewicz (2010) again criticise Prensky’s (2009) dualistic perspective, arguing that the evolutionary connotation of *Homo sapiens digitalensis* implies advancement and opportunities for the digitally evolved and the opposite for people who have not suitably advanced.

Homo sapiens digitalensis furthermore suggests that those who are not born or have not grown up with ICT face evolutionary struggles. I do not suggest that individuals cannot escape adverse circumstances that confront them; indeed, I believe that a person's reality can be changed when coming into contact with others from different backgrounds and experiences. I believe that digital 'strangers' can be advanced through a process of 'digital enculturation' supported by 'digital elites' (Bandura, 1989); that is, a process whereby a digital stranger gradually acquires some or many of the characteristics and norms of digital technology literates.

3.6 Methodology

I deployed action research as a methodology. The first half of this section—framed within the *principle of multiple interpretations* (Klein & Myers, 1999)— describes, discusses and illustrates action research. This discussion includes an overview of the multi-method approach that I adopt to collect data. The remainder of the section draws from Klein and Myers's *principle of suspicion* to address the validity and rigour of this thesis.

3.6.1 The principle of multiple interpretation

This principle holds the interpretivist to examine the impact of the social context on the subjects under study. Interpretivists achieve this goal by uncovering multiple perspectives along with the motives that ground them. The analysis of motives may be contained in power relations or social values (Myers & Klein, 2011). This compels the intepretivist to unveil and enhance the credibility of multiple perspectives to ensure that all the stakeholders' views are equally and fairly represented. This principle is consistent with action research, which invests in the epistemological premise that meaning-making stems from multiple realities, which are context-, political- (power) and time-dependent (Hope & Waterman, 2003; Mertler, 2017).

3.6.2 Action research

Kurt Lewin, a social psychologist, is widely acknowledged for first using the term *action research* in the 1940s. Lewin was a scientific pragmatist. Action research originated from pragmatism (Adelman, 1993). Pragmatism emerged through the work of George Herbert Mead, Charles Sanders Peirce, John Dewey and William James, among others (Manning & Smith, 2010). Pragmatists resolve a problem through both explanation and understanding—relying on mixed-method approaches. Pragmatists also rely on hypothesis formulation but do not cast their experiments into causality laws (Adelman, 1993).

In devising a hypothesis, pragmatists do not insist on preceding phenomena, but rather consequent phenomena; that is, pragmatists aim to unearth potential significant consequences that ensue from action. These consequences lay the grounds for organising further observations and analyses. Pragmatists oppose the theory-testing character of positivist research whereby a hypothesis is derived and tested from known concepts in theory (Cherryholmes, 1992; Goldkuhl, 2012). Pragmatists furthermore reject positivist causality to prove or invalidate action and observed outcomes; instead, they argue that one cannot explain an engaged action without reference to the outcome being pursued.

For example, one cannot simply assume that a student is motivated for IS learning if they are playing a game based on learning content. For pragmatists, such an assumption, as it relates to outcomes and actions, must be a constituent of beliefs about actions and the ends being pursued, along with an appraisal regarding the rationality for engaging in an action. Pragmatists infer that causation laws cannot sufficiently explain actions in pursuit of specific ends. Logic, instead, links purposeful actions to intended outcomes, for example, playing an educational game to heighten motivation for learning IS. Therefore, pragmatist experiments are not random, pointless actions but always prevail under deliberate intent and foresight, which determine one avenue of action instead of another (Susman & Evered, 2006).

Pragmatists agree with the interpretivist view that social interaction facilitates a process whereby people confer meaning to other people, objects or phenomena. They further agree that researchers must uncover these meanings, intentions and beliefs of the social group to explain their actions. Pragmatists, however, place more emphasis on the consequentialism of actions and the external reality of semiotic artefacts by examining our encounters with these, through interventions. Pragmatists further regard the interpretivist inclination to only understand as narrow, in reference to their disinterest in effecting change towards improvement (Goldkuhl, 2004, 2012).

To address this drawback, Goldkuhl (2012) combines pragmatism with interpretivism; what he labels *interpretivist action research* and which I adopt to this study's action research strategy. In Goldkuhl's conception of interpetivist action research, empirical focus is not only to enable change through action, but also to understand how social actors construct their particular realities through social interaction and bestow symbolic meaning upon them (Goldkuhl, 2012).

3.7 Participant recruitment

The Programming I and Professional Communication I modules of the Information and Communication Technology: Applications Development course were gamified. To recruit participants for the empirical work, I deployed purposive sampling. Purposive sampling is a non-random technique that is widely used in qualitative research studies. Furthermore, the researcher hand-picked participants who could produce the requisite information to answer the research questions by virtue of having specific knowledge or skills (Tongco, 2007). I applied purposive sampling to recruit the lecturers who teach Programming 1 and Professional Communication 1, respectively (see Table 6). This converging instance of Programming I and Professional Communication 1 constitutes IS as an interdisciplinary science.

Table 6

The curriculum of CPUTs Applications Development course (CPUT, 2015)

Module Name	Content Description	Academic Discipline
Computer Networks	The module is an introduction to different network topologies: the properties, applications, devices and protocols relating to network technologies such as TCP/IP Wi-Fi and IP addresses are discussed.	Computing Science
Applications Development Foundations 1	The module exposes the student to the development of computer applications, functionalities of programming code and design logic	Computing Science

Programming 1	Computer Software focuses on the design of computer applications using *HTML*, *CSS*, *Java*, *JavaScript*, *VBA* and *XML*. The students learn to design small computer or mobile applications to serve the social and economic needs of a community.	Computing Science
Multimedia Foundations 1	This module covers the fundamentals of history and multimedia. Students are trained in producing, sourcing and editing integrated media and constituent elements on web page platforms. Design and layout aspects are introduced to create websites that ultimately, show a synthesis of the topics.	Computing Science
ICT Fundamentals	ICT Fundamentals focus on the foundational principles in the creation and maintenance of ICT artefacts (e.g., business application software).	Computing Science
Professional Communications 1	This module is introduced to teach learners soft skills for success in a future workplace. The module focuses on verbal and non-verbal communication. The content investigates communication barriers, group communication, problem-solving in groups and interpersonal communication.	Humanities Science
Business Practice 1	Introduction to Business, Entrepreneurship, Accountancy, Social Responsibility and Business Ethics.	Business Science
Project 1	For Project 1, students construct a portfolio of evidence which reflects and integrates knowledge and skills acquired from the course curriculum. Students use *Microsoft Project* as a software tool to generate the Project Management Plan which covers portfolio evidence, project outputs and outcomes, and the project presentations.	Cross-disciplinary

The students who are enrolled in this applications development course were also selected purposively on the basis that they are in the process of becoming knowledgeable and skilled in the principles and praxis of information systems. According to Tongco (2007), a researcher using purposive sampling “does not need … a set number of informants”. Seidler (1974) investigated different informant sizes and concluded that a minimum number of five informants is sufficient to produce reliable data. Creswell (2014) argues that there is no answer to what size is appropriate for interpretive research. Creswell suggests one or two participants for narrative research, three to ten for phenomenology and 20–30 for grounded theory. Bertaux (1981) deems a sample size as small as 15 acceptable for all interpretive research, regardless of the methodology. Nonetheless, twenty-seven students volunteered and gave official consent to participate in the present study.

3.8 Research ethics

This study's vision of adhering to high standards of ethical research practice is guided by the University of South Africa's (UNISA) ethical research policy framework. Indeed, I received ethical approval to conduct this study from the Research and Ethics Committee of the UNISA College of Science, Engineering and Technology (see Appendix A). In research, ethics relate to the appropriateness of the actions of a researcher, with concern for the rights of the stakeholders who become the subjects of inquiry (Saunders et al., 2007). I applied for and received permission to conduct research from the Research Ethics Committee of CPUT. See Appendix B for the application letter and Appendix C for the ethics clearance letter. I then (on two separate occasions) met in person with the lecturer who teaches Professional Communications 1 and the lecturer who teaches Programming 1. I explained the aim, purpose and nature of the study. They were furthermore briefed on the principal ethical considerations relating to informed consent, confidentiality and anonymity, and physical and emotional safety (UNISA, 2016b):

Informed consent: The research subjects were assured that participation is voluntary and that they can withdraw at any time without stating a reason.
Confidentiality: The research subjects were assured that their identities would not be revealed in any subsequent publications; instead, pseudonyms would be used instead of real names.
Physical safety: The research subjects will not be asked to commit any act which may be experienced as upsetting, stressful, embarrassing or causing physical injury.

Upon agreeing to participate, the lecturers who had agreed to participate in the study signed the consent letter (see Appendix D). In a *Microsoft PowerPoint* presentation, I demonstrated to the students the study's purpose as well as the principal ethical considerations. I asked students who had agreed to participate in the research study to sign the consent letter. After both lecturers and students had given consent, they were supplied with an information sheet (see Appendix E). The information sheet summarises the research purpose and ethical considerations.

3.9 Research method

Walliman (2011) describes research methods as techniques that researchers use to conduct research. Walliman refers to them as 'tools of trade' which equip the researcher with the means to gather, sort and analyse data in order to draw valid conclusions. The choice of method that a researcher decides upon specifies the type of data to be collected in advance of the investigation or allows the data to arise from the research subjects. This research study adopts a multi-method qualitative research method. Researchers using a multi-method approach combine more than one data-gathering technique with corresponding data analysis techniques (Creswell, 2014; Saunders et al., 2007). I selected focus groups, field notes and semi-structured interviews to collect qualitative data. A detailed discussion of these techniques follows in Section 3.9.1.

De Villiers describe qualitative research as an exploratory, naturalistic interpretive science that uses non-numeric methods such as textual resources, interviews and participant observation for collecting data to provide "insight into cultural aspects, organisational practices and human interaction" (2005, p. 13).

3.9.1 Data collection techniques

I selected field notes (participant observation), semi-structured interviews and focus groups as data collection techniques for this study; in the following subsections, I provide a rationale for choosing these techniques.

Field notes

Field notes are written observations of verbal and non-verbal gestures (Schwartz & Merten, 1971; Tjora, 2006). In addition, field notes provide a personal and reflective portrayal of what has been observed; consequently, they include the researcher's conjectures, notions, impressions, connections and ideas for future research (Krueger, 2002). As stated above, field notes involve participant observation. I adopted an approach to participant observation following the tenets of phenomenology, which define meaningful action as an event that is based on expectation and intention (Schutz, 1967; Schwartz & Merten, 1971). This definition of meaningful action is consistent with action research. As discussed in Section 3.6.2, action research is based on the philosophical assumptions of pragmatism. Pragmatism, in turn, regards meaningful action as a subsequence of deliberate action taken with intent (Susman & Evered, 2006).

In contrast to the above, researchers using quantitative methods to collect and present data are subjecting epistemological assumptions that derive from participant observation to the objective/subjective dichotomy. The rationale for objective interpretations of an observed action is informed by the belief that the observer can impute meaning to the physical actions that a person performs on a particular occasion. It is argued that such an action carries a unique significance, regardless of the anecdotal account of the social actor before or after the action has been performed. In terms of subjective meaning, the suggestion is that a social actor attaches meaning to their actions, which implies that the action and the meaning are two separate entities (Schutz, 1967; Schwartz & Merten, 1971).

Phenomenologically-based researchers reject an explanation of social action that is cast within an objective/subjective dichotomy. These researchers agree that it is plausible that observation of physical movements performed at a particular moment can be so expressive as to accurately reflect a person's state of mind. However, they also maintain that the formulation of meaning is not bounded by what is observed at a concrete time and place. Instead, meaning is treated as being interwoven with the lived experience that spans over the time continuum of the past, present and future. Therefore, a social actor's interpretation of their verbal utterances and behaviour in the present is constructed from past experience, with an orientation towards the future (i.e., conceiving goals to be attained) (Schutz, 1967; Schwartz & Merten, 1971).

Observing and interpreting lived experience facilitate a dialectic nexus between thought and action that prevails in a social environment (Schutz, 1967; Schwartz & Merten, 1971). In the context of action research, I approach my observation of social action as a cultural inquiry. That means I seek to observe how thought (that is, the student decides to increase their motivation for IS learning) formulated in the early and past phases of action learning is enacted (the implementation phase) through the culture of games. Nonetheless, I engaged in participant observation from the first to the last action learning activity, which occurred during academic delivery hours (08:00–15:00/16:00) within the training venues of CPUT. Appendix F illustrates the field notes protocol.

Semi-structured interviews

I also selected semi-structured interviews and focus groups as data collection techniques. In the previous subsection, I provided a rationale for choosing participant observation (rooted in phenomenology) as a data collection technique. In this subsection, I extend this rationale to semi-structured interviews and focus groups. I also problematised the investigation of action that is subject to an objective/subjective dichotomy in the previous section. To reiterate, the rationale for the dichotomy derives from the assumption that observers can infer meaning from an act only by observing a person's physical actions. This implies that the meaning inferred from such physical actions transcends any meaning they may ascribe before or after they perform the action. The dichotomy, therefore, assumes that a person's words and actions constitute two separate entities (Schutz, 1967; Schwartz & Merten, 1971).

Phenomenologists counterargue that observers cannot legitimately assert that they know a person's intentions unless they have at least a partial understanding of that person's attitude towards the action before or after performing it. Phenomenologists acknowledge that a contradiction could occur between the actions a person plans to perform and the ones they indeed perform. However, to obtain such an understanding of a person's attitude towards an action, the observer asks the person who performed the action—or at least someone who has witnessed what occurred—to describe the behaviour or shed light on actions that differ from those announced in the past (Schutz, 1967; Schwartz & Merten, 1971). Because one-on-one semi-structured interviews and focus groups require participants to talk, I regard them as appropriate techniques to reflect my phenomenological assumptions about the use of game culture to motivate students for information systems learning.

One-on-one semi-structured interviews are designed to enable a researcher to elicit subjective responses from a research participant about a particular phenomenon they have encountered (McIntosh & Morse, 2015). McIntosh and Morse (2015) recommend semi-structured interviews for research studies that have obtained a sufficiently objective understanding of an experience but lack subjective knowledge. Nevertheless, before each interview, I briefed participants about the relevant ethical considerations such as voluntary participation, confidentiality and anonymity. Additionally, I acknowledged the use of audio recording equipment to record interviews and allowed participants to decide if the session should be audio-recorded. The interviews were conducted in a quiet, vacant lecture room on campus. I conducted 22 interviews, which each lasted 30 minutes. Appendix G illustrates the student interview protocol, and Appendix H illustrates the lecturer interview protocol.

Focus Group

As pointed out earlier, observing participant action as it relates to a phenomenon is a form of cultural inquiry. In the present study, I observed actions emanating from student experiences with game culture and the desire to increase student motivation for information systems learning. Schwartz and Merten (1971) position culture as a system of shared meanings; that is, culture is a catalyst for motives that account for the symbolic agency through which a person constructs and negotiates relationships and interactions with others. Ang, Zaphiris and Wilson (2010) note that game culture arises from gameplay that extends beyond game software, what they call *extrinsic play*. For example, in massively multiplayer online games, the design of the game software partially constitutes a team player's experience; it is the emergent shared cultural values and practices relating to leadership, communication and collaboration that provide meaning (Ang et al., 2010).

Focus groups can accommodate contextual elements of shared meaning, such as producing interaction data from group discussions (participants remarking on each others' encounters and asking each other questions). Similarly, focus groups can also accentuate differences in perspectives and experiences. Indeed, disagreements and contentious views are common in group discussions (Lambert & Loiselle, 2008). Phenomenologists encourage remarks or questions that evoke conflict. This way, the participant explicitly confronts motives for an action that they consider common behaviour or normal, thus not requiring an explanation (Schwartz & Merten, 1971).

Focus groups typically involve between four and 12 participants (Saunders et al., 2007). I used probability sampling to choose eight participants, inviting the chosen participants by email. The email included the following ethical aspects: First, participants' real names would be used in the discussion, but their identities would be protected with pseudonyms in the interview transcripts;

second, participants were reminded that the focus group dialogue would be treated confidentially; third, I acknowledged that video recording equipment would be present to video record the session. For the convenience of the participants, the focus groups were held on campus. The duration of the sessions was two hours, with a ten-minute break after the first hour. Lastly, I made observational field notes during and after the sessions.

3.9.2 The research process

This section describes how action research and action learning underpins the gamification strategy empirically. As already stated, action research enables a systematic approach for people to discover and apply actionable solutions to problems that confront them in their everyday community and professional practices (Baum, MacDougall, & Smith, 2006). The primary purpose of this study is to use action research to determine if and how gamification can increase student motivation in IS. Following from the discussion thus far, action research is most appropriate within interpretivism because it is participatory in nature and aims to interact with complex dynamics in a social context (Stringer, 2014). I adopt Mertler's (2017) action research model which is composed of these four stages: (1) *planning*, (2) *acting*, (3) *developing* and (4) *reflecting*.

- **Planning**: The action researchers identify the research problem, review the literature andformulate the research questions.
- **Acting**: Data are collected and analysed.
- **Developing**: This stage involves the writeup and discussion of findings.
- **Reflection**: The action researcher deepens the understanding of data and improves rigour by reconciling participants' multiple perspectives.

Action learning

Participant roles are usually embedded more in action learning than in action research. The roles of student participants involve experiential action learning (Noran, 2016). Action learning means improving practice through collaborative, experiential learning and does not always include research approaches, whereas action research focuses on improving practice (i.e., both action and research) by creating new knowledge and constructing theories of practice (McNiff & Whitehead, 2016; Zuber-Skerritt, 2001). In this light, participants are only involved in the acting stage of action research. The acting stage branches off to start a systematic iterative cycle of its own. Dick (2007, p. 13) refers to action research cycles contained within other cycles as nested cycles. The researcher labels the two nested cycles (provisionally planned) as *acting stage* cycles.

For the acting stage cycles, the researcher will adopt the action research model that Oates (2006) proposes. Five stages express the iterative cycle by Oates (2006): (1) *diagnosis*, (2) *planning*, (3) *intervention*, (4) *evaluation* and (5) *reflection*. In the context of this research project, the five stages involve the following activities (see Figure 14):

- **Diagnosis**: The transdisciplinary team, in an informal discussion, identifies factors and circumstances which lead to low student motivation in IS.
- **Planning**: The transdisciplinary team reflects on the affordances of gamification and plans how these can alleviate students' learning challenges.
- **Intervention**: As an action-orientated intervention strategy, the team implements the proposed and approved gamification idea.
- **Evaluate**: The research candidate conducts semi-structured interviews and hosts a focus group to evaluate the participants on the achievements and challenges of gamification.
- **Reflection**: The team reflects on new knowledge and the practical outcomes of gamification. This is also the stage where it is decided whether or not a new cycle is needed. The present research study produced two cycles. In the second cycle, the team attempted to address the challenges from the first cycle and improve gamification.

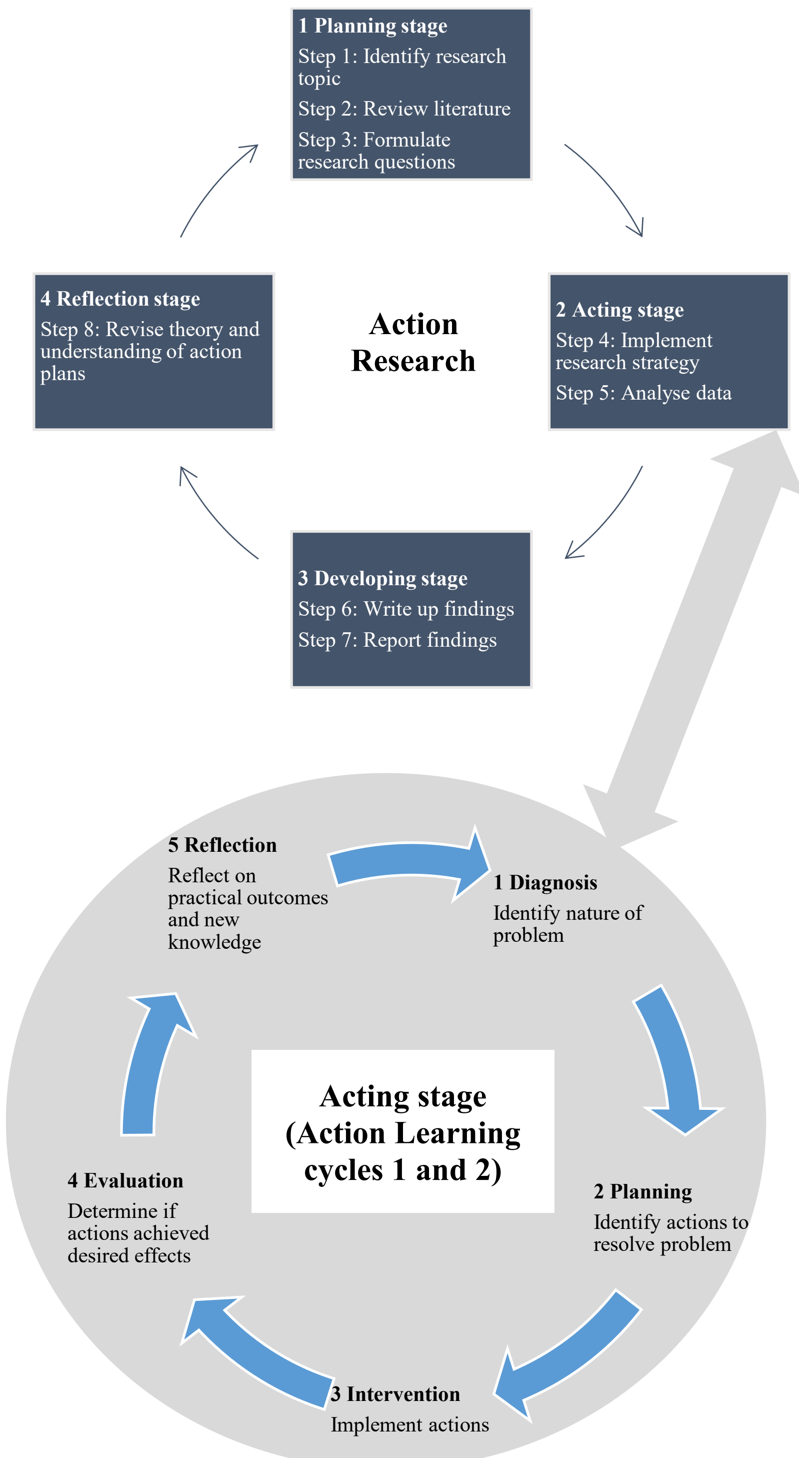

Figure 14. The action research and action learning research process of this study (adapted from Dick, 2007; Mertler, 2017; Oates, 2006).

3.9.3 The principle of suspicion

This section frames the discussion of data validity and reliability within Klein and Myers's (1999) principle of suspicion. This principle maintains that the researcher is attuned to potential distortions and biases in the data collected from the research subjects (Klein & Myers, 1999), which have implications for the credibility and reliability of the findings that are produced from the collected data. The credibility of findings means that all researchers seek data validity, that is, ensuring the accuracy of findings (Creswell, 2014). Therefore, researchers seek to determine whether the the findings are a truthful account of the phenomena under study (Saunders et al., 2019). In turn, the reliability of findings mean that the results are reproducible when a research study is repeated with the same methods and data collection techniques (Walliman, 2011). Credibility and reliability do not hold the same connotation in interpretivist studies as it does in post-positivist studies (Scotland, 2012).

In post-positivist research, credibility and reliability means that research results are generalisable and reproducible in other settings. In interpretivist studies, credibility and reliability means data collection and analysis produce a thick description of phenomena in a specific research setting (Saunders et al., 2007). In terms of validity, McNiff and Whitehead (2016) maintain that the validity of action research can be demonstrated when action researchers are able to refer to authenticated evidence-based data. This is articulated as a range of standards, criteria and tactics that promote and enhance rigour, legitimacy and trustworthiness. The validity standards are the following:

- **Member checking:** I will revisit participants' responses, asking participants to review some of the opinions, views and remarks they expressed during the participant observation, semi-structured interviews and focus groups. This activity will allow participants to verify if the researcher accurately interpreted their views, beliefs and perspectives (Stringer, 2014).
- **Data triangulation:** Multiple data sources permit the researcher to compare and identify reciprocal themes. For example, data generated from the semi-structured interviews will

be cross-checked with data produced from focus group meetings and field notes, to enhance accuracy and rigour (Creswell, 2014).

- **Prolonged engagement:** Information-rich data do not emerge from brief conversations or interviews. It is advisable for the interpretivist to spend significant time at the site of investigation to add credibility to the narrative account via the development of an in-depth understanding and convey the details of the phenomena, people and site (Creswell, 2014). Action research generally requires prolonged engagement at the site of inquiry (Mertler, 2017).
- **Data refinement through iteration:** In theory, the participants and I will become more knowledgeable with each action research cycle as greater integrity is inscribed into findings. Moreover, each cycle signals the refinement of ideas and themes, reducing ambiguity and vagueness (Hope & Waterman, 2003).

3.10 Summary

In this chapter, I invoked Klein and Myers (1999) and argue that subjective understanding of gamification is constituted on the following premise:

- Instead of unidirectional causation, game elements affect behaviour and behaviour, likewise, affects game elements (with reference to the hermeneutic circle).
- A game theory (instead of numeric data) is generalisable.
- Unsuccessful gamification is not merely a historical error that requires correction in the present, but also an important sociohistorical product that affects social actors' present perspectives.
- The meaning that social actors assign to and negotiate about a phenomenon emanates from social interaction, not from indiscriminately applying predictors.
- All gamification research (regardless of philosophical affiliation) results are affected by a degree of researcher/participant bias; moreover, the decisions and views that the interpretivist contribute become part of the research population; hence, interpretivism being labelled 'subjective understanding'.

- Instead of proclaiming gamification results based on predictors (for example, game elements) as ‘present truth’ for a research population, collaborating with research subjects to craft a gamification strategy enables a thick description of the phenomenon under study.
- Instead of predicating data rigour on the replicability of numeric data, a methodology that is iterative in nature, namely data triangulation, member checking and prolonged engagement in the research setting predicates data authenticity.

Chapter 4: Action Learning Cycle 1

4.1 Introduction

In this chapter, I present the findings related to the student participants' gamified action learning experience for IS learning. This action learning experience emphasises the motivational and demotivational factors encountered by students and their educators. I outline the key considerations that helped to conceptualise IS learning and action research rooted in this research study's action learning encounter. Beyond this, I examine sociocultural concepts as a converged exploration with perspectives on dialecticism, playfulness and gamefulness as a function of the action learning approach of this study.

4.2 Developing the action research findings

In this action research process, the methodology and findings occur simultaneously. In action research, the findings—propelled by action (in the context of this study, action learning)—are implemented as they are constructed (Koshy, Koshy, & Waterman, 2011). While the focus of the action element is to add direct value for the study's participants (that is, experiential learning), emergent findings are situated knowledge from the action-reflection cycle that generates the crucial data (Genat, 2009). Meyer (2000) and Koshy et al. (2011) argue that action research findings, compared to those emanating from the traditional sciences, are more meaningful because they mirror reality more narrowly by returning data to events as they naturally transpire in the field.

4.3 Action learning Cycle I

As noted in Chapter 3, at its foundation, action research rests on assumptions of pragmatism. Lewin (1946) (the originator of action research) believed that behavioural change can be accomplished through pragmatic action and democratic participation. Pragmatic action refers to the action that a person performs to enact positive change. This research study seeks to effect positive learning for IS learning through gamification. In the subsections below, I discuss pragmatic action in formulating the gamification strategy that was applied in the present study.

4.3.1 Pragmatic action: Selecting *Millionaire* as a gamification strategy

The game show *Millionaire* was adapted as a gamification strategy. In *Millionaire*, the show host asks a contestant 15 increasingly difficult questions. Each question has one correct answer and three incorrect answers. The contestant wins a cash price of one million of the local currency if they answers all the questions correctly. If the contestant gives an incorrect answer but answers a previous question correctly, that equates to a designated cash value (also called a safety net) and the contestant exits the game with that amount of cash. For example, question five (for £1000,00) is a safety net question in some versions of the British *Millionaire*; if the contestant answers question six (worth £2000,00) wrong, they leaves with £1000,00 (Millionaire, 2019b).

The contestants can invoke a 'lifeline' to assist in answering challenging questions. The original format of *Millionaire* generally has three lifelines: 'Ask the Audience', '50:50' and 'Plus One'. If a contestant uses the 50:50 lifeline, the game computer removes two incorrect answers; therefore, the correct answer and one incorrect answer remain. If a contestant invokes the Plus One lifeline, they are allowed to invite a friend from the audience to help them answer a question. If a participant invokes the Ask the Audience lifeline, the audience votes for a multiple-choice answer via an electronic keypad. A contestant can only use each lifeline once (Millionaire, 2019b).

I exercised pragmatic action to guide deliberate intent and foresight in the selection of *Millionaire*; that is, I endorsed taking one course of action rather than another. I report on these courses of action in the forthcoming sections. The course of action initially takes shape inside one's head but requires execution to verify the efficacy of the idea by its consequences. This allows the gamification team to negotiate consequences; that is, abandon some ideas and formulate and embark on testing a different theory in subsequent cycles (Helskog, 2014). Pragmatic action led to the selection of *Quizlet Live* as the gamification strategy for the second action learning cycle (see Chapter 5).

Millionaire was also subject to another critical feature of action research, namely social agency. In other words, *Millionaire*'s implementation was centrally arranged around inclusion in the sense that participants were encouraged to provide input to customise *Millionaire* to the study context and goals. To this degree, the participants had the opportunity to infuse *Millionaire* with autonomy, allowing them to craft a path that influences the outcome of gameplay in their favour. Interpreting and understanding the contribution of participants in decision-making was perpetuated throughout both cycles; therefore, new knowledge gleaned from the perceptions impelled continuous action towards modifying the study's gamification strategy to better address participants' needs.

4.3.2 Pragmatic action: Gamifying the Communications I and Programming I modules

In Chapter 3, I mentioned that I deployed purposive sampling to select the Programming I and Communications I modules to be gamified. In my opinion and drawing from Lee's (2004) concept of an information system, these two modules epitomise IS education. I contextualise the learning focus of the communication module in the *social system*, with reference to a strong emphasis on social interaction. Likewise, I contextualise the learning focus of the programming module in the *technical system*, with reference to strong emphasis on the design, implementation and use of ICT.

My idea of learning IS through game-based intervention involves more than students only being receivers of programming and communication knowledge. Instead, students should be contributors to game-based learning strategies. Gamification, instead of conventional games, seemingly fits designer–player interaction better, based on the analytical separation of the design process that constitutes game vs. gamification. Games are products of game design with little end-user input and usually only involves a game designer who imbues a game with their own worldview. In contrast, gamification is understood as a process that is highly player-centric insofar as creating a playful and gameful experience of activities that are of interest to the player (Deterding, 2015; Werbach, 2014).

Game designers seek to generate a positive experience for their games via *iterative experiential prototyping*. This involves the designer defining an experience that they aims to evoke and then constructing game elements that might generate it. This first step recognises that one cannot always predict how players experience a game; indeed, experience seems to be a highly emergent property of games. Thus, game designers construct and tests prototypes to determine how and why player experience diverges from the intended experience and then modifies, adapts and tests the prototype again (Deterding, 2015). This approach is promising for IS learning, especially programming-related modules. As it happens, the students participating in the study by Kenny et al. (2017) design their own gamified applications and experiences.

The gamification team of this study selected *Millionaire* as a gamified learning strategy. We used an application called *jQuizShow* (2001) to digitally simulate *Millionaire*. Figure 15 illustrates *jQuizShow* customised to gamify the Programming 1 learning content. In the previous chapters, I argued extensively against attempts to increase low motivation by the prompt insertion of learning into an entertainment game. Instead, I argued that the motivation for IS learning through games does not depend on game elements and independent variables but on how the resulting elements fit learning attitudes and their social practice and perception of games.

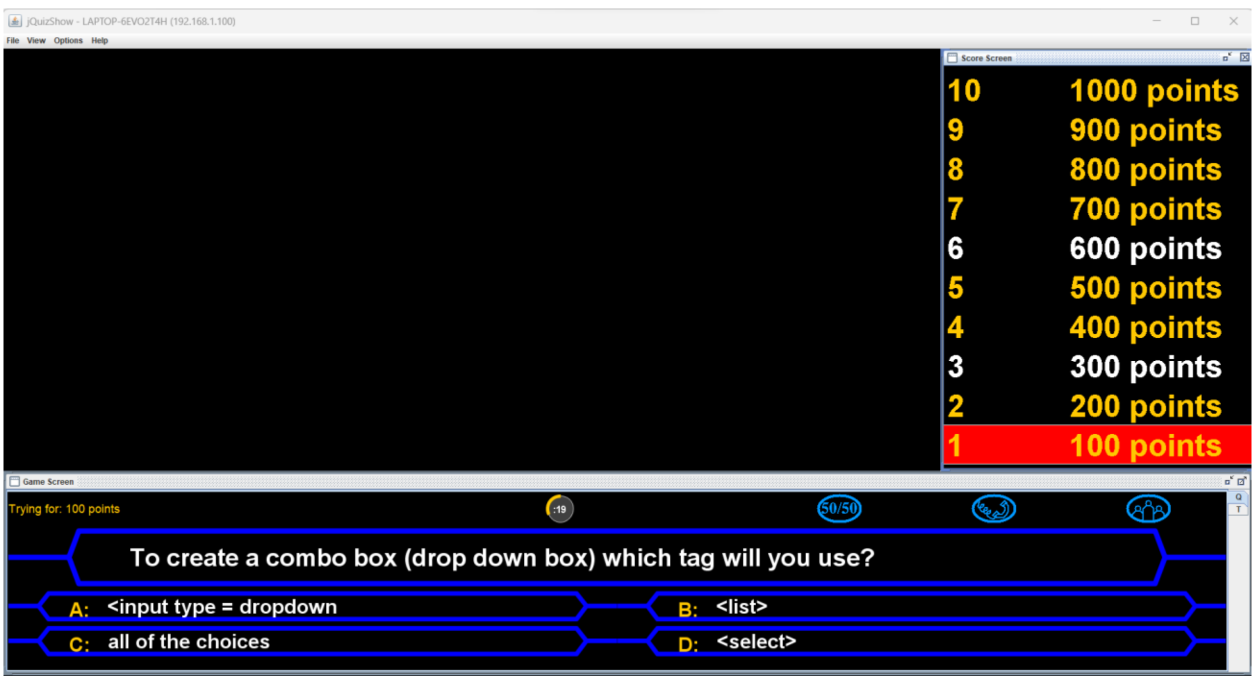

Figure 15. *jQuizShow* has been customised to gamify the Programming 1 learning content (jQuizShow, 2001).

4.4 The diagnosis and planning phases

My experience of action learning was somewhat messy, disorderly and not a strategy that enables the participants to follow the process step-by-step (Stringer, 2014). The disorderliness of action research inconstancy obligates action researchers, in some instances, to engage the phases backward, repeat processes and even leapfrog them in some instances (see Figure 16) (Stringer, 2014). In the present study, some of the phases intentionally and unintentionally co-occurred. The planning and diagnosis phases, for example, purposely coincided due to time constraints and brevity. Indeed, Zhou (2012) points out that action research-orientated methodologies usually require much of instructors' and students' time, placing additional pressure on already heavy workloads and academic responsibilities. Furthermore, processes, tasks and activities were under constant scrutiny and modification due to a complex array of influences, most notably, participant input and several unanticipated circumstances.

To deal with the disorderliness, I incorporated Stringer's (2014) action research routine cycle of *look* ⇨ *think* ⇨ *act* within and between the action learning phases (see Figure 16). *Look* means identifying the problem of inquiry, *think* refers to the endeavours undertaken to understand a problem and *act* denotes the measures implemented to resolve the problem. Later, I contextualise the *look* ⇨ *think* ⇨ *act* routine in the customisation of *Millionaire*'s game elements. In the first dialogue session, the participants and I not only attempted to collaboratively *diagnose* circumstances which lead to low student motivation, we also planned *Millionaire* as a gamified learning strategy.

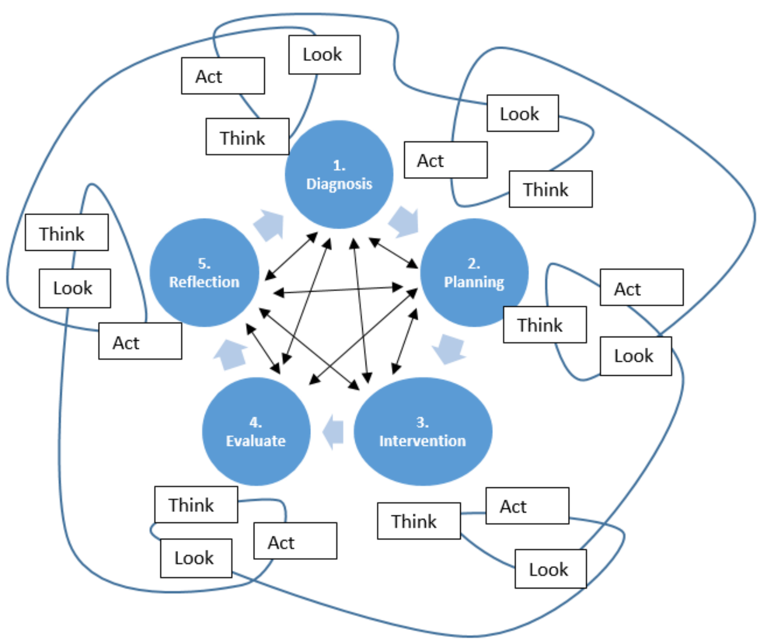

Figure 16. Structuring inconstancy in action research through the *look* → *think* → *act* cycle (based on Oates, 2006; Stringer, 2014).

In this and the next chapter, I report on what transpired during the *diagnosis*, *planning* and *intervention* phases of each respective gamification strategy (*Millionaire* and *Quizlet Live*). Chapter 6 (thematic analysis chapter) offers an account of the *evaluation* phase as an emphatic distillation of the data collection and analysis methods. All chapters, through continued reflection (*reflection* phase) constitute a valuable narrative of the new knowledge and practical outcomes that the proposed gamified solutions deliver.

4.5 Conforming *Millionaire* to a team mode play

In their IS curriculum guide, ACM and AIS emphasise that "written and oral communication skills and team skills continue to be important: graduates need to be able to interact effectively" (ACM & AIS, 2010, p. 2). In *Millionaire* (2019b), only one contestant plays at a time. To socialise the experience (Deterding, 2013a), I suggested that students play this study's version of *Millionaire* in teams of three. Several articles in the literature on game-based learning advances the role of team formation (Deterding, 2013a; Earp et al., 2013; Vegt, Visch, De Ridder, & Vermeeren, 2015). The primary motivational relevance of collaborative play is the sense of belonging to a team. Experiencing this kind of relatedness promotes the co-construction of knowledge, inclusivity and reflective group thinking in learning (Earp et al., 2013).

4.6 Customising *Millionaire* with playful design elements

I mention in Chapter I that I adopt the playful design features (symbolic play, constructive play and functional play) recommended by Tseng and Sun (2017), to promote a playful experience for the participants. In the subsection below, I explain how the participants and I attempted to incorporate these three features.

Functional play

Functional play involves the design or use of elements that encourage exploration. Tseng and Sun (2017) regard exploration in games as a fun activity. I position the three lifelines of *jQuizShow* (2001) as conceptions of functional play elements. Therefore, if the playing team is unsure about the correct answer, they can explore any of the three lifelines to help advance to the next question.

Exploration is a strong theme in the IS Ethics, Sustainability, Use and Implications for Society module recommended in the IS 2020 curriculum guide (ACM & AIS, 2020). The competencies linked to this module holds that students will be able to (ACM & AIS, 2020, p. 154):

- "demonstrate ethical behavior during data collection";
- "identify the moral issues that surround the storage and usage of data"; and
- "categorize ethical stakeholders and their importance to Information Systems".

In the forthcoming discussions, I highlight how issues of IS ethics, sustainability, use and implications of information systems manifested themselves in the conceptualisation of constructive and symbolic play in this study.

Constructive play

Constructive play means that players can assemble and create in the 'world' of the game (Tseng & Sun, 2017). A more detailed analysis follows in the implementation phase of this action learning cycle. Constructivism in IS learning promotes spontaneous student engagement and reflection, amplifies student self-confidence and increases the sharing of generated resources (Jakovljevic, Ankiewicz, & De Swardt, 2007; Rambe & Bere, 2013). In a technical context, object-orientated programming needs to prepare students for a construct, for example, software system architecture (ACM & AIS, 2020). As indicated, students will not design (code) their own games in this study; they will, instead, engage with constructive play whereby they provided input for customising the progress bar of *jQuizShow* (2001).

Symbolic play

The symbolic play feature describes a player internalising a role in a game (Tseng & Sun, 2017). In an IS context, the ACM and AIS (2020) maintain that IS students should understand information systems user roles beyond the trends of ubiquitous computing of the 1990s. During this period, information systems were limited to managers and employees in an organisational context. Since then, modern computing—augmented by the rapid grow of the World Wide Web—expanded new user archetypes that are observable "in roles such as … spectators … game players … etc." (ACM & AIS, 2020, p. 17).

Three narrative mechanics are introduced in this research study: Formulating a unique name for this gamification project's version of *Millionaire*, formulating the role of the hosts and formulating the role of the audience. Student 2 suggested the unique label for this study's version of *Millionaire* and the participants preferred: *Who Want[s] to Pass This Year?*[1]. Student 2 said that they would hopefully achieve this goal with the help of a gamified learning approach. Here, creativity emerged as a foundational knowledge and skill in IS (ACM & AIS, 2010, 2020). Regarding the role of the host of the game show, I proposed that the lecturers take on the role of the 'trainer–host'. The trainer-host is tasked with controlling the flow of the game, enforcing the rules, motivating the 'student–contestant' and generally facilitating the smooth execution of the game (Yaman & Covington, 2006).

I proposed that students who were not engaged in a *Millionaire* game take on the role of the audience. Therefore, if a team evokes the Ask the Audience lifeline, the trainer–host then asks the members of the audience to vote for an answer. Although this lifeline is notorious for its accuracy in the original *Millionaire* (2019b), contestants can choose to go with the answer that received the most votes or not and whether to use another lifeline. I additionally proposed that a group can invite any other student participant who was not engaged in a *Millionaire* game to act as the Plus One lifeline.

4.7 'Bad Play': Tension between coordination and competition

Through a action research and social game theory lens, the focus on symbolic play shifts towards a wider theory of competitive and collective (coordinative) play (Earp et al., 2013; Schelling, 1960; Stenros, 2015; Vegt et al., 2015). These two concepts, which are well established in games, are based on the notion that competing teams can engage in competition with shared goals and collective resources (Vegt et al., 2015). For *Millionaire*, I assume that while teams would aim to surpass each other's performance, they would also share resources (that is, assist other teams through the Ask the Audience lifeline). Students 3 and 9 opposed the idea; they argued that sabotage and trust could become an issue. For example, Student 9 said that he would not feel inclined to assist another team and will most likely give a wrong answer to indirectly benefit his team.

Schelling (1960) suggested that such friction should be analysed through a lens of mixed-method (cooperation) games. Schelling grapples with the idea of conflict which destabilises convergent expectation in coordination games. Mixed-motive games introduce a conflict of interest that overlaps with some degree of cooperativeness, designed to be biased toward one of the two partners (in the *Millionaire* game in this study, competing teams are also partners in a coordinative sense). Thus, the payoff is higher for one player and less desirable for the other. Bargaining behaviour towards a desired outcome for all parties is central to the mixed-motive theory as divergent motives become present. In the realm of *Millionaire*, not accepting another participant's (Student 5) rejection of the views of Students 3 and 9 relativises the theory of mixed-motive games.

Student 5 voiced the aim that I endeavour to achieve via teams coordinating in *Millionaire* by stating that he understood the desire of participants to see their team perform well and not be disadvantaged but that the broader goal is also important; namely, a collective goal of improving all participants' IS knowledge as a result of the research project. Student 5 alluded to an altruistic attitude along with friendly competition. As Schelling (1960) puts it, winning relies on the expected behaviour that one player assumes from the other. The collective goal is lost and all players lose unless they make a joint decision that meets the other's expectation. I structured the bargaining behaviour in the form of participants voting for one of two decisions: (1) remove the two lifelines in question and collaboratively create new lifelines or (2) retain the lifelines.

The majority of the participants voted for the lifelines to stay. The demand for mutual accommodation takes precedence over self-interest, or both lose altogether. In the context of *Millionaire*, teams assist each other reciprocally via the lifelines, which are ultimately beneficial for all teams. But how do players then reach an equilibrium of cooperation in the mixed-motive game? Schelling (1960) suggests that the only viable answer would be a pre-'binding agreement' to cooperate, that is, not to defect. In this vein, the trainer–hosts and I will remind student participants before each *Millionaire* gameplay session of the study's goal which is that all student participants are a coalition that collectively and ethically strives to increase student motivation and performance for IS education.

Towards situated rule-based play in gamified information systems

The friction between competitive and coordinative play places the development of a gamified information system under scrutiny. The emergent friction problematises dispositions (for example, those promoted by Freeman and Freeman (2013); Kenny et al. (2017) that presuppose reflexive meaning and practices in the development of game-related technologies. These studies assume that systemic technical systems with gamified objectives can be modelled by applying declared and rigid criteria for quantifiable outcomes—social, cultural and political elements seem inconsequential. This choice of approach is called 'hard' systems thinking (Checkland, 1988).

Hard systems thinking holds an implication for reflexive meaning-making (entangled in game rules and role-taking) appended to game-related activities. In their IS-focused study of game-based learning, Freeman and Freeman (2013) adopt Salen and Zimmerman's (2004) description of a game. According to Salen and Zimmerman (2004, p. 80), "a game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome". Deterding (2013a) criticises Salen and Zimmerman (2004) for defining a game as an abstract object where the social actor is separately assigned to the human–environment relation. The definition by Salen and Zimmerman (2004) of players as people who "interact with the system…" is also questionable. This contrasts the concept of a system in this study as an activity, consisting of both people (for example, the player) and objects in a two-way relationship (Lee, 2004).

Furthermore, inferences of a game as an abstract object/system with quantifiable outcomes are oblivious to what constitutes gaming. Consider the designer of computerised chess who conducts a useability test: Repeating and testing moves that eventually leads to a 1 – 0 score in favour of the tester hardly classifies as gaming (one can assume that student participants in a Kenny et al. (2017) type of study would not only be game makers but also game testers). Additionally, imposing quantifiable outcomes on games would imply that a tennis ball (an abstract object) on a court has a quantifiable outcome (Deterding, 2013a). As a consequence, the player's role in the game is then indiscriminately re-projected as an underlying cause. By rejecting such hard systems thinking, this dissertation instead frames a game 'system'—in the context of information systems—according to the following dialectical view:

> An information system is that which results from the intervention of an information technology into an already existing social system [emphasis added], as much as an information system is that which results from of an intervention of a social system into an already existing information technology. (Lee, 2004, p. 11)

Situated rule-based play in gamified information systems

Freeman and Freeman (2013, p. 7) assert that the facilitator of a gamified information system "needs to establish the rules of play". If one followed this suggestion, *Millionaire* (in this study) would subscribe to a mixture of operational, implicit and constitutive game rules (Salen & Zimmerman, 2004). Operational game rules are written instructions that direct players, for example, this study's *Millionaire* partially follows the original *Millionaire* rule format. Implicit (unwritten) game rules refer to inferred rules of appropriate game behaviour, for example, most games promote friendly competition or healthy conflict that require players to coordinate actions to create safe and fair gameplay conditions. Constitutive rules are mathematical structures of a game, for example, video games where rule logic are contained within the game's code.

Salen and Zimmerman would suggest that the original *Millionaire*'s constitutive rule structure is discernible beneath the surface structure (operational rules) of *jQuizShow* (e.g., *jQuizShow* replicated *Millionaire*'s 50:50 feature where the computer executes the player's choice of eliminating two incorrect answers). Constitutive rules can ostensibly be reconstructed into operational rules via ethical conduct (Salen & Zimmerman, 2004). Deterding (2013a) criticises the underpinning as behaviouristic. Considering that game rules can be coded as algorithms suggests that a human who is knowledgeable in computer script writing instituted its constitutive rules. Because human understanding emanates from situated actions, constitutive rules are dispositional resources (Deterding, 2013a). *jQuizShow*'s (2001) 'ask the audience' lifeline, not having a computer input-output model of its constitutive rule representation, exemplifies situated action.

It further demonstrates that situated action can be divorced from computational rule implementation by the execution of constitutive rules in a discursive manner. Steve Chen's (2006) (the designer of *jQuizShow*) description of the lifeline supports such situational framing of constitutive rules:

> The Poll-the-Audience option is even more loosely defined. All it does is to play some music when selected. During this time, you can hold an informal poll with the members of the audience. For example, you might have the audience raise their hands to vote for what they believe is the right answer. (Chen, 2006, para. 6)

Chen's (2006) indication that all the digitised game element does is "play some music when selected", affirms that the meaning of its rules can emerge from socially negotiated use, but it does not guide expected behaviour through (computational) conditioning. The disparate perspective on coordinative play, however, remains a vexing issue. To better understand this problem, Deterding's (2013a) conceptualisations of informal games and unwritten rules are useful. Because *jQuizShow* diverges and reconstruct some of the constitutive rules of *Millionaire*, it classifies as an informal game. Furthermore, in this study, *Millionaire* is a system of secondary constitutive rules that are intentionally crafted, thereby altering existing behaviours into a new intertwining system of attemptable, reciprocal entities that are intelligible and normative (Deterding, 2013a).

Unwritten rules are fundamental to the game. An example of unwritten rules is the expectation that players must not cheat in a game. But the idea that unwritten rules—underpinned by etiquette—inform moral decision is a flawed assumption. Contextualised to the study's coordinative play context, Student 5 prioritising collective IS learning over winning is not shared by Students 3 and 9; from an ethical perspective, they imply a risk of cheating and that their opponents would not play an honest game (Deterding, 2013a). A requisite of gamification, therefore, is a reflexive, reproduced meaning-making which is absent in *jQuizShow*'s notion of coordinative play.

Operational (explicit) rules do not warrant separation from implicit rules. One will then ignore that operational rule adherence is a normative requirement of playing a game. Although one might understand the operational rules of 'how to play', the rules do not determine the subsequent action. Similar to implicit rules, operational rules embody practical understanding that is susceptible to complex social dispositions. In light of these unstable formalised rule systems, the prevalent disputes of *jQuizShow*'s coordinative play were resolved on the fundamental meaning embedded in rules, which is the capacity to continue a game in a reciprocal, intelligible consensus in which all players agree to a rule. For example, an unwritten rule that players learn in most games is not to cheat because then their defeat or victory would not really imply anything about their skills (Deterding, 2013a).

As mentioned, consensus on the Ask the Audience / Plus One lifeline rules was reached by submitting the how to play rule to a moral discourse. A chief characteristic of this discourse being promoted was that moral reflection should be included in the negotiation of authentic collaboration. As stated earlier, this is accomplished when participants approach their role(s) of Ask the Audience / Plus One with a unilateral, ethical and moral attitude. This requires students to realise that the study's goal is a holistic regard for the benefit of the coevolving whole (Collins, 2004). Therefore, negotiation and moral ethics arise from playfulness as foundational knowledge and skills in the pursuit of motivation in IS learning.

Negotiated autonomy is a strong democratic element of action research (Collins, 2004). ACM and AIS recognise the importance of ethics in any IS curriculum and exhort its profound impact on IS graduates; their conception of negotiation also pertains to competition in gameplay; they say the following with regard to the two topics below.

In terms of ethics (and interpersonal communication), IS students and professionals must be able to (ACM & AIS, 2010, p. 8):

- "critically evaluate and possibly act on current ethical issues in the IS field";
- "communicate effectively with excellent oral, written, and listening skills"; and
- "demonstrate persistence, flexibility, curiosity, creativity, risk taking, and a tolerance of these abilities in others".

In terms of negotiation, the ACM and AIS (2010, p. 21) note that "negotiation skills are very important for IS professionals. In their organizational roles, they have to navigate carefully between different, competing interests within the organization".

It remains to be seen whether participants' competing interests' in symbolic play will be left out in light of negotiations toward cooperative play. Nonetheless, from a macro teaching and learning perspective, students indeed successfully exhibit soft skills (negotiation and ethical analysis) deemed important for IS education by the ACM and AIS, through gamification (ACM & AIS, 2010, 2020). Ironically, then, the focus on the problematic ethics that surround the lifelines are beneficial amid the perception that is bad play as unpractical, unproductive or nonsensical. Two main findings stems analysis in this section:

First, I challenge the assumption, for example, by Tseng and Sun (2017) that positions the incorporation of play elements in IS as 'pleasurable' or 'fun'. As Stenros (2015, p. 72) says, "there is a tendency in the discourse surrounding play to see play activity and playfulness as inherently positive", implying that bad play is somehow not play at all. Play that involves sexual harassment the harasser's point of view, remains play, albeit one-sided play. Indeed, despite not agreeing on some aspects regarding the play rules, the students of this present study applied soft systems thinking in a playful frame of reference.

Second, a gamified information system consists only of a social system, the whole; the technical system is a dependable, constituent part. Hence, I reject Lee's (2004) positioning of programmers as 'already existing' technical systems; game programmers are social actors who are firmly entrenched in the social system and who continuously and consciously engage the social system to negotiate the ethical, hedonic and creative aspects of their gaming artefacts.

4.8 Customising this study's *Millionaire* for gamefulness

I also sought to infuse the *Millionaire* theme of this study with gamefulness. Gamefulness is described by Deterding et al. "as a systematic complement to 'playfulness'" (2011, p. 3). Gamefulness captures playing in a rule-bound and competition-driven system toward discrete outcomes. Gameful design aims to design systems that attend to a particular purpose and use, and enable both via enjoyable, motivating experiences (Deterding, 2015). I synthesise *Millionaire* with Deterding's (2013b) *skill atoms* as a design lens for user-centred gameful design. I assess whether Deterding's concept of gamefulness facilitates an increase in student motivation to obtain a improved understanding of specific Programming I and Communication I knowledge.

Skill atoms comprise skills, goals, tokens, actions, challenges, feedback and rules. A skill atom denotes a feedback loop between a player and a player-centric game that focuses on specific skills and challenges that the player wants to master. In the ambit of a skill atom, a game is conceptualised as a linked, nested collection of mini games. In turn, the mini game signifies a loop between a goal the player sets and actions the player executes to reach that goal. Taking action is in response to tokens, which describe the game entities (questions, points, countdown timers, etc.). A system of rules then evaluates the failure or success of the player's action. Instant feedback on progress indicates how well the player has achieved their goal (see Figure 17) (Deterding, 2013b).

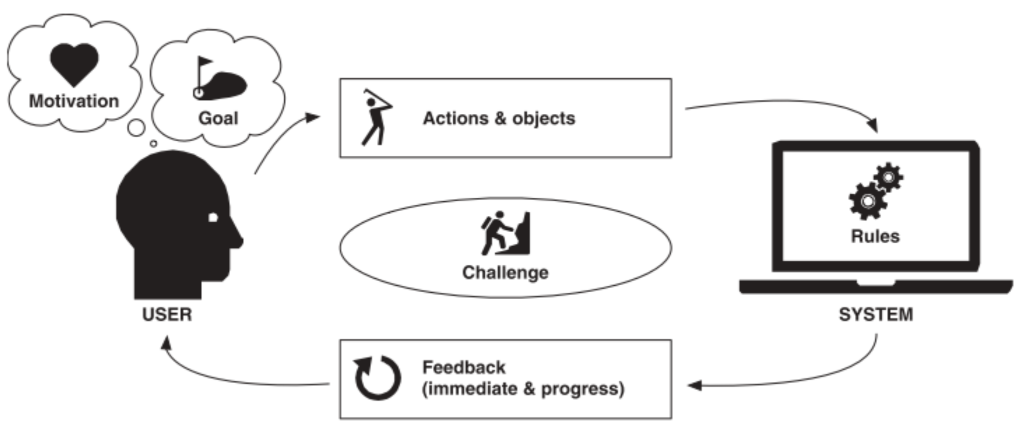

Figure 17. A skill atom (Deterding, 2015, p. 314).

Feedback loop

The feedback loop of a skill atom is premised on three conditions. First, clear goals that allow someone to properly direct their efforts must define the activity. Second, unequivocal and instant feedback on one's performance needs to occur for one to make modifications to the varying demands that the activity requires. Immediate feedback reduces the risk of losing focus. Third, one must have confidence that the player has the skills to face the challenge presented by the activity (Deterding, 2015).

A skill atom mini-game and challenge: The questions in *Millionaire*

Each question in *Millionare* symbolises a mini-game. In the present study, each question is interlinked with the other questions (that is, other mini games) given that they focus on the same learning topic covered in previous lessons. In line with the questioning format of *Millionaire*, the participant lecturers provided sets of questions (related to the topics) that increase in difficulty with each successive question. Questions of increasing difficulty link to the 'challenge' skill atom. Deterding (2013b) imputes a continuous generation of intrinsic interest as the player masters incrementally difficult tasks. The questions on the programming module featured the scripting languages HTML and CSS. The questions on the professional communications module focused on basic concepts concerning interpersonal, intrapersonal, intercultural and mass communication.

According to Deterding (2015), challenges are the core of any game experience. Challenges are obstacles that the player tries to surmount and arise from the player's actions and goals. Furthermore, Challenges are bound by rules and opponents which add more challenge to reaching those goals. Challenges need to be tackled collaboratively and should be nontrivial to conjure motivation, curiosity and fun. I consider the challenges in this study's *Millionaire* non-trivial since they revolve around the two IS modules under investigation.

A skill atom token and feedback: Answering a question in *Millionaire*

Student participants take action by responding to a question (that is, a token) and respond to other tokens in the form of a lifeline in case they struggle to answer a question. For example, the 50:50 lifeline can be placed as both a token and a feedback system. Consider an instance where a team is not sure about a correct answer but their intuition guides them to choose between answer A and answer D. Feedback through the 50:50 lifeline—when the computer removes two incorrect answers—evaluates how good the students' intuition is. If the 50:50 lifeline reveals that the correct answer is either answer B or answer D, the probability of answering the question correctly is relatively good (based on Deterding, 2013b).

Feedback, intrinsic and extrinsic motivation: The payment structure

Feedback also occurs through *Millionaire*'s payment structure. The payout structure can be located as a progression and performance indicator. Figure 18 is an example of this; the payment structure in *Millionaire* indicates a contestant's performance by showing that he has progressed to a milestone (safety net) of £32,000. Additionally, it visualises 'levelling', indicative of each level as a discrete subdivision that the player has mastered or to which they aspire to ascend. If applied correctly, the psychological outcome of progression is fun; for levelling, the psychological result is motivation (Seaborn & Fels, 2014). For *Millionaire* in this study, I proposed the conversion of currency to points. I heed calls by Bharamgoudar et al. (2016) and Dale (2014) to dissociate educational gameplay from monetary-orientated rewards because money decreases intrinsic motivation.

Figure 18. The payment structure shows that the contestant progressed to a milestone (safety net) of £32,000 (Millionaire, 2019a).

4.9 The implementation phase: Reflecting on a playful and gameful experience

Deterding's (2015) iterative prototyping requires that gameplay concepts are translated into 'playtest'. The rule that the prototype should meet is to interact with the central challenge of the skill atom. Deterding notes that 'paper' prototypes suffice. Figure 19 illustrates prototyping in the form of a flowchart of this study's *Millionaire* procedure. Deterding further proposes that the paper prototype should be enacted via digital interactive prototyping, which the research candidate implemented in the form of a pilot *Millionaire* session.

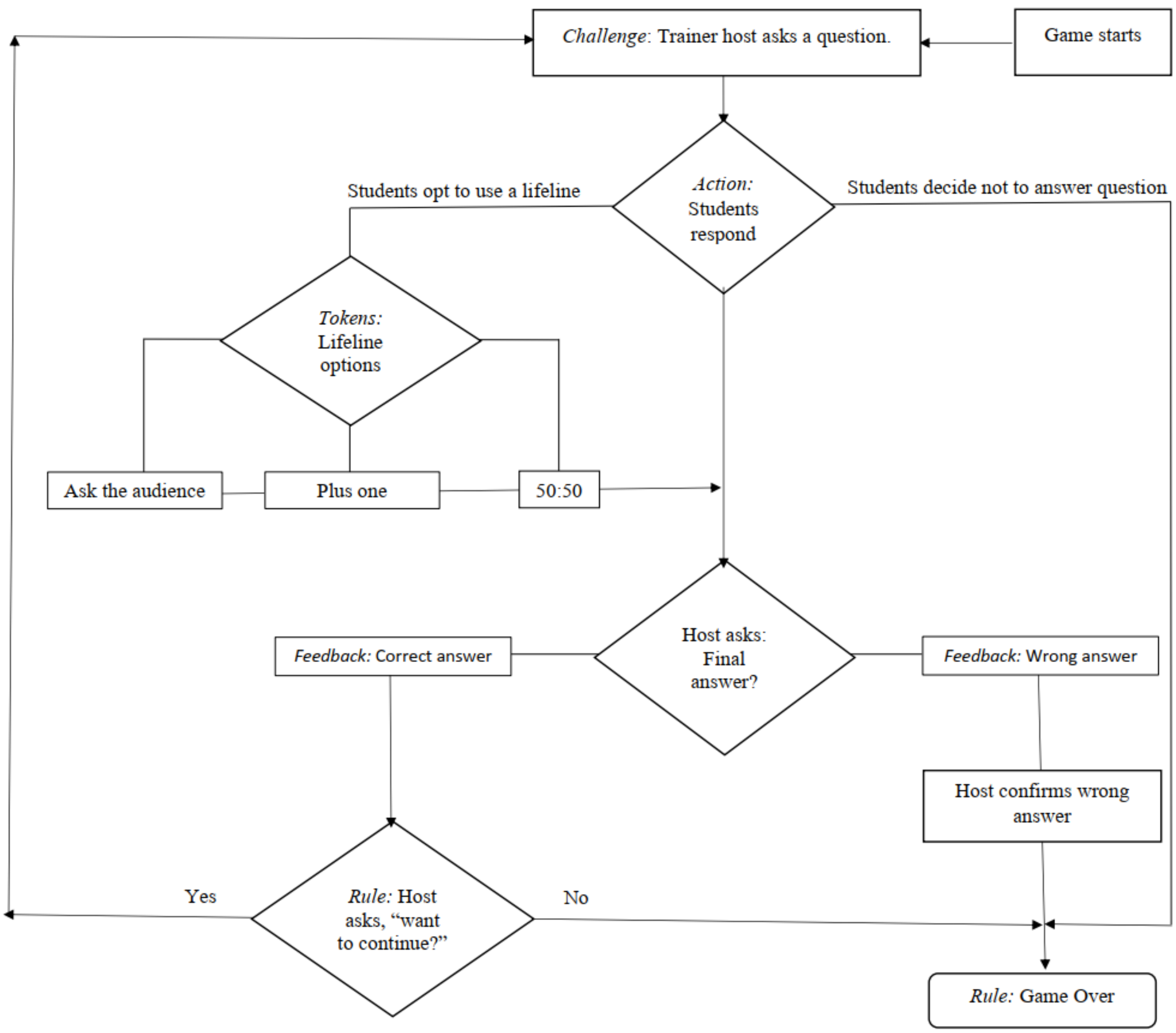

Figure 19. A skill atom prototype of *Millionaire* procedure (based on Deterding, 2015; Fotaris et al., 2016).

4.10 Group thinking in *Millionaire*

Group thinking via team play was negatively affected by a pattern of low attendance that plagued the entire first action learning cycle. I observed, for example, that the absence of one member of a team from a game session disrupted cohesive, reflexive group learning and caused a breakdown in team formation. Nonetheless, despite the presence of all teams (and their members) at some gameplay sessions, I observed a lack of communication when team members deliberated a question's possible answer. I attribute the lack of communication to the student participants not being fully acquainted with each other. I observed this when I made the randomised team formations known during the planning phase. For instance, it was noticeable that some participants did not know the names of the other students allocated to their teams. I deferred the issue of high absenteeism and lack of collaboration to the forthcoming individual interviews and focus groups to shed more light on this phenomenon.

4.11 Playfulness in *Millionaire*

Due to a lack of time, the participants and I were unable to finalise all ideas during the dialogue sessions of the diagnosis and planning phases. This highlights (as noted earlier) how action research does not follow a predetermined methodological structure (Stringer, 2014). As Stringer (2014) remarks, the consequence is that processes un(intentionally) co-occur. In this section, I report on the findings of the playful experiential learning of programming and professional communication through *Millionaire*.

Constructive play in *Millionaire*

An aspect not finalised in the diagnosis and planning phases was the safety net levels of the payment structure. As mentioned earlier, I situated participants co-constructing the payment structure as a constructive play element (Tseng & Sun, 2017). To briefly repeat, constructive play is where players have the freedom to extensively customise a game's virtual world or/and characters extensively. In this light, I invited participants to provide input for the customisation of the safety net values and questions. Negotiation emerged as a soft skill again.

Student 6 proposed one safety net question that is set at 500 Points; she argued that the safety net equates to 50% of what the student needs to pass assessments and exams. Student 6's proposal corresponds to Mead's (1934) view that a person internalises the role of the 'generalised other' in play. If a person embodies the role of the generalised other, they adopt (but only partially) roles, aspirations, actions and constraints that frame the existence, experience and goals of the person they imitate. Student 6, thus playing the role of herself (a student) and peers (students like here), assigns meaning to the safety net question that conditions a pass requirement of 50% to be evaluated as competent in the two IS modules.

Some participants disagreed with Student 6's suggestion. Student 2 stated that it would make the game too challenging and suggested two safety net questions at 300 points and 600 points to give teams a reasonable chance to win the game. Teams mostly struggled to cope with the difficulty level of questions linked to 600 points; as a result, they exited the game with 300 points. It appears that the teams were not extrinsically motivated by the achievement of the 300 points milestone; on the other hand, they also did not seem demotivated when they exited at 300 points. In this vein, I posit that milestone levels mitigate demotivation but do not necessarily increase motivation for the IS modules. Beyond this, I observed their engagement with the modules increased; for example, following their 'game over', they approach lecturer participants to query the question they answered incorrectly.

Symbolic play and functional play in *Millionaire*

In essence, *Millionaire* recruits identities under the auspice of knowledge display. In this sense, symbolic role-play positions students as a contestant motivated to engage their learning content. This form of symbolic play emerged when I noticed members of a team reading through their notes before the gameplay session started. Upon a query about the notes, the students said that good performance in *Millionaire* could likely be a consequence of some preparation. Students, thus, constructed an *action* around their gameplay identity (as contestants) to accord with how this identity ideally responds to the game sphere. That is, the contestant's role is to win the game through knowing, to adequately display knowledge in the world of *Millionaire* (Gee, 2003).

Functional play became intertwined with symbolic play because of the connection between the lifelines and the connection between participants' roles and the lifelines. A team's decision to use the Ask the Audience and Plus One lifelines (constructed as functional play elements) became involved in the controversy surrounding fellow students who take on the role of the audience (positioned as symbolic play). An atmosphere of distrust persisted around these play elements, despite requests (before the game session had started) for ethical/moral play when assisting as an audience member. This distrust translated to teams neither evoking the Ask the Audience nor the Plus One lifelines, only the 50:50 lifeline.

The constraints of collaboration (in this instance) and the ambiguity concerning common goals (Domik & Fischer, 2011) somewhat reinforces the notion of technical systems with an independent existence that are arranged according to laws, processes and materials that can be fully comprehended from an objective viewpoint (Pannabecker, 1991). The students' preference for the 50:50 lifeline is cast in a causal relationship because its rule of use is instantiated fully in *jQuizShow*'s code. Such preferences resonate with positivists who anticipate a positive motivation to learn in computing-related disciplines from the use of selected digitised game elements. However, play and game through the 50:50 lifeline is still constituted by human intervention insofar as student participants, as social agents, exert the choice of evoking the rules of a lifeline (Deterding, 2013a).

4.12 Gamefulness in *Millionaire*: Replaying a skill atom challenge

As stated earlier, *Millionaire* questions are the primary skill atom challenge. On the surface of the *Millionaire* skill atom, prior knowledge as a mechanic of the game emerged as a discouraging discourse. The concept of prior knowledge holds that a concept representation in one's head differs in important ways—crucial to the extent of content that is learned—centred on a person's existing knowledge (Gee, 2003). In this light, some student participants claimed that their knowledge being tested on some programming concepts had not been covered in the lessons. The aesthetic of the resultant game was frustration. As a consequence, game dynamics manifested in a negative action; i.e., students are incapable of answering the question with a high probability of success.

This phenomenon motivated me to implement the game element, *repetition* (Gee, 2003); namely, relearn and reteach in a pedagogical context (McFarland, 2017). I suggested to the students that they research concepts of which they have no prior knowledge and reassess that knowledge through *Millionaire*. The repetition approach was guided and accords with Gee's (2003) concept of reflective learning through video games and the cycles of probe/hypothesise/reprobe/rethinking underscore this process. Gee (2003) states that this four-step process is the foundation of skilled reflective repetition in any semiotic domain.

Probe: The player probes the virtual game environment; for example, running around in a first-person shooter game, shooting at things but not yet fully engaging the game. In the present study, I suggested that the student participants reengage programming concepts that they had encountered for the first time in *Millionaire*.

Hypothesis: Contingent on reflective probing, the player formulates a hypothesis about the meaning of a virtual game artefact, for example, the player learns that the state of the health of their game entity is worse when injured or attacked. In the present study, I imply that students might hypothesise how programming concepts of which they had no previous knowledge are significant in relation to concepts they are familiar with, via replay.

Reprobe: With the hypothesis in mind, the player re-probes their newly gained knowledge in observance of its effects; for example, the player probes their game entity's continued ability to operate while injured or attacked. In the context of this study, the students probe how they can apply their new-found knowledge in different and practical ways.

Rethink: This effect is treated by the player as feedback. The player then adopts or rethinks their original hypothesis; e.g., if a player's game entity is severely injured or under heavy attack, they could attempt to finish a certain difficult objective with the remaining health. Alternatively, they might purposefully incapacitate their game entity to restart the game stage with replenished health, preserving it as long as possible, to improve their chances of winning the formidable objective. In the present study, a student might perceive the unknown knowledge gained through the game as insufficient or otherwise valuable. In addition, the student might apply different knowledge or skills to achieve a learning goal.

To strengthen Gee's (2003) concept of repetition, I consulted the "Learning Techniques for Different Levels" metric in the ACM and AIS (2010) IS curriculum guide. I construed that learning by repetition is the core of the five levels proposed through these learning techniques. I followed the proposal by ACM and AIS (2010) of using only the first four levels for an undergraduate IS program. The ACM and AIS base the depth of knowledge acquired through these learning techniques on Bloom's (1956) six-level knowledge metric. Appendix J demonstrates the depth of knowledge metric and levels of knowledge metric mapped to outcomes of replay learning in the present study. The ACM and AIS (2010) divide Bloom's (1956) Level 1 into Levels 1 and 2 of the IS curriculum; Bloom's Levels 4, 5 and 6 align with Level 5 of the IS curriculum.

Level 0 denotes that the student does not know how to use an IS concept. 'Awareness' is Level 1 knowledge, which ACM and AIS (2010) posit is knowledge that is immediately obvious and that the student can recall. In such a context, I posit that students might recollect unfamiliar concepts they have researched. Level 2 knowledge is ‘literacy’, which necessitates not only awareness but also contextual awareness; that is, the knowledge component and its related components should be familiar to the student. Following a replay of unfamiliar concepts, I observed that attaining new knowledge motivated the students.

An example of the relevancy of Levels 0, 1 and 2 is a programming question about different ways to render text in *bold* in the web browser; e.g., the CSS ‘font weight’ property with the value *bold* (e.g., {font weight: bold}), the HTML element <*strong*> and the HTML element <*b*>. Some students report that their knowledge has not been tested on the <strong> HTML element in previous lessons. In sessions where unfamiliar knowledge was retested, questions (with the correct answer, <strong>) were left unchanged before the students presented their grievance; the question was and continues to be posed as follows: "The <b> element makes text bold; what is the other element that makes text bold?".

Level 3 indicates ‘comprehension and usage’ which entails extensive practice and creative repetition. The focus of Level 4 is the student engaging in unsupervised practice and the ability of a student to design, apply, test and debug an application that applies programming constructs. Concerning Level 3, I observed that replay helped students to comprehend programming concepts previously unknown to them; *usage* and unsupervised practice, however, is an issue because *jQuizShow* (in a programming context) is capable of testing new knowledge conceptually but not applying the knowledge practically.

The importance of skill application coincides with Deterding (2015) who notes that inherent challenges in game-based learning should ideally be skill-based to engender competence. In terms of the HTML <strong> element: if students understand its purpose following a *Millionaire* replay, it is inherent to the task of rendering text *bold* but not being able to apply it within *jQuizShow* devalues it from the imperative of skill usage. Unsurprisingly, the students later (in the second focus group) raised the drawbacks of assessing programming knowledge in *Millionaire*. Specifically, they highlight how it is not *Millionaire* that assesses practical programming skills.

Gamefulness: A skill atom token and rule

Earlier, I indicated that the actions of students signify a token of the skill atom. In particular, a team answering a question connotes the primary token of a skill atom. The lecturer participants who, in initiating the token, managed to internalise the role of the trainer–host; they expressed elation when the student participants answered correctly and were emphatic when the students became ‘game over’. Nonetheless, in terms of enforcing the rules (particularly regarding the countdown timer), they exhibited flawed behaviour (discussed below). *Countdown timers* are a game mechanic in *Millionaire* (2019b) that triggers the game dynamic by which a contestant must answer a question in 60 seconds. The aesthetic of the game is a sense of pressure, which can enhance a player’s motivation and performance to complete a task (Behnke, 2015).

A countdown timer is also included as a game dynamic in the Plus One lifeline. Should a contestant choose to use this lifeline, the Plus One player has 30 seconds to assist with the question (Millionaire, 2019b). For the study version of *Millionaire*, the Plus One lifeline countdown timer was left unchanged but I proposed a time limit of 30 seconds for the countdown timer of questions to the participants. The basis of this decision is that this study’s version of *Millionaire* has three players compared to the one player in the original *Millionaire*’s one player; hence, the rationale is that three minds working together would need less time.

The student participants initially agreed to the time limit adjustment but eventually expressed negative views after the first official *Millionaire* session (the one which followed the pilot session). The student participants explained that the 30 seconds time limit was too much pressure and suggested changing the time limit back to the original 60 seconds. In an IS learning context, the students again exhibited *negotiation* as a foundational knowledge and skill which the technical system could accommodate. According to the IS curriculum guide of ACM and AIS, IS students should learn to negotiate and manage “resources of time” with IT service providers and technical system users (ACM & AIS, 2010, p. 21).

The lack of rule enforcement by the lecturer participants can be attributed to the constitutive rule of time limits that is not coded in *jQuizShow*. I further surmise that this rule-breaking was not deliberate, because one can easily get caught up in a team’s intense deliberation about the possible correct answer; however, it contradicts externally imposed directives (for example, by the IS curriculum guide ACM and AIS (2010) of good time management). Therefore, *jQuizShow* does not terminate the game if players fail to answer a question within the time limit. From a technological deterministic viewpoint, *jQuizShow* could be criticised for exacerbating poor time management skills, considering the lack of constitutive algorithmic rule implementation.

4.13 Summary

Despite the problems that emerged from intergroup collaboration, I believe the students were motivated by the *challenge* (game mechanic) that *Millionaire* presents. The game mechanic of *Millionaire* states that a player wins the game by answering all the questions (which become incrementally difficult with each subsequent question) correctly (based on Deterding, 2015). In this sense, overcoming the challenge is intrinsically rewarding. As I stated before, *Millionaire* fundamentally facilitates knowledge assessment. Although students were rewarded with virtual points for each correct answer, the objective was not to motivate them via points. Again, I invoke Bogost (2011), who argues that the addition of external rewards to so-called non-contexts can be exploitative as it does not mean that the context in question is game-like (discussed in Section 2.11.2).

I furthermore observed that interpretivist action research is not free from politics in that a researcher is in a privileged position of power concerning how data are recorded (Helskog, 2014). Despite my belief that a *Millionaire*-based gameplay approach constitutes the fundamental goal of this research study, it is nevertheless superimposed on the empirical study. Moreover, playfulness and gamefulness, as Stenros (2015) argues, can become intermingled with ethical and social structures, which transcends the romanticised view of play as an inherently positive activity. This was particularly prominent in coordinative and competitive play. Nonetheless, 'bad play' does not suggest that a game is not achieving its goal of imparting knowledge; as reported, students still manage to learn and express soft skills in this study's gamification process.

The findings also indicate that technical matters are emergent and reliable properties (parts) within the whole of an information system. Despite the technical system being dependable on the social system, it remains a formidable entity insofar as hard-systems thinking influences the regulation of behaviour; for example, insufficient countdown timer behaviour affects human rule implementation behaviour. I evoke Goffman's (1961) rules of irrelevance to address and to counter argue that self-regulation behaviour remains an alternative to digitalised behaviour. The rules of irrelevance maintains that whether you play chess using wooden pieces with handcrafted designs of the material game entities (that is, the Queen) or whether you play with metal disk pieces with inscriptions of the representational entities, the players execute the same sequence of moves and countermoves, and conjure the same contour of enjoyment within the constitutive rules of chess.

Chapter 5: Action Learning Cycle 2

5.1 Introduction

In this chapter, I discuss the actions and experiences that emerged from the second action learning cycle. For the second cycle, the gamification team selected *Quizlet Live* as a gamification strategy. Quizlet (2022, para. 1) describes *Quizlet Live* as a "fun, fast-paced classroom learning game that students love". Pragmatic action primarily led to the selection of *Quizlet Live*. To be specific, the gamification team endorsed *Quizlet Live* to increase student motivation instead of another attempt through *Millionaire*. The rationale that underlies the selection of *Quizlet Live* is explained in more detail in Section 5.2.1.

In the next section, I immediately engage with the findings in the diagnosis and planning phases, specifically focusing on the conceptualisation of *Quizlet Live* within a playful and gameful frame of reference. In the second half of this chapter, I discuss the implementation phase; here, I reflect on the playful and gameful experiential learning that *Quizlet Live* produced. I defer the discussion of the evaluation phases (data collection and analysis) of both cycles to Chapter 6, the thematic analysis chapter.

5.2 The diagnosis and planning phases

As observed in Chapter 3, action learning is not an orderly activity. The diagnosis and planning phases of this cycle coincided with the focus group meeting of the first action learning cycle. The lack of available time prevented an exclusive group dialogue for the diagnosis and planning phases. Thus, I relied on the focus group participants to help coordinate ideas.

5.2.1 The democratic impulse of action research: Choosing *Quizlet Live*

I recounted to the focus group participants the suggestion that Student 2 made at the first meeting of the first cycle; Student 2 proposed using *Quizlet Live* as a gamification strategy. Student 2's suggestion was a salient moment at the first meeting; she enthusiastically explained that a lecturer who teaches one of their other modules introduced them to *Quizlet Live*.[3] She praised *Quizlet Live* as a fun and collaborative game. Moreover, the other participants shared her enthusiasm for *Quizlet Live* since they agreed with the idea both verbally and nonverbally.

5.2.2 *Quizlet Live*: An overview

Quizlet Live is a team-mode game to help students learn. Instructors and educators create a teacher account on *Quizlet*'s website. This account allows teachers to create questions with their answers (called study sets) from their own material. They can also add images if they want to test semiotic knowledge. To play a game, educators launch *Quizlet Live* on the website and display the user interface on a projector screen for the students to view. The projector screen displays an instruction and a six-digit code for the students. Students must join the game by opening the web page quizlet.com/live on their devices and enter the 'join' code (Quizlet, 2016) (see Figure 20).

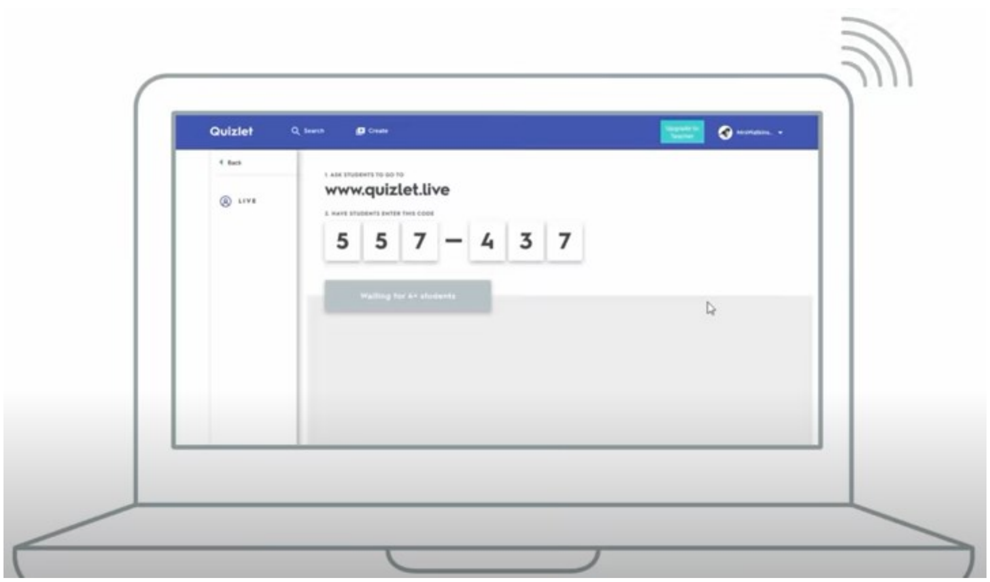

Figure 20. To join *Quizlet Live* the students must visit the url quizlet.com/live and type in the displayed code (Quizlet, 2018).

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[3] *Quizlet Live* was introduced to the student participants before they became involved in this research study. Furthermore, the research candidate is not aware of the existence of *Quizlet Live* prior to commencing this research study.

Once students enter the code, *Quizlet Live* asks them to enter their names to join the game. The educator can either choose an option that randomly assigns a student to a team of three to four students or the educator can assign students to a specific team. Irrespective of how students are assigned, *Quizlet* then groups the students into fictional animal-themed teams. One team, for example, is the T-Rexes and another team is the Orcas (Quizlet, 2018). While each player in a team is prompted with the same question (see Figure 21), different possible answers are presented to each player—only one player has the correct match (see Figure 22). Team members, therefore, must cooperate to match answers quicker than the opposing teams. Teams must answer 12 questions per game (Quizlet, 2018).

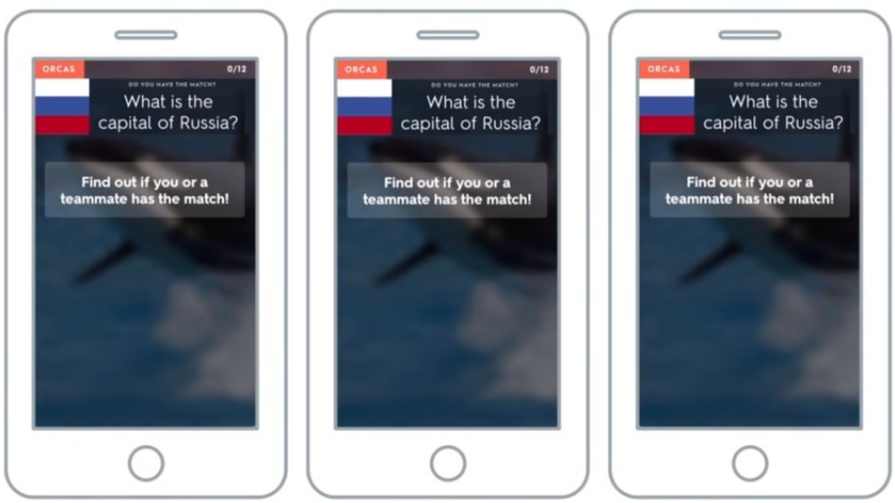

Figure 21. Players see the same set of questions on their separate devices (Quizlet, 2018).

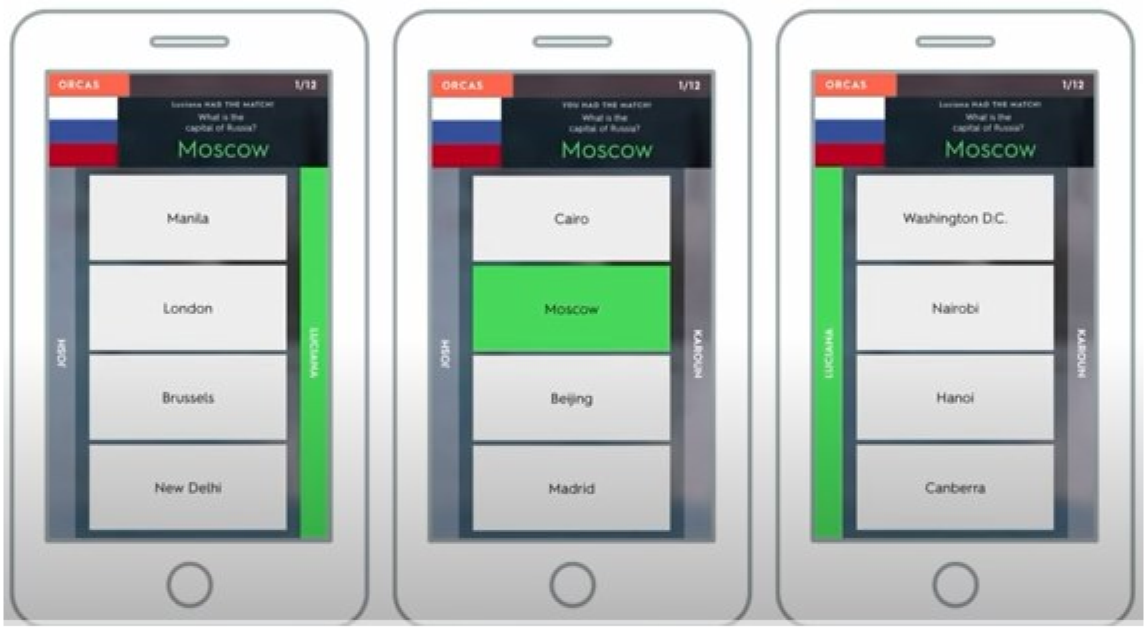

Figure 22. Each player of a team sees the same question but different answers (Quizlet, 2018).

While teams play, the projector screen displays an interactive leaderboard that show a team's progress as a race (see Figure 23). If a team answers a question incorrectly, their progress is reset to zero and they must then start again. Before their progress resets, they are navigated to a screen that displays the correct answer for three seconds. The team that manages to answer all questions correctly wins (Quizlet, 2018).

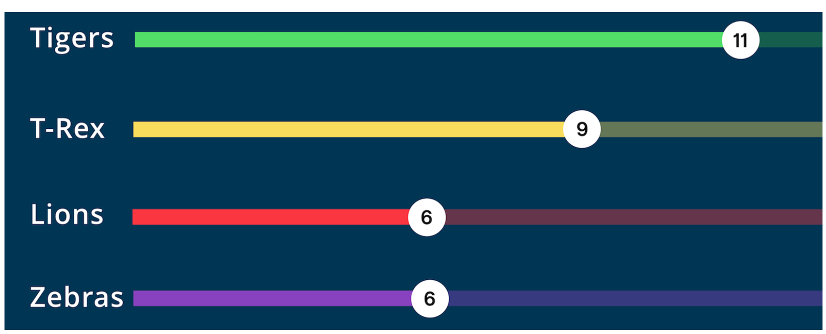

Figure 23. An interactive leaderboard displays the teams' progress – the Tigers lead the race with 11 out of 12 questions (Quizlet, 2018).

5.2.3 Social agency: A strategy to improve team communication

In Chapter 4, Section 4.5, I cited the IS curriculum guide of the ACM and AIS (2010) to highlight the importance of communicating effectively within a team. But as I reported, teamwork in *Millionaire* was characterised by a lack of communication. I deduced that team members not being acquainted with each other contributed to this phenomenon. An early glimpse at the individual interview data of the first action research cycle indicates that the randomised team formation improved social relations among students but in a pedagogical context, contributed little to collaborative learning. During his individual interview, Student 8 confirmed this when I asked him about his team-play experience in the first cycle:

> I felt way more comfortable, and I also felt you get the answer easily because you can discuss it.[4] *(sic)* And it allowed me to get to know my classmates as well because obviously, it is like the first year in the fifth month…six month[s] at least. (Student 8)

For this second action learning cycle, I decided to intensify social agency to improve team formation; in the diagnosis and planning dialogue session, I asked participants' opinions on the student participants assembling their own team for a *Quizlet Live* gameplay session. They approved the proposal. In the forthcoming section, Group Communication in *Quizlet Live*, I report on the outcome of this intervening strategy.

5.2.4 Reflecting on assumptions of playfulness

Diagnosing and planning playfulness are not quite as extensive in this cycle compared to the first cycle. In contrast to the customisable nature of *Millionaire*, *Quizlet Live* is a closed-sourced platform. By implication, (rule) play is predefined and unlike in a case like *Millionaire*, not an agentic, renegotiable activity. Therefore, the participants and I cannot construct play as we have done with *Millionaire* but are subjected to the playful conditions imposed on *Quizlet Live*. In Chapter 4, I mention that I engage in continuous reflection through all the action learning phases; however, considering that the participants and I cannot construct playfulness for *Quizlet Live*, instead I reflect and offer assumptions on its playful dimension in the subsections below. I align the soft skills that the ACM and AIS (2010, 2020) curricula guides advance, to assess the playful dimension of *Quizlet Live*.

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[4] By stating "because you can discuss it", Student 8 means it is easier to determine the correct answer by discussing a quiz question with one's teammates.

Assumptions on playfulness in *Quizlet Live*

In *Millionaire*, play can be conceived as what Stenros (2015) describes as ‘telic’. Telic describes a purpose that is future-oriented, goal-driven and purpose-directed toward an activity. For example, the application of Tseng and Sun’s (2017) playful design mechanics in the first action learning cycle sought to induce motivation for soft systems thinking in gamified IS learning. Conversely, *Quizlet Live* shows the quality of being ‘paratelic’, which marks an activity that is present-time oriented, passion-driven, gives instant gratification and willing experimentation. The students’ immediate suggestion of and consensus on *Quizlet Live* as a fun game signals a cursory rationalisation of paratelic play (Stenros, 2015).

Therefore, play appears to be an innate state in *Quizlet Live*, in contrast with the designed playfulness in *Millionaire*. Stenros (2015) argues that the activity of play is still a derivative of an internal state of being playful. Then, playfulness—if considered a phenomenological intersubjective mental state (or attitude)—suggests that some tenets of consequent play may or may not be shared by players (Stenros, 2015). According to Stenros, players risk depriving serious or non-game contexts of any enjoyment if they do not share the same tenets of play (especially from an ethics point of view). This inference aligns with Deterding’s observation that “for a playful keying to be shared by participants, it has to be enacted in an observably orderly way that is mutually intelligible as playful” (Deterding, 2013a, p. 39).

Following from the above, the mere enthusiasm with which student participants want to engage IS learning via *Quizlet Live* is an expression of playfulness, which Deterding (2013a) calls the *transformation of activity*. Deterding positions such playful framing as an institutionalised kind of activity of its own. Indeed, IS modules reside as constituents exerting influence within a global entity (that is, CPUT the institution). For example, similar to how only learning content that was covered in previous lessons would normally be assessed in tests/exams, so too should the content of the two IS modules under inquiry be covered in a playful frame. In contrast to *Millionaire*, A playful transformation of IS learning via *Quizlet Live* seems fully shared by student participants. This inference is based on all of the students’ positive experiences with *Quizlet Live* in the past.

Acts of mouse-clicking on answers on the *Quizlet Live* interface while intently watching their progress on the interactive leaderboard is a concrete type of activity that defines play(ing).

Assumptions on rule-bound play in the *Quizlet Live* information system

The findings in Chapter 4 indicate that formalised rules that are codified in software artefacts (for example, *Millionaire*'s 50:50 lifeline) gave rise to technological determinism. I attribute technological determinism to *jQuizShow* (the software application that was utilised to digitally simulate *Millionaire*) insofar as it partially replicates the constitutive rules of *Millionaire*. In this chapter, I present a similar argument concerning *Quizlet Live*; it indirectly facilitates technology determinism because rule-bound play is fully and artificially embodied in its technical system. Therefore, it is cumbersome for players to modify, negotiate or not adhere to the game rules (Deterding, 2013a; Stenros, 2015).

However, a key consideration in the analysis of *Quizlet Live* cannot be ignored, the human aspect of play; that is, its digital platform functions as a natural artefact and not as a social agent where the rules are disputable. Deterding (2013a) argues that the materially embodied rules of a computer often do not account for unwritten rules that could permeate games. For example, if a player randomly mouse-clicks answers when playing *Quizlet Live* it hardly constitutes play. Because the internal algorithmic rule models only accept pre-ordained inputs, such actions qualify as computer interactions but do not constitute the activity of rule play. Furthermore, player culture defines what rule play outside the material software artefact counts as un(acceptable); for example, if one player physically and deliberately blocks the view of their opponent at a difficult part of the game, their opponent might complain that the unwritten rules of fair play are being violated (Deterding, 2013a).

The preceding passage suggests that the social system warrants analysis in instances where technological imperatives have significant symbolic power over meaning-making. However, I regard technological determinism as too reductionist in its evaluation of play and gaming in encounters with information systems. As shown in the first action learning cycle, social phenomena are subsumed in the sociocultural environments of players. This suggests that *Quizlet*

Live could perhaps also produce a multiplicity of the play experience that moves beyond the power of techno-optimistic bias.

Assumptions on macro-learning of IS through *Quizlet Live*

In Chapter 4, I have shown that the construction of play facilitates macro-learning of IS learning insofar as students acquired or improved the soft skills that the ACM and AIS (2010, 2020) curricula models promote. In the previous chapter, I attributed the macro-learning of soft skills to the highly customisable nature of *Millionaire* that created ample opportunity to negotiate or construct the rules of play. At the start of the second action learning cycle, I was initially sceptical about its ability to facilitate playfulness because *Quizlet Live* is a closed-sourced platform with predefined rules. However, I observed that *Millionaire*, at a gaming level, not only produced micro-learning but also macro-learning of IS.

At the *Millionaire* gaming level, students indeed expressed some of the ACM and AIS (2010, 2020) foundational knowledge and skills. Students applied interpersonal communication skills and collaborated to negotiate the correct answers; in teams where low confidence and lack of communication were observed, I also observed (on several occasions) that one team member would demonstrate leadership qualities to evoke confidence and effect better intra-team communication and collaboration. Thus, I anticipate that soft skills and macro-learning of IS, too, will be observable in *Quizlet Live* gameplay sessions.

5.2.5 A gameful frame of *Quizlet Live* in IS learning

In Chapter 4, I aligned *Millionaire* with Deterding's (2015) *skills atoms* as an assessment instrument of gamefulness. I also align *Quizlet Live* to Deterding's skills atoms as follows:

A skill atom mini game and challenge. I position questions posed to students in *Quizlet Live* as a mini game (that is, a skill atom) (Deterding, 2015). A question also marks a challenge, which forms the core of a skill atom. For the programming module, the focus remained on HTML/CSS and for the professional communications module, the questions again featured basic concepts relating to interpersonal, intrapersonal, intercultural and mass communication.

A skill atom token. As explained in Chapter 4, The tokens of a skill atom impel action. I consider the interactive leaderboard to be a token. One can argue that a team leading the *Quizlet Live* race wants to maintain their lead; likewise, acquiring the lead mainly impels the actions of trailing teams.

A skill atom feedback and rule. As explained earlier, progress made on the interactive leaderboard reset to zero such that if a team answers a question incorrectly, then they must start again. Before their progress resets, they are navigated to a screen that displays the correct answer for three seconds. I position this process as a skill atom feedback. *Quizlet Live* asks the question answered incorrectly again, later in the game. I conceptualise this as *replay* from game theory (Gee, 2003) which, in turn, translates to *relearn* in a pedagogical context (McFarland, 2017). I frame 'progress-reset-to-zero' on the interactive leaderboard as a skill atom *rule*.

5.3 The implementation phase: Reflecting on a playful and gameful experience

In the first action learning cycle, I borrowed from Deterding's (2015) *iterative prototyping* concept to submit *Millionaire* to a post-launch assessment. As explained above, iterative prototyping involves testing and refinement through a rigorous design process. This may include concept sketches (see Figure 24 for a flow chart of *Quizlet Live* procedures), which later translate into practically implemented activities such as 'playtest'. In this empirical fieldwork, I pilot game sessions as playtests.

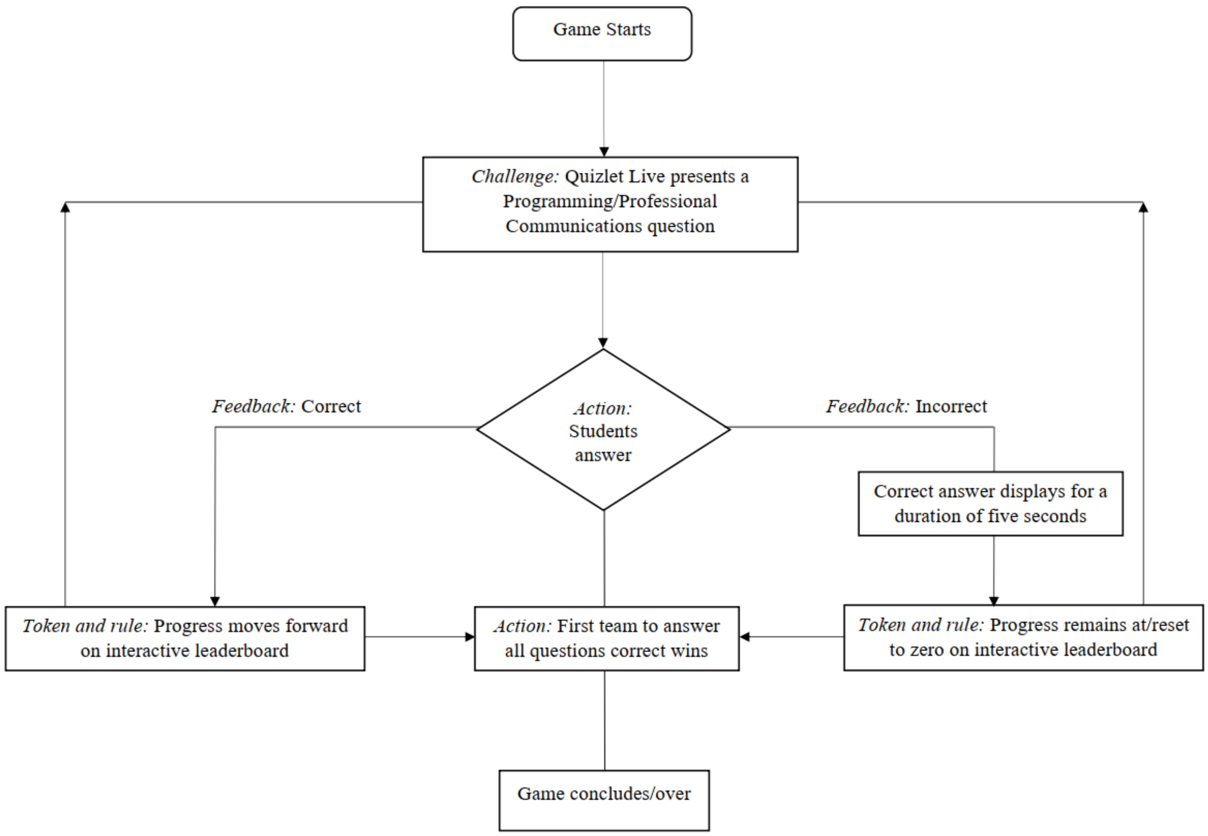

Figure 24. A skill atom prototype of *Quizlet Live* procedure (based on Quizlet, 2016, 2018).

5.3.1 Group communication in *Quizlet Live*

The students had the agency to choose their own team members, which produced mixed results. Language skills largely directed group formation. Less fluent English-speaking students formed a team while fluent English-speaking students formed a team. Fluent English-speaking groups performed better, which I attribute to effective communication in English. Schwalbe (1983) argued that the use of language determines *joint action* effectiveness. Joint action refers to the meaning ascribed to one's acts in a group to indicate to other members what these acts aim to achieve (Blumer, 1986). In return, such meaning indicates the acts that one expects the members to perform to help with achieving a goal. If all members agree on the meaning that the act enfolds, coordinated joint action is possible. However, if a member's sense of meaning diverges during coordination, the joint action breaks down.

In light of the above, Schwalbe (1983) suggests that joint action is difficult if two individuals speak different languages or an instance where one individual struggles to express themself fluently in a language. Bandura (1989) agrees; he states that if one acts on a misunderstanding of what others say, the effects are adverse. As I highlighted in Chapters 1 and 2, language is a contentious subject in computing education. Because ICT is a Western invention, it tends to reflect Western linguistic models (for example, written and spoken English). By implication, speakers who are not first-language English speakers might struggle to perform academically in a computing learning culture, which is predominantly rooted in Western epistemology (Dalvit et al., 2008). I expand the discussion on this finding in the next subsection.

Language

The issue of language competence emerged from a distinctive moment during a Professional Communications game. I noticed that students of team Kangaroos (a *Quizlet Live* assigned name) lacked the energetic interaction that the Sharks and Giraffes teams displayed. The Kangaroos' interaction seemed hesitant and unconfident; Student 12 and Student 13 mostly engaged with each other and only pointed to an answer on Student 11's screen as an indication that he must select it. The lecturer drew my attention to Student 11 and mentioned that the student has difficulties with the English languge. The lecturer further said that Student 11 is French-speaking; for Student 11 to make sense of the correct context of what he reads, he reads slowly. What the lecturer conveyed explained this student's and other ineloquent English speakers' lack of involvement in team communication.

Student 11 and other less fluent English speakers have difficulties with translating concepts that have multiple meanings (see the interview extract below). Consider the term *accessibility* in the context of technical systems; students understand that the term refers to the capacity of a group of people to access the user interface of a technical system's user interface. However, for some students, it is difficult to understand the literal translation of the term (that is, the extent to which something can be approached or obtained) (Dreher & Dreher, 2011). Additionally, I observed that the pressures that underlie the competitive setting of gameplay exacerbate matters. Subsequently, these students were somewhat inert in team communication.

> Research candidate: You mentioned that the language barrier is a problem for you. Was it also a problem in the gameplay sessions, especially in terms of understanding the questions?
>
> Student 11: Ja, sometimes. Sometimes there is a question, you know, when I see it I'm thinking, "oh what is that word?" You understand the questions, but you know the word can make you think about, "is it that also?" … You doesn't *(sic)* know that, because you know, it is not your own language. (Student 11)

Despite students having the agency to choose team members beforehand, I observed that the Kangaroos was an ad hoc team. I link this ad hoc team formation to the psychological perspectives of language use. These students lack the self-esteem to establish social relationships, which I attribute to poor English-speaking skills. Because students find it difficult to negotiate meaning through English, they are acutely aware of their lower sociocultural standing in terms of English proficiency. Consequently, they feel socially marginalised (Lakoff & Johnson, 1980). Such a feeling of exclusion translates into a negative gaming experience:

> The other people, they know each other. And me, I'm not talking too much in the classroom. I know Student 12 but we don't talk a lot. The other person they know, that is [a] friend; for me, we are just colleague[s] if you are not talking. So when they choose our group and I feel like you are just two, so let's do it, but we are not so close. And we are gaining something, you must be close and talk about it. What is that? What is that question? What do you think? You know, when you know each other. But in my group, it's like because you don't talk out of the game, you don't talk. In the game we are reserved, I don't know if in English you can say ja like we are not like open, we are just like ja, okay, ja, okay *(sic)*. (Student 11)

In contrast to *Quizlet Live* gameplay of the communications module, the programming module (in terms of language) was not an issue for less fluent English-speaking students. This is because artificial languages like HTML/CSS are formal languages in comparison to English or French, which are natural languages. Natural languages use verbal signs to interact in everyday communication; contrastingly, formal languages use equations, numbers and algorithms to communicate with unambiguous references and precise measurements (Marsen, 2008; Ruby & Krsmanovic, 2017). Accordingly, assessing HTML/CSS in gameplay is free from conceptual context-driven misunderstanding. Consequently, demotivation is mitigated under the pressure that competition evokes which, in turn, places less strain on team communication.

I further link the satisfactory programming gameplay that the ineloquent English-speaking students experienced to programming languages that are essentially created to allow communication between human and machine. Programming languages, not having the advantage of speech and absent from the social context, remove ambiguieties from meaning (Ruby & Krsmanovic, 2017):

> Research candidate: Is language also a problem in terms of interacting with your team members?
>
> Student 11: Professional Communication, it was really difficult for me because you have to think about English and all kind[s] of things. But in programming it was … *ja* you know, you know the code! You just say like ah I know that stack; ah I know this one. So, in Professional Communication it was a big problem for me for the language *(sic)*. (Student 11)

5.3.2 Playfulness in *Quizlet Live*: Oppressive computerised rule-play

In the context of playfulness, *Quizlet Live* for IS learning was both motivating and demotivating. Language challenges also affected playfulness. Fluent English-speaking teams experienced positive play, while less fluent English-speaking teams experienced a breakdown in play. Teams that experienced positive play appear to have no problem with rule-play delegated to *Quizlet*'s computerised code, while teams plagued by communication problems rejected *Quizlet*'s artificially encoded rule-play. For example, layered on top of communication challenges, the progress-reset feature in *Quizlet* unintentionally caused frustration. Students felt adamant that the progress reset was too stringent. These students opined that if they had the agency to change this feature, a team's progress would remain stagnant or only move back one or two levels on the interactive leaderboard.

My belief is that play is inhibited in *Quizlet Live* by what Glass (2018) describes as digital technology's 'architecture of oppression'. Glass recognises that there is some misplaced optimism in digital technology. Glass infers that digital technology's widespread progressive drive to better rationalise human activity globally, in effect, helps to establish the oppression of user behaviour in an authoritarian way. Glass perceives users here as passive beneficiaries rather than a contributing force in technology development.

Glass (2018) draws attention to a limitation of the participatory culture of digital technology namely, programmed features that "algorithmically control circulation of information" (Glass, 2018, p. 293). The applicability of this notion relates to the replay feature in *Quizlet* that Student 11 criticises; he thinks that *Quizlet* should only ask a question once, "and when it's done … it's not coming back". As noted earlier, *Quizlet Live* includes some customisable features, yet its code is mostly immune to modification by users. This emphasises the separation between the interests of technical and social systems. Glass would argue that *Quizlet*'s technical system is politically oppressive insofar as it can hinder the learning development of students. Thus, students are not able to comprehend and transform their digitised social reality according to their own interests, experiences and needs.

The preceding analysis, therefore, does not support my earlier assumption of a shared playful experience via *Quizlet Live*. Furthermore, a critical examination of issues such as proficient language use and the insufficient fulfilment of social system requirements in information systems suggests that this is not a case of the losing teams being bad losers. If unwritten rules of play imply that players should, for example, not cheat and be provided with a level playing field, the consequence is that a player can legitimately protest that play is not enjoyable or motivating (Deterding, 2013a). In the context of the present study, less fluent English-speaking players alluded to the advantage that fluent English-speaking players have; the latter do not face the additional barrier of language during competitive gameplay.

5.3.3 Gamefulness in *Quizlet Live*

Although some students did not have a playful experience, I observed that all participants had a gameful experience, which I mainly attribute to *Quizlet*'s feedback skill atom. I link this assertion to observations of spontaneous player involvement, for example, I noticed energetic cyclic shifts of all students' attention between the interactive leaderboard to monitor progress, their own screens to ensure they understand the questions and interaction with team members to deliberate on the answers. It is in this behaviour cycle that I observed macro-learning of IS, that is, a display of soft skills.

Ironically, the same feedback system (the replay feature in particular) came under scrutiny. Student 14 argued that the three-second screen, which shows the correct answer following an incorrect answer, should have a 'skip' option. Under such strenuous rule-play conditions, competitive behaviour takes priority over the replay feature, which some students considered a waste of time:

> I feel that [the] screen that tells you what you got wrong and what is right could last a little bit quicker. I felt like that hampered a bit of your time 'cause the screen is on for about five seconds. You already know the answer by just reading it in a second or two. So, I feel that delays you a bit, because it also reset[s] all the way back to zero. (Student 14)

Deterding (2013a) cautions against players who overtly care about winning; he argues that the aim of winning should affect an enjoyable shared activity, not dominate it. Although some participants (mostly fluent English-speaking students) also considered the progress-reset-to-zero feature stringent, they rationalised its behaviour as necessary to improve their knowledge on questions they had answered incorrectly:

> I almost want to say that it is extremely brutal because you feel you made such good progress, to the last question and all of a sudden, you return to the beginning. But I would say if your progress are*(sic)* just reduced down one level and not entirely then you wouldn't really have

> learned from your mistakes. So let's say there were 30 questions and we answer a question wrong and our progress are *(sic)* not reset to zero but only to 29, then you wouldn't have learned from your mistake. You then base your progress on speed instead of thinking. (Student 6)

Competition mostly improved cooperation between team members. In light of the interview extracts above, participants also compete against the technical system (that is, an artificial contest) (Salen & Zimmerman, 2004). The zero-sum game concept is pertinent and appropriate to such an artificial contest. A non-zero-sum game means that the gains of a player in a game do not necessarily mean losses for another player (Manning, 1992). A non-zero-sum game style works as follows in *Quizlet Live*: If Team A answers a question correctly, their progress does not affect the progress of Teams B and C. If Team A answers a question correctly, their progress does not affect the progress of other teams. Likewise, if Team A answers a question incorrectly and Teams B and C answer their questions correctly, the consequent progress reset of Team A does not affect the progress of Teams B and C.

A plausible assumption about *Quizlet Live* as a zero-sum game is that a team and the technical system have a common interest; both aim for the team to win as well as to learn in the process. The opposing interest is that some students reject some of the computerised rules they consider too strict (for example, the progress-reset feature). In contrast, *Quizlet Live* considers rule enforcement through its programming code as a means to ensure that students learn from their mistakes. However, the inaccessibility to the programming code of technical systems is a point of contention. Glass (2018) considers this a political issue in software construction that continues unchecked; she calls for a participatory culture in the design of technical systems to better suit users' values and needs.

5.4 Summary

The second action learning cycle sought to redress the political problems that characterise action research and restrict motivation increase for IS education. However, political challenges manifested in a new form: the oppressive nature of technical systems. Exemplified through rules regulated by the programming code, this chapter illustrated how technical systems can curb the democratic and motivational relevancies of social interaction. Such sociopolitical determinants indicate that the sociocultural realities of encounters in play and gaming do not emerge impromptu. As seen, language—as a sociocultural and emerging sociopolitical artefact—highlights how meaning is both shared and not shared concerning play and gaming in IS learning.

This chapter highlights a turbulent, yet interesting relationship between learning about information systems and learning via information systems. Despite some participants' dislike for computerised rule play, the gameplay of the programming module (a field that is cast in causation) yielded intelligible gameplay. Programming languages, characterised by causation, are prefered over context-driven language which is mostly prevalent in the communications module. Causation in programming language seemingly emphasises the upside of disambiguating gamified information systems towards precision. In opposition, I argue that language (including different scripting code versions) emphasises the diverse, emergent impulse of continuously evolving sociocultural dynamics in context-bounded IS learning environments.

Finally, this chapter briefly alluded to the possibility of improving mutually intelligible gameplay if the designers of gamified information systems cooperate with players in constructing the rules contained in the technical system's code. I agree with Kenny et al. (2017) that students, in their quest to increase their motivation for IS learning, should not only be game consumers. As stated earlier, Kenny et al. suggest that IS should produce "game makers not game players" (2017, p. 2). In my view, IS should instead produce co-constructing game makers and game players.

Chapter 6: Thematic Analysis

6.1 Introduction

I deployed and combined applied thematic analysis (Guest, MacQueen, & Namey, 2012), informed grounded theory (Hassan, Mathiassen, & Lowry, 2019) and thematic analysis (Braun & Clarke, 2012) to analyse the collected data. Nevertheless, I also discuss the other techniques recommended by Ryan and Bernard (2000) for qualitative data analysis in this thesis (see Figure 25). The main body of the text explains how the study analysed the data using the three selected approaches of the present study. Appendix K provides an exposition of the other qualitative data analysis techniques. The purpose of the supplementary discussion is to advance qualitative data analysis as a framework of theory and practice in the IS discipline.

Appendix K illustrates that qualitative data analysis approaches are numerous, typifying a broad range of disciplinary perspectives. Therefore, IS scholars do not need to use only one or two data analysis techniques with which they are comfortable, often to the exclusion of others. Indeed, Appendix K is contextualised in computing and IS-related contexts. Appendices are usually suitable for relatively brief content; however, they are also appropriate for detailed descriptions of concepts that are not referred to directly in the main body of the text (American Psychological Association, 2010). Furthermore, in the first part (Section 6.2) of the data analysis of this study, the principles and techniques of applied thematic analysis are applied to plan and prepare the data analysis. In the second part (Section 6.3) of the data analysis, the principles and techniques of thematic analysis and informed grounded theory are applied to elicit themes from the collected data.

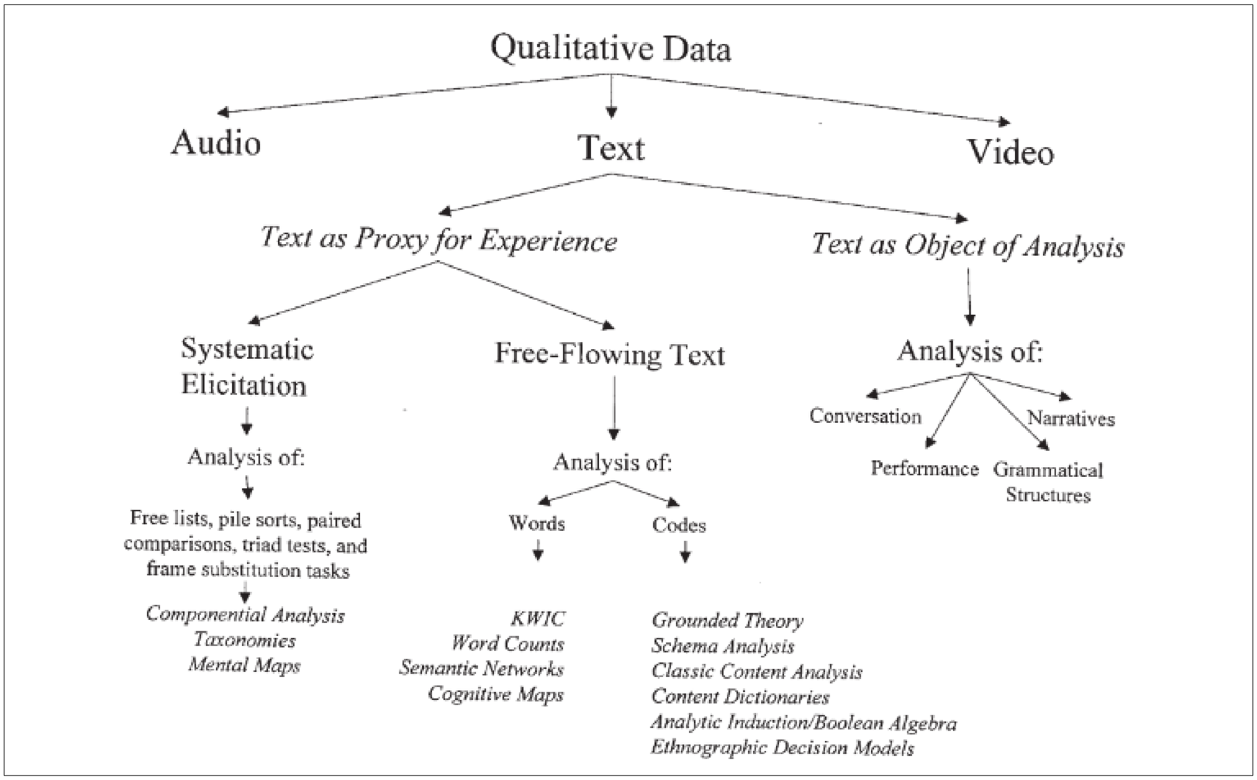

Figure 25. Range of data types for analysis in qualitative research (Ryan & Bernard, 2000, p. 771).

6.2 Plan of analysis

As aforementioned, I deployed applied thematic analysis to plan the analysis. Applied thematic analysis is derived from applied research that explores solutions for practical problems. Comparably, applied thematic analysis applies techniques to help solve practical matters in data analysis. In this study, such concerns included deriving and validating appropriate questions for the semi-structured interviews, clarifying the analytic purpose of the study, and developing codebooks to support the elicitation of the themes (Guest et al., 2012).

6.2.1 Preliminary steps to improve the quality of data

I developed the semi-structured and focus group interview questions from the literature and observational data documented in my field notes. For example, consider Interview Questions 1.2.6 and 1.2.13 in Appendix G. These questions focus on games and gamification in group contexts. I derived ‘Do you play games with other people?’ (Question 1.2.6) and ‘What do you think about students playing in teams?’ (Question 1.2.13) from the literature review. In addition, a review of the literature review produced a study by AlMarshedi et al. (2017) (see Section 2.4.1), which indicates that individualism and communitarianism are two important sociocultural elements that affect a person's preference either to play by themself or with other people. I formulated Questions 1.2.6 and 1.2.13 after observing the similarities in the analysis by AlMarshedi et al. (2017) of social gaming and the study's field notes documenting the students engaging in gamification in coordination with others. Section 6.2.2 sheds more light on the rationale that informs the conceptualisation of the interview questions.

To improve the quality of the semi-structured interview questions, Guest et al. (2012) recommend that researchers apply the following steps: (i) Conduct a pilot interview and read the transcribed text to identify questions that may need improvement; and (ii) reflect on whether the topical content of the research should be expanded, contracted or refined. Table 7 summarises an example of the first step.

Table 7

A summary table of problematic interview questions (adapted from Guest et al., 2012)

Extract from interview	Problem	Potential solution
Research candidate: What are your thoughts on the scheduling of the planning of all activities in terms of time allocations? Student 9: I personally actually wanted to … how can I say … be there for the other teams, like, to have us all in one classroom and play so I could kind of have my … almost like a scouting…or cheering on type of thing for the other teams so I can … Research candidate: Support? Student 9: Support … or scouting in terms of who my competition are *(sic)*. And what are the basic questions asked, what I need to know so I can … kinda … *ja*.	Completing statements for participants	Allow the participant to finish the statement; they might have wanted to say something other than 'support'. The rest of their statement shows strong evidence that the participant would not have said 'support'.

Table 8 illustrates the problem and potential solution to an interview probe and the responses I extracted from a pilot interview. The line of questioning was based on pilot gamification sessions that were scheduled for each respective class group (Group 1A and Group 1C). Some of the student participants were in Group 1A; others were in Group 1C. The pilot and official gamification sessions occurred during free periods for a group, although not concurrently for the two groups. Hence, the two groups were rarely in the same gamification session. This problem was compounded by a general lack of attendance at the gamification sessions.

The act of the participant completing the statement could have obfuscated the finding (presented in Chapter 4) that a constructivist gamification strategy allows "negotiating competing interest" (ACM & AIS, 2010). To reiterate, participant observation indicated that the distrust around *Millionaire* lifelines resulted in 'bad play'. Notwithstanding this observation, students (from a macro-learning perspective) still expressed soft skills, i.e., negotiation skills. This data quality analysis links the 'negotiating competing interest' with the general notion that IS education should prepare students to understand the depth and breadth of the IS profession. Student 6 presented a similar line of reasoning: "Everyone wants to see how others progress ... it helps you prepare ... [but] we were so little *(sic)* participants".

The second preliminary phase of analysis assesses whether the questions are sufficient, insufficient or generic. Guest et al. (2012) note that each successive data collection phase warrants adjustments to interview questions. In the present study, I changed the interview questions based on my observation of the pilot gamification session. The initial questions, which sketched a picture of this modification process, were the following: (1) Did you enjoy participating in this research study? Why/why not? (2) What game elements (if any) of this project made learning more enjoyable (3) Are there any elements of the game (if any) that you dislike? (4) Do you think that the game elements made a difference in motivation in the course? Please elaborate.

I determined that the resulting data lacked depth and were not informative in terms of addressing research questions. I do not consider the questions and responses in Table 8 weak; however, after observing the reaction to some of *Millionaire's* game elements, I concluded that it was necessary to ask participants what they liked and disliked about specific game elements. Therefore, I added the following questions: (1) What are your views on the points system? (2) What are your opinions on lifelines? Previously, I conceptualised these elements as skill atoms (discussed in Section 4.8).

I am interested in finding out whether these skill atoms constitute gamefulness to motivate students to 'microlearn' programming and communication concepts and skills.

Table 8

An interview question before it was subjected to preliminary analysis

	Extract from interview
Research Candidate	Are there elements of the game (if any) that you dislike?
Student 1	The timer, especially when you are really unsure about the question … especially the wording because I am very specific. So, when there is *(sic)* really general answers then I freak out because I am then looking for that specific answer and then the time runs out and I feel like I already lost, sort of. Then, I made the wrong decision.

These questions narrow the focus to specific game elements and strengthen the data and its use to address the research questions.

6.2.2 The analytic purpose

The analytic purpose indicates whether a researcher seeks to confirm, explore, explain, compare or describe the resulting data. The analytical purpose must be related to the research question(s) (Guest et al., 2012). The aim of this study is to explore, explain and describe the data. The analytic purposes link to the research questions as follows:

- *explore* – What are the essential social and cultural factors that affect student motivation in gamified IS learning?
- *explain* – Why do social and cultural experiences affect student motivation for gamification in information systems learning?
- *describe* – How do social and cultural spaces affect gamification in information systems learning?

6.2.3 Codebook development

In this section, I outline the design and development of the study codebook and begins with the following definition of terms related to codebook development:

- *Data:* An interaction, observation or conversation's textual representation.
- *Theme:* A segment of meaning that a data analyst elicits from the data.
- *Code:* A textual explanation that semantically frames a theme.
- *Codebook:* A structured collection of codes that explains how codes are connected.
- *Coding:* The process of assigning specific codes to specific units of data.

Code definition

A codebook essentially focuses on constructing and defining a code, known as a *code definition*. A code definition includes the following information:

- *Code label:* A mnemonic (generally four to fourteen characters) to distinguish between codes.
- *A brief definition:* Write a short descriptive phrase that signifies the essence of the theme to its represented code.
- *Full definition:* Write a more substantive and descriptive paragraph (two to ten sentences) that captures the key features of the theme and its assigned code. In addition, briefly refer to the significant cultural, theoretical or conceptual dimension of the code.
- *When to apply:* The data analyst should clarify the context as well as textual cues that imply thematic meaning.
- *When not to apply:* This feature describes the context and textual cues that denote thematic meaning that could potentially correlate with other codes. This feature should additionally highlight meanings that could be confused with the present code. It should illuminate other similar codes to the extent that the data captor more accurately elicits the meaning of the data in question.

Table 9 (in the Applying structural coding section) illustrates a code definition.

Structural coding and domains of inquiry

Structural codes represent domains of inquiry. Research domains derive from the research objective of a study. The research objective of this study (formulated in Chapter 1) takes a dialectical perspective for examining sociocultural meaning in the use of gamification to increase motivation in IS education. Hence, the domains of inquiry consist of interview questions (Guest & McLellan, 2003).

The interview questions in Appendix G related to the domain of enquiry serve as an example. The first set of interview questions (1.2.1–1.2.6) focuses on achieving the exploratory analytical purpose. The questions collect data on the present and past conventional gaming habits of students; students are questioned on the specific games and the types of games they play, the amount of time that they spend on gaming, whether they play games with other people, and the reasons why they play games. This dialectical approach helps in discovering the very essence of the game norms. Gleaning data from conventional gaming norms is not an auxiliary aspect of theoretical study; instead, it is a historical inquiry that underlies the very base of the phenomenon under study (Vygotsky, 1978).

Questions 1.2.1–1.2.6 were derived from gamification literature that promotes the motivational benefit of conventional games. These studies, furthermore, investigate methods and strategies that enable the transfer of play and game elements to the so-called non-gaming context, such as education. Tseng and Sun (2017) (discussed in Section 2.3) examine the affordance of play elements in conventional games and their appropriation for learning. In the context of the present study, consider Question 1.2.3 and its subsequent prompts: At what difficulty level do you play games? This question derives from a discussion by Dicheva et al. (2015) about progress bars. Whether students play games at different difficulty levels would suggest whether they are prepared to be presented with gamified learning content that incrementally requires higher levels of comprehension.

The dialectical perspective also examines change (Vygotsky, 1978). The explanatory analytical purpose of this study frames the examination of change, with the objective to understand the change in student behaviour as a result of playful and game elements. Here, I am wary of the causal treatment of game elements concerning human behaviour; Bowman (1982) observed that those game elements might not forge a more competent student. Therefore, unwanted behaviour might be the outcome of game elements; indeed, dialectical perspectives suggest that conflict usually leads to change. In Chapter 4, I reflect on the conflict that arose from the conceptualisation of *Millionaire*'s game elements (lifelines, in particular). Questions 1.2.7 to 1.2.11 (Appendix G) focus on the *Millionaire* game elements by questioning students on the following experiences with *Millionaire*: aspects of *Millionaire* they like and dislike the most, their views on the difficulty level of the questions, their views on the points and their views on the lifelines.

Questions 1.2.7 to 1.2.11 were formulated based on the literature review and participant observation. For instance, Question 1.2.9 in Appendix G asks about the participants' perspectives on the difficulty level of the questions. In the current study, I observed that the progress bars, which represent the increasing difficulty of gamified content, have little correlation with the participants' ability to comprehend advanced and complex IS concepts. Chapter 4 reports that the participants expressed more concern regarding the protocols (referred to as lifelines), which they perceive as obstacles to achieving higher levels of comprehension.

Questions 1.2.13 and 1.2.16 were derived from participant observation and an iterative literature review. Question 1.2.16 in Appendix G serves as an example: What are your thoughts on the scheduling of the gamification activities? This question purports to reflect on the impact of the great time demands of action learning on academic responsibilities. In the field notes, I captured the following observations: "The programming lecturer submitted an apology for not being able to attend the proceedings as he was lecturing elsewhere at the time" (Millionaire_field note 1), and "Group 1A had a lecture at the time and could not attend" (Millionaire_field note 3). Indeed, reviewing the literature indicates that academics and students find it difficult to set aside time to participate in action research, which requires extensive periods of time to conduct (Zhou, 2012). See the discussion in Section 4.4.

Individual content-driven codes

The primary condition for the effective development and application of a structural code requires that the interviewer use the interview and focus group guide consistently, that is, the interviewer consistently asks the same questions in every interview (Guest et al., 2012). However, semi-structured interviews inherently enable the researcher or participant to diverge from the interview guide to explore an idea in detail (Gill, Stewart, Treasure, & Chadwick, 2008). This was the case during the semi-structured interview with Student 11 from which the individual content-driven code, 'gamification_language' was conceptualised.

As observed in the *Language* section in Section 5.3.1, it was difficult for Student 11 to communicate in a group, particulary when gamification focused on the Professional Communications module. Student 11's behaviour impelled me to deviate from the interview guide. For Student 11's interview, I formulated and asked Student 11 this additional question: "What are the difficulties and challenges you experience in the IT course?" As expected, Student 11 responded that it was difficult for him to master and study in English. I elicited data to shed light on the impact of language problems on the gamification experience with follow-up prompts.

I deployed the hermeneutic loop to explore and extend the discussion about the influence of language. That is, language is a 'part' (in Student 11's interview) that contributes to the 'whole'. The whole reference further explores the topic of language in the focus groups. In focus groups, multiple viewpoints contribute to the whole. Therefore, I adapt the individual content code 'gamification_language' to a structural code, applicable and applied to the language-related transcribed focus group text.

Applying structural coding

Text segmentation is the first step in structural coding. Text segmentation involves the selection of text that is linked to a central interview topic (that is, probes and responses). A *network code* is then assigned to the text segment. A network code serves only as a segment label and should not be interpreted as a theme. As an example, I segmented interview questions 3.6 to 3.17 of the focus group guide (Appendix I) and assigned 'Action_Learning' as a network code; these questions focus on the action learning experience of students with *Millionaire*. Text segmentation is applied again, the second time to the existing segmented text. Henceforth, I refer to the aforementioned as *nested segmentation*. Thereafter, a structural code and code definition are applied to specific questions and responses (see Table 9).

Table 9

Code definitions applied to a structural code

Interview topic	Question number	Structural code	Code definition
Gamified Action Learning	3.6–3.17	Action_learning	Note: This is a network code only. It is not used for coding purposes. Responses to Questions 1–5 belong to this network but will be assigned to their respective structural codes, i.e., 'Gaming_status' and 'Gaming_motive'.
Gamified Action Learning	3.8	Programming_movivation	*A brief definition:* Reflections on Programming I games. *Full definition:* Descriptions/reflections on Programming I topics as the focus of increasing motivation through *Millionaire*. This also includes descriptions/reflections that align the verbal and nonverbal expressions of the participants with their level of motivation and efficacy. *When to apply:* This code is applied to descriptions/reflections of Programming I that are the focus of *Millionaire* games. This code also captures the verbal and nonverbal actions of the participants as an expression of their motivation and efficacy before, during and after games. This structural code can be embedded within a structural segment of another topic if the participant reacts to programming topical issues in the context of *Millionaire*. *When not to apply:* Do not use this code to capture descriptions/reflections about expressions of gamification to improve IS learning in general, use the 'Gamification_motivation' code instead. Furthermore, do not capture descriptions/reflections of motivation or efficacy participants express through verbal and non-verbal actions in team formations; use the Millionaire_team code instead.

Structural codes are most effective when an interview and focus group questioning guide is used consistently but even with a highly structured guide, the researcher is likely to deviate from the sequence of questions. This can happen because a participant spontaneously engages with a topic that the researcher intends to discuss with a later question (Guest et al., 2012). Guest et al. (2012) refer to this specific coding issue as *fractured structure*. Structural coding addresses *fractured structures* through two different approaches.

First, consider an interview where a data collector intends to discuss Topic X and Topic Y. For these topics, the data collector will formulate two questions together with associating probes (i.e., Question_X and Question_Y) to structure the respective topics. If the data collector later analyses the text, they discover that the participant returned to Topic X during their response to Question_Y (that is, Response_X_Question_Y). The first option is to position Response_X_Question_Y as a structural element of Question X and code it as such. As a consequence, Question_X contains multiple structural segments in the transcript. An additional consequence is embedded structural segments insofar as a segment coded as Question_X is embedded within a larger segment coded as Question_Y (Guest et al., 2012).

Alternatively, Response_X_Question_Y can be considered as a structural element of Question_Y. A separate, individual content-driven code associated with Response_X_Question_Y that explicitly references the structural code and code definition of Question_X can be created to capture Topic X embedded in the Question_Y response. Data collectors can also code Response_X_Question_Y solely contingent on its emergent content; the relationship to Question_Y does not need to be considered in this instance. Figure 26 shows the difference between these two approaches (Guest et al., 2012).

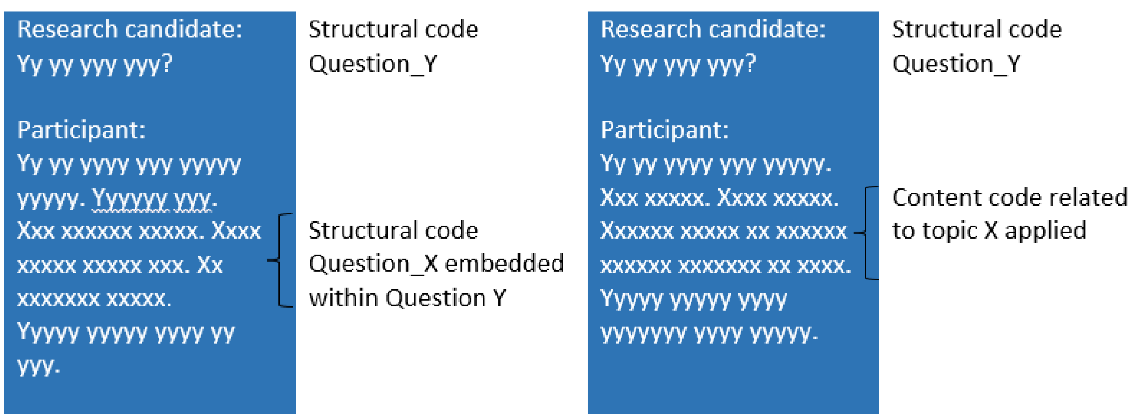

Figure 26. Two approaches to fractured structural coding (based on Guest et al., 2012).

To contextualise with real data, I extracted an excerpt from Student 3's interview. The first topic, Conventional Game Summary, contains subtopics. The subtopic asks whether the students play games, which games they play and how much time they spend gaming; Subtopic Two establishes the reasons why they play games; Subtopic Three reveals whether they play with other people; Subtopic Four determines the preferred difficulty level of a game. Student 3 jumped ahead to the second subtopic while responding to a question about the first subtopic; that is, Student 3 discussed reasons that motivate him to play games, which I intended to discuss in a later question. By incorporating 'when to apply', text about *reasons to play games* that are included in the larger segment 'gaming status' was coded using the relevant structural code 'gaming_motive'.

Coding focus group data

For the analysis of focus group data, Guest et al. (2012) propose that data analysts segment and code text associated with each participant's responses. This coding technique enables data analysts to explore how variability in the formulation of questions contributes to the richness of the data. One may reveal nuances that might not have become apparent outside a group conversation. It is also essential to establish whether a few speakers dominate the conversation and whether a specific view is widely shared. By identifying participants in a group conversation, data analysts examine how group dynamics affect individual views.

All the codebooks (semi-structured interviews, focus groups and field notes) can be viewed at https://drive.google.com/drive/folders/1SqNv8sZRHREzC_SURHA2YjKqkdcpjSG4?usp=share_link.

6.3 Theme

After the codebooks have been developed and the data have been collected, researchers embark on generating the themes of this study. According to Braun and Clarke, a theme is a "patterned response or meaning within the data set" (2006, p. 82). I deployed informed grounded theory (Hassan et al., 2019; Kelle, 2014) and thematic analysis (Braun & Clarke, 2012) and to generate the themes of this present study.

6.3.1 Informed grounded theory

Informed grounded theory assisted in generating the themes in the study. Informed grounded theory derives from classical grounded theory. Classical grounded theory is concerned with theory building that does not involve an existing theoretical framework. Classical grounded theorists must free themselves from theoretical preconceptions before they embark on an investigation. No preconceptions allow theory to emerge from data, which produces an accurate knowledge of the topic being investigated. The application of previous theoretical knowledge is rejected because it ‘rigidifies’ the analytic process. In contrast, informed grounded theorists argue that qualitative researchers cannot simply disconnect their conceptual lenses. Without theoretical lenses, we are incapable of understanding meaningful phenomena (Hassan et al., 2019; Kelle, 2014). Social cognitive theory is this study’s theoretical lens (discussed in Chapter 2).

Informed grounded theorists advance the use of extant theoretical concepts as sources of creative reflection, ideas, inspiration and creative associations, and agree not to apply them rigidly to empirical data (Hassan et al., 2019; Kelle, 2014). In Table 10, I contextualise the phases of grounded theory to the present study (Dixon, Igo, & McGuire, 2017; Tie, Birks, & Francis, 2018).

Table 10

Informed grounded theory aligned with the present study

Informed grounded theory phases	Study context
1. Depart from purposive sampling	Commence data collection by recruiting participants using the purposive sampling (see Chapter 3, Section 3.7)
2. Collect data	Action learning
3. Initial coding: The fracturing of data to compare case to case; look for similarities and differences in pattern in data	Apply structural and individual content-driven codes
4. Intermediate coding: Identify a core category; elicit abstract concepts from data; define and refine relationships between concepts; subsume concepts beneath core concepts	Identify subthemes (see forthcoming Section 6.7)
5. Advanced coding: Integrate a narrative to facilitate the integration of a comprehensive final grounded theory. As opposed to presenting themes, findings are presented as a set of interrelated concepts	Identify high-level themes (see forthcoming Sections 6.8, 6.9 and 6.10)
6. Informed grounded theory: (i) theory (descriptions and justification of relationship between concepts and boundaries of theory); (ii) model (definitions of abstract concepts and their relationships; (iii) rich description (narratives documenting observations without abstraction)	Theoretical contribution (discussed in Chapter 8)

6.4 IS theorising and the context of discovery

Informed grounded theorists engage in theorising to build and advance theory from data. Theorising describes a process through which data are segmented into coherent concepts, based on extant theoretical principles capable of explaining relevant phenomena (Hassan et al., 2019). IS theorists advance concepts that pertain to human experience with digital phenomena by applying principles pertaining specifically to IS and not to the field of information technology (IT), computer science (CS), computer engineering (CE) or software engineering (SE) (Hassan et al., 2019). This set of principles demarcates the enunciation of concepts by a branch of knowledge, thereby distinguishing IS discourse from IT, CS, CE or SE discourse in computing (Burton-Jones, Butler, Scott, & Xu, 2021; Hassan et al., 2019).

Theorists reject data discovery which implies the formulation and testing of hypotheses. This process is called the *context of justification* in data analysis. The context of justification marks the phase in research in which data analysts reconstruct the actual steps and idealised logic that underpin hypotheses formulation, and present it in perfected and refined form (that is, statistical data). In contrast, theorising is rooted in the *context of discovery*. The context of discovery represents the motives of the researcher and the steps the they execute during data collection. Indeed, loose ends, luck, mistakes and intuitive leaps by the researcher mark the inquiry. Regardless of this ostensible messiness, it is during this stage of the research that theorisers exhibit 'disciplined imagination' and creativity (Hassan et al., 2019; Kelle, 2014).

6.5 IS theorising framework

I adopt the framework for IS theorising by Hassan et al. (2019) (see Figure 27). Hassan et al. (2019, p. 201) describe their framework "as a set of *foundational* and *generative discursive practices* that deploy different strategies to produce specific *theory components* [emphasis added]" in IS. Theory components are produced in the form of a new framework, concepts, claims or theory boundaries. In the context of the present study, I aim to produce a gamification information systems framework that is IS discipline-specific and demarcates gamified IS as an interpretivist science. Theory components are organically linked to its foundational and generative discursive practice, which I discuss below in more depth.

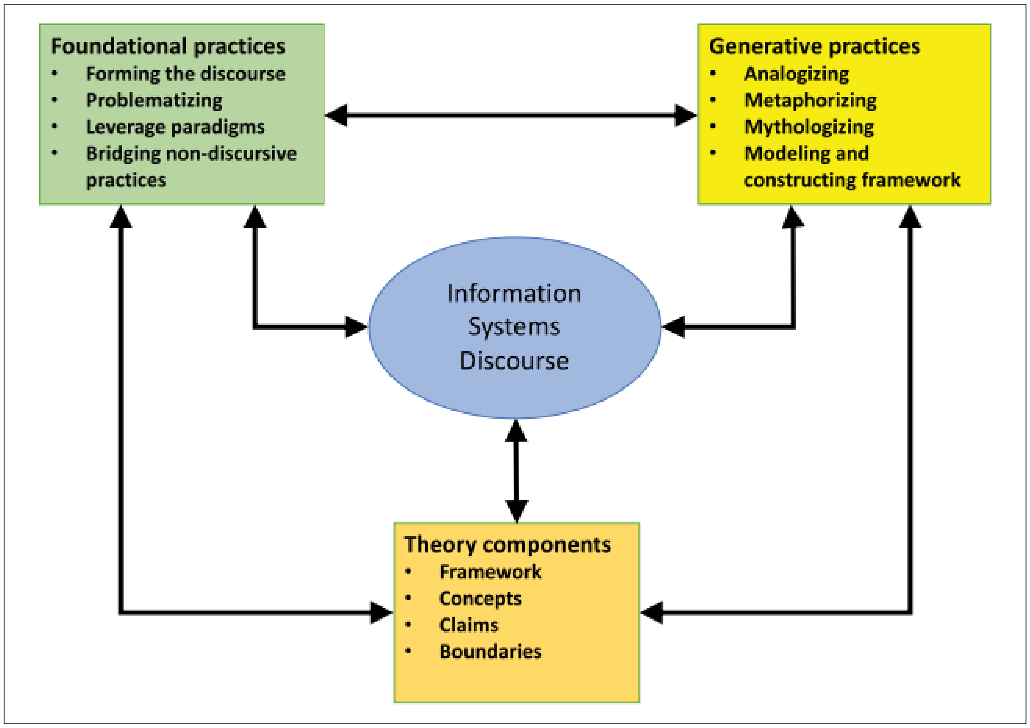

Figure 27. IS theorising framework (Hassan et al., 2019, p. 202).

6.5.1 Foundational practices

Foundational practices assist IS theorists to bound their thinking processes to the phenomenon of interest. In other words, foundational practices help theorists to delineate IS discourse. Below, I discuss each foundational practice.

Forming the discourse. The researcher defines the foundation of unity enclosing different phenomena linked to the field of study to determine whether the investigation is grounded in IS. For example, I apply social cognitive theory in Chapter 7 to study game behaviour using principles concerning psychology, education and communication sciences. A question that inquires whether the research is about psychology, education, communications, IS, IS in psychology or IS education, can arise in the discourse. The next practice, *problematising the IS phenomenon*, addresses this question. This practice assists theorists with the formation and accentuation discourse belonging to their field of study. In the present study, the practice assists in emphasising the study's *IS education* discourse.

Problematising the IS phenomenon. Here, the researcher asks questions that other disciplines are not asking. Thus, by posing the problem of 'motivation' and asking questions related to the impact of sociocultural factors on motivation in gamified IS learning, I am not focusing on the psychological state of students, as one might expect in the case of 'motivation'; rather, I am connecting antecedents of motivation, that is, sociocultural factors (a theory about human learning (Vygotsky, 1978)) to the discipline of (gamified) information systems.

Leveraging paradigms: Based on Thomas Kuhn's conception, A paradigm is defined by Hassan and Mingers (2018, p. 576) as "a shared exemplar for scientific practice, which communities of scientists and researchers agree in part or completely, that provide models from which coherent scientific traditions may emerge". The Kuhnian paradigms are grouped by Masterman (1970) into three categories: (i) *metaphysical paradigms*—defined by beliefs, speculation, myths and overarching principle; (ii) *sociological paradigms*—defined by grammatical usage, political bases and universally recognised achievement and the (iii) *artifactual or conceptual paradigms*—defined as applications and techniques, analogies and standard tools.

I regard Gee's (2003) work, *What Video Games have to Teach us About Learning and Literacy*, as an artifactual or conceptual paradigm of *gaming information systems.* I derive this assertion from Gee's illustration of the interaction between players and gaming consoles. Moreover, Gee illustrates the effects of digital games on human cognition. Gee's discourse on *replay* is a salient example. Replay (i.e., the *game over, try again* of games) is a universal element in commercial digital games and refers to the act of replaying a part of the game that the player previously failed to complete. I consider Gee's discourse on the extent that humans *learn from previous mistakes* through replay, as paradigmatic thinking.

*Bridging non-discursive practice*s: These practices enunciate similar knowledge items as their discursive counterparts but are in the form of repeatable 'unsaid' phenomena such as routine processes and events in different social, political, economic and legal institutions. This conception implies that non-discursive IS practices are inextricably linked to its discursive practices, which bridges basic and applied science, and theory and practice. In the context of this study, learning through digital games is a non-discursive practice that is linked to the discursive practices of learning about and through information systems (Hassan & Mingers, 2018).

6.5.2 Generative practices

These practices underpin or alter the discourse once it has been accentuated and delineated. Below, I discuss each generative practice.

Analogising. To analogise means to simplify or use a scaled-down reference to illustrate something complex. As an example of an analogy in information systems contexts, consider the electrons flowing in a computer's electrical circuit as an exchange of information between neurons of the brain is part of the theory itself (Hassan et al., 2019; Versace & Chandler, 2010).

Metaphorising. To metaphorise in IS means to analogise in linguistic form. The selection of familiar linguistic objects is charged with more than meanings of the analogies, it also assists to define the characteristics of those familiar objects. For example, the human brain is often the metaphor that Computing scientists use to describe a computer's processing cycle of input, processing, storage output and control (Hassan et al., 2019; Versace & Chandler, 2010).

Mythologising. To mythologise means to deploy myths and methodology and use hidden assumptions to investigate a means of explanation to highlight unity, contradictions, social structure and coherence. Myths are often considered popular misconceptions or mistaken beliefs.

Modelling and constructing framework. I deployed this practice to theorise from data. Hassan et al. (2019, p. 209) define a model as an imperfect replica of the phenomenon of inquiry. As an example, Hassan et al. (2019, p. 209) refer to William Gilbert, an English physicist, who "applied the model of the earth as a magnet with the poles as the ends of that magnet to explain why compasses point north". Models are often confused for theories and frameworks; models are simplifications of the phenomenon of inquiry that assist in theory building.

I applied the ACM and AIS *IS2020 A Competency* ***Model*** *for Undergraduate Programs in Information Systems* [emphasis added] as a model that represents IS education. Thus, I aligned IS knowledge and skills that the student participants were motivated to demonstrate through gamified learning to the competency requirements in the ACM and AIS competency model. The resulting theory serves as a guide for meaningful gamification in (undergraduate) IS programs. In the next section, I discuss the AIS and AIS IS2020 models in detail.

6.6 The ACM and AIS IS2020: A competency model for undergraduate programs in information systems

The ACM and AIS (2020) competency model is a curricula guideline for undergraduate degrees in IS. The ACM and AIS define competency as "the graduate's ability to apply knowledge, skills, and dispositions" in a task (ACM & AIS, 2020, p. 35). ACM and AIS furthermore recognise task-relevant motivations and behaviours that are utilised together with knowledge and skills in the completion of tasks. To manage the variety of IS competencies, the ACM and AIS group competency areas into the following six realms: (i) *IS foundations*, (ii) *data*, (iii) *technology*, (iv) *development* (v) *organisational* and (vi) *integration*. Figure 28 illustrates competency areas and realms. I provide a brief description of each competency realm in the subsection below.

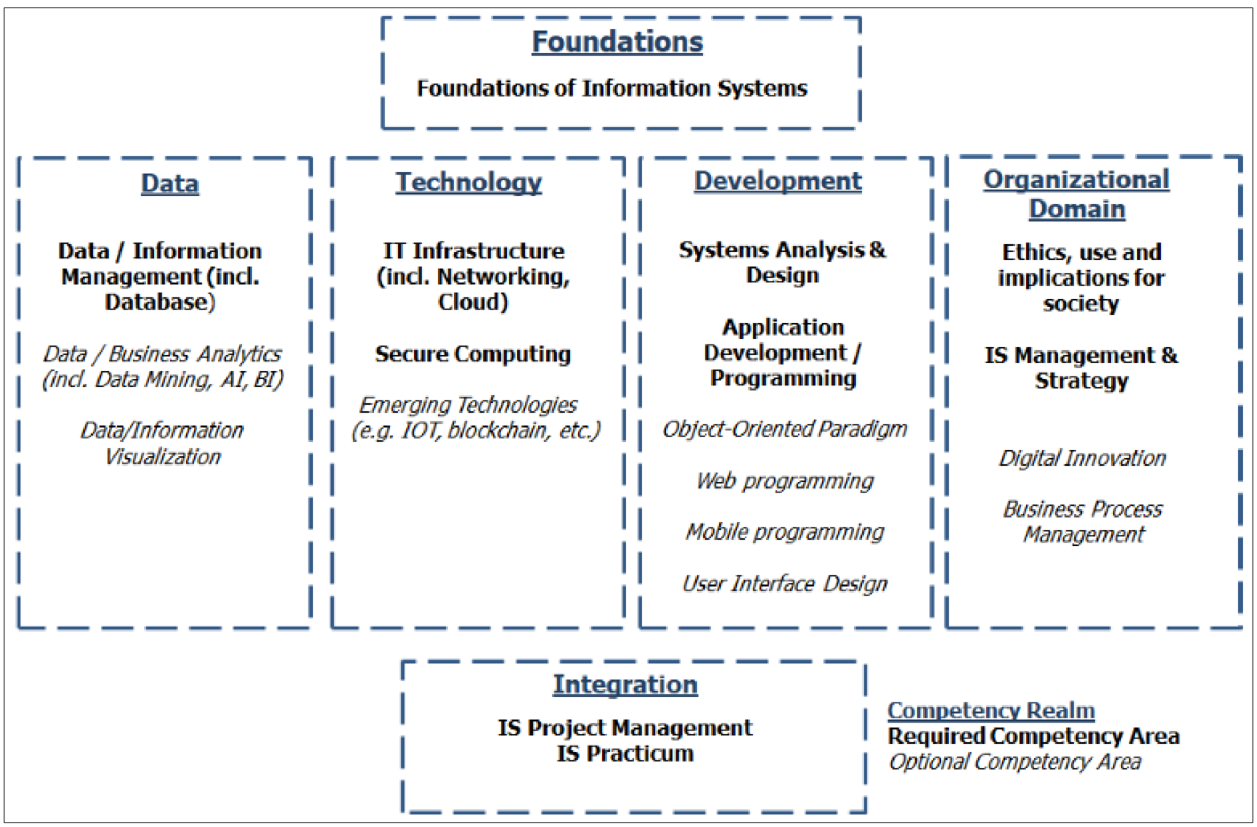

Figure 28. IS competency realms (ACM & AIS, 2020, p. 12).

6.6.1 IS competency realms and areas

IS Foundations. This realm refers to the student's ability to understand the different knowledge areas of IS and how they are being applied. It also refers to the ability of the student to understand fundamental IS concepts such as hardware, software and information acquisition.

Data. This realm refers to the student's ability to manage data in relational databases. It is primarily concerned with the students' ability to collect, organise, curate and process data to support the extraction of information towards improving effectiveness.

Technology. This competency realm covers the design, installation, maintenance and management of IT infrastructure and architecture. It is furthermore concerned with secure computing, which involves the defence and testing of information systems. That includes data security, human security, organisational security and social security.

Development. This competency realm is concerned with the application development life-cycle. This realm assesses whether students exhibit the ability to use various methodologies and modelling tools for software analysis, programming, user interface design, web development, object-orientated design and mobile development.

Organisational domain. This competency realm focuses on the ability of students to apply and reflect on IS in an ethical, strategic and innovative manner. In terms of ethics, students are trained to be cognisant of practices and moral codes that are prevalent in information systems.

Integration. This competency realm refers to the ability of the student to integrate and use the knowledge and skills acquired across the curriculum, typically through a project experience. Students engage in project management to understand the appropriate concepts, management and techniques of IS projects. In addition, *IS Practicum* is a new competency area that AIS and ACM introduced as part of the integration competency realm and involves students engaging in the application's development cycle, to design a system that meets the specific user needs of an organisational client.

6.6.2 IS competency, dispositions, knowledge and skills

As I noted earlier, each competency realm comprises competency areas (see Figure 28); for example, web programming and user interface design are competency areas of the development competency realm. Specific competencies are linked to each competency area. For example, the following competencies are linked to user interface design: (1) apply user-centred design principles, (2) apply principles of user-system interaction, (3) design user interaction that is user-centred and (4) identify and assess the attributes of effective user experience (ACM & AIS, 2020).

Attached to each competency are the terms *key dispositions* and *knowledge-skill pairs*. I align student *motivation* to engage IS learning through gamification to the dispositions. Indeed, *dispositions* are the 'know-why', i.e., the motivations that impel engagement with social and technical skill and knowledge. Knowledge refers to the 'know-what' element, that is, factual information on an IS concept. In turn, skills fulfil the 'know-how' of a task, that is, the practical application of knowledge (ACM & AIS, 2020). For example, Table 11 provides a summation of key dispositions and knowledge-skill pairs linked to the competency, *"create and analyse an algorithm for effectiveness and efficiency"*, which is part of the *web development* competency area (ACM & AIS, 2020, p. 140).

Table 11

Knowledge component, skill level and key disposition of the 'apply user-centred design principles' competency

Knowledge component	Skill level (Bloom's cognitive level)	Key dispositions
Algorithm and its underpinning logic	Create	Self-directed Purpose-driven Meticulous
Use an algorithm to solve a problem	Apply	
Effectiveness of an algorithm	Understand	

6.7 The themes of this thesis

Data analysis generated three primary themes: (1) social exclusion in gamified information systems, (2) the oppressive gamified technical system and (3) the commitment to learning through gamified information systems. I applied Braun and Clarke's (2012) thematic analysis approach to lead the theme-finding process: (i) Phase 1, familiarise yourself with the data; (ii) Phase 2, generate initial codes; (iii) Phase 3, search for themes; (iv) Phase 4, review potential themes; (v) Phase 5, define and name themes; and (vi) Phase 6, produce a report. I discuss the first and second phases in Sections 6.2.1 and 6.2.2. Below, I discuss the third and fourth phases in Sections 6.7.1 and 6.7.2. Phase 6 is discussed in Chapter 8 and involves the building theory by linking the meaning in the dataset to an IS theorising framework (discussed in Sections 6.5 and 6.6) (see Table 12).

Table 12

Thematic analysis aligned with the present study (based on Braun & Clarke, 2012)

Thematic analysis phases		Study context
1.	Familiarise oneself with the data	Familiarise yourself with the data to determine its relevance to the research questions (discussed in Sections 6.2.1 and 6.2.2).
2.	Generate initial codes	Apply codes to data segments that are relevant to the research questions. The topics are discussed in Section 6.2.3.
3.	Search for themes	Identify broad topics from codes that describe meaningful, similar and coherent patterns in the data.
4.	Review potential themes	Review the appropriateness of developing themes in connection with the coded data.
5.	Define and name themes	Name and describe themes in detail (covered in Sections 6.8, 6.9 and 6.10.
6.	Produce a report	Justify claims based on themes within the overall theoretical position (build IS theory from data) (discussed in Chapter 8).

6.7.1 Searching for themes

This phase involves the data analyst expanding codes to broader topics that can help to answer the research questions (Braun & Clarke, 2012). In the following sections, I identify topics (subthemes) that are similar across the codebooks.

Subthemes of High-Level Theme 1

I started by linking the 'gaming_status' structural code to the responses of the interview questions 1.2.1–1.2.5 in Appendix G (student interview protocol). The structural code reflects conventional gaming norms, which include the preferred difficulty level, the types of games that are preferred, the duration of a game, and playing the game individually or with other people. Regarding group problems that I observed in both action learning cycles and the observational accounts, which I later linked to the 'millionaire_team' and 'QL_team' codes, the phenomenon of gaming alone or with other people that reflects through the 'gaming status' code became a unifying topic that underpins the first high-level theme.

I linked the code to discourse on gaming modes that enable experiential learning about information systems through group collaboration. The code, furthermore, illustrates that students are attracted to group work on the basis that they have the support of fellow group members to impede a disappointing performance in IS learning via gamification. Hence, the subthemes 'groups simplify the rationale behind action and research involving groups' and 'groups are safety in numbers' were identified from the code 'millionaire_team'.

I also linked the 'millionaire_team' code to the preference of engaging in gamification as a solo player. This emphasises the dialectic progression between individual and group preference for gaming in the 'gaming status' and 'millionaire_team' codes. In this regard, I draw attention to individual learning of information systems, which could benefit the group. Therefore, I derived the 'reliable IS individual' as an additional subtheme from the code 'millionaire_team'. In addition, I linked the 'millionaire_team' code 'millionaire_team' to the obvious preference to participate in gamified IS learning in group mode over individual mode, from which I formulated the subtheme 'social determinism'.

The coding performed as outlined in the above passage led to the 'millionaire_team' and 'QL_team' codes being linked to problematic occurrences that germinated from the overreliance on group collaboration to facilitate information systems learning through gamification. I assigned the name 'group cohesion' as the subtheme.

In summary, the subthemes (i) 'groups simplify the rationale behind action and research', (ii) 'groups mean safety in numbers', (iii) 'reliable IS individual', (iv) 'social determinism' and (v) 'group cohesion' were combined to formulate the high-level theme 'social exclusion in gamified information systems'. The narrative embedded in the high-level theme expresses the overt reliance on group collaboration to facilitate information systems learning to the extent that individual gamification as a mode of learning is excluded as an approach to motivate students. I summarise High-Level Theme 1 and its subthemes in Table 13.

Table 13

High-Level Theme 1 and its subthemes

Subthemes	High-Level Theme 1
i. Groups simplify the rationale behind action and research involving groups	Social exclusion in gamified information systems
ii. Groups mean safety in numbers	
iii. Reliable IS individual	
iv. Social determinism	
v. Group cohesion	

Subthemes of High-Level Theme 2

In the introduction of the previous discussion, I discussed the 'gaming_status' code that I had linked to conventional gaming norms. The code reflects that students' understanding of different digital devices for gaming implicitly motivates them to learn basic hardware and software. Based on this description, I named the subtheme 'fundamental hardware and software knowledge'.

I also observed a close connection between the 'gaming_status' code and the 'programming_motivation' and 'gaming software' codes. I linked the code to utterances that promote the study's gamification approach and technology as a means of learning programming concepts and assigned the name 'fundamental programming knowledge' as a subtheme. Based on their fundamental programming knowledge, students evaluated the programmable behaviour of gamification technology according to their expectations and whether this behaviour could be accessed and altered. I linked the 'gaming_software' code to these expressions and formulated the 'software customisation' subtheme to represent the broader discourse around altering software to meet learning needs.

The student response that I linked to the 'gamification_motivation' code broadened the discussion about the alteration of the gamification software to meet learning needs. In this regard, students were demotivated by the inability of the *Millionaire* software and *Quizlet Live* platform to assess their practical programming skills. From these views, I derived the subtheme 'practical programming skills', which, in turn, showed similarities with the 'gamification_curriculum' code. The 'gamification_curriculum' code was linked to the perspective that students—if gamification is to be incorporated into the curriculum—should be able to evaluate practical information systems skills and tasks.

The student responses linked to the 'millionaire_lifeline' code affirm that social systems (the Ask the Audience and Plus One lifelines) fundamentally underpin technical systems. Even if lifelines were instantiated with formidable programming code, a problematic underlying social system threatens the effective execution of information system features. From this analysis, I formulated the subtheme 'the oppressive social system'. In a similar vein, I identified the 'oppressive AI' subtheme from perspectives that I linked to the 'QL_dislikes' and 'QL_reset' codes. Students expressed dislike for the *Quizlet Live* progress reset function, typifying it as too stringent. However, the students' comments also indicated that the progress reset feature enabled one to learn from your mistakes. Two subthemes were formulated from these codes and their associated views, namely 'oppressive AI' and 'relearn through replay'.

Conversations related to the 'QL_dislikes' and 'QL_reset' codes led to the formulation of the 'gamification_language' and 'gamification_difficulty' codes. Remarks that I linked to the 'gamification_language' and 'gamification_difficulty' codes indicate that non-native English-speaking students generally struggle with gamification conducted in English. Non-native English-speaking students are more prone to falling prey to the progress-reset feature, considering that they struggle to understand the grammatical context of quiz questions that are rooted in the English language. From this analysis, I formulated the 'language' code.

In summary, the subthemes (i) 'formulated hardware and software knowledge', (ii) 'fundamental programming knowledge', (iii) 'software customisation', (iv) 'assessment of practical programming skills', (v) 'the oppressive social system', (vi) 'oppressive AI', (vii) 'relearn through replay' (viii) and 'language' articulate a description of the gamified information system that oppresses both its social and technical systems. This combined description led to the formulation of the second high-level theme, namely 'the oppressive gamified social system and the technical system'. I summarise High-Level Theme 2 and its subthemes in Table 14.

Table 14

High-Level Theme 2 and its subthemes

Subthemes		High-Level Theme 2
i.	Formulated hardware and software knowledge	The oppressive gamified social and technical system
ii.	Fundamental programming knowledge	
iii.	Software customisation	
iv.	Assessment of practical programming skills	
v.	The oppressive social system	
vi.	Oppressive AI	
vii.	Relearn through replay	
viii.	Language	

Subthemes for High-Level Theme 3

I formulated and assigned 'AL_scheduling' to conversations about the impact of gamification on full-time academic schedules. These conversations indicated that the participants struggled to dedicate time to gamification amid busy academic priorities. In this vein, I formulated the subtheme 'commitment'. The conversation also revealed that students sometimes choose to engage in other social activities on campus instead of gamification. Based on this analysis, I formulated the subtheme 'competing social activities'.

The 'AL_scheduling' subtheme was also applied to discussions about the scheduling of separate gamification sessions that were held based on the study participants who had been recruited from two different class groups. Because the two class groups had different rosters, the students could not participate in the same gamification sessions. Consequently, I formulated the subtheme 'disconnected gaming' to reflect the broader discourse on separate gamification sessions. Therefore, the combined subthemes (i) 'commitment', (ii) 'competing social activities' and (iii) 'disconnected gaming' articulate students expressing the view that they do not feel connected to the overall gamification experience. The high-level theme, 'commitment to learn through gamified information systems', denotes the combined subthemes. Table 15 summarises High-Level Theme 3 and its subthemes.

Table 15

High-Level Theme 3 and its subthemes

Subthemes	High-Level Theme 3
i. Commitment	Commitment to learn through gamified information systems
ii. Competing social activities	
iii. Disconnected gaming	

6.7.2 Reviewing the themes

According to Braun and Clarke (2012), it is important to review the themes in connection with the coded data and the entire dataset. The authors state that one "should not force your analysis into coherence" (Braun & Clarke, 2012, p. 65). According to the authors, data analysts should emphasise the following key aspects of developing themes: the quality of a theme (i.e., is it helping to answer the research questions?), the sufficiency of the data to support the theme (i.e., the theme may be 'thin') and the diversity of the data that are linked to the theme (i.e., the theme must be coherent).

I pondered whether I had formulated and analysed the subtheme 'reliable IS individual' into coherence. Initially, the subtheme seemed thin, given that Student 3 was the only participant who expressed the explicit desire to learn information systems through individual gamification instead of group gamification. However, Ryan and Bernard (2003) state that a theme can be idiosyncratic yet pervasive across the dataset. Ryan and Bernard's theme-finding technique, the *Missing Data* technique, helps find and accentuate these types of themes.

Ryan and Bernard (2003) describe Missing Data as a technique that functions oppositely to the usual theme identification techniques. The Missing Data technique requires qualitative data analysts to seek what they can learn from unstated assumptions. For example, during a discussion concerning contraceptives, those with strong religious beliefs may avoid the topic of abortion (Ryan & Bernard, 2003). In the context of this study, I was somewhat surprised that more students did not express a desire for individual gamification in response to the problems that emerged from group gamification.

I surmised that the students were inattentive to the idea of participating in gamification as individual players. This inattention took root because I strongly promoted learning information systems through group collaboration. Indeed, I justified group gamification on the basis that it would produce more gamification sessions compared to the number of sessions individual gamification would have produced. This rationale was driven by the assumption that many gamification sessions translate into richer data. Therefore, students might have thought that it was not worth talking about individual gamification, seeing that it was not an alternative to group gamification in this particular project.

6.8 High-level Theme 1: Social exclusion in gamified information systems

6.8.1 Subtheme: 'both solo and group gaming are preferred'

Students regard individual and group gaming as equally important conventional gaming norms (see Table 16). Nonetheless, the participatory nature of action learning inevitably led to the gamification team engaging in group collaboration across all action learning phases. Group collaboration generally predominates over personal autonomy in IS. This study adopts both intra- and intergroup approaches for the reasons detailed below.

Digital collaboration practices, skills and platforms are promoted across different domains of IS including education, government, healthcare and business (ACM & AIS, 2010, 2020). Experiential action learning requires that study participants learn in small groups. Advancements in information systems provide solid digital platforms to facilitate group learning (Noran, 2016). Learning, informed by a sociocultural perspective, is thought to occur through collaboration (Scott & Palincsar, 2009).

Table 16

The subtheme 'both solo and group gaming are preferred'

Code	Transcript extract	Subthemes
Gaming status	"No, on my Xbox I don't, 'cause I don't have an internet connection, so I just play the story mode as it is set out". (Student 2) "Yes, sometimes I do play with my friends, we do a competition sort of thing". (Student 7) "During the week, I use[d] to play on my own and the weekends my cousins use[d] to come over and we use[d] to play". (Student 8) "With twin brother. Have [the] same interest in the gaming genre". (Student 10)	Both solo and group gaming are preferred

6.8.2 Subthemes: 'groups simplify the rationale behind action and research involving groups' and 'groups are safety in numbers'

Group collaboration was strengthened by a realisation of its perceived benefits. For example, group collaboration helped the gamification team to simplify the logistics behind action and research. Solid logistics are desired in action research, which I experienced as "not a neat, orderly activity" (Stringer, 2014, p. 33). Student participants experienced (as the ACM and AIS prescribe) "unanticipated and unscripted problems as a team" (ACM & AIS, 2020, p. 59). Students demonstrated *"competency 4: work effectively in a team environment, of the systems development"* competency realm in the ACM and AIS (2020) IS competency model. Students showed the ability to apply (that is, a skill under Bloom's cognitive levels) the competency model's knowledge elements: team collaboration and communication skills (ACM & AIS, 2020). From the students' points of view, group learning facilitates 'safety in numbers' (see Table 17).

Table 17

The subthemes 'groups simplify the rationale behind action and research involving groups' and 'groups are safety in numbers'

Code	Transcript extract	Subthemes
Millionaire_team	I pointed out how only one contestant at a time plays *Millionaire* on the original show. In this study's version of *Millionaire*, however, I would like participants to collaborate and play the game in teams of three. (Millionaire_Fieldnote 1) I furthermore want to observe how collaborative gameplay impacts soft skills such as cooperation and communication. (Millionaire_Fieldnote 1) Playing in teams instead of individually avails more gameplay sessions considering the students' busy academic program and the short timeframe to complete the empirical fieldwork. (Millionaire_Fieldnote 2) "It felt safer playing in a team because I do not need to rely on myself only". (Student 1) "I felt more comfortable and I felt you get the answer easily because you can discuss it". (Student 8) "I found it very helpful because with my uncertainty, I usually tend to get nervous and hesitate so having fellow teammates that actually verify that it's right or wrong is actually helpful". (Student 9) "I am very anti-social. For me to be in a team and actually discuss. I actually even hardly talk within the team. It opened me up a little, to communicate". (Student 13)	Groups simplify the rationale behind action and research involving groups Groups mean safety in numbers

6.8.3 Subtheme: ‘reliable IS individual’ (graduate or professional)

Earlier, I highlighted that individual gaming is as important as group gaming (see Table 16). Its pedagogical equivalent, individual learning, receives ample discussion in the ACM and AIS (2010, 2020) curricula models. The ACM and AIS emphasise the significance of individual learning as follows: Students must express the ability and interest to “collaborate with other professionals as well as perform successfully at the individual level” ACM and AIS (2010, p. 8). In video games, game designers prescribe and incorporate both single and multiplayer modes (Romero et al., 2012). The *Missing Data* technique reinforces the need for individual learning (through individual gaming) (see Table 18). Students demonstrate “*competency 3: explain the roles, responsibilities and characteristics of the IS professional”* of the *foundations* competency realm in the ACM and AIS (2020, p. 98) competency model. By implication, students apply (a skill, Bloom’s cognitive level) the individual *role*, *characteristics* and *responsibilities* of an IS professional ACM and AIS (2020).

Table 18

The subtheme ‘reliable individual’

Code	Transcript extract	Subthemes
Millionaire_ team	“I think it would be more interesting doing it individually, you are going to be the one writing the exam. So, it is good to play the game, based on just your knowledge. The way I look around it is, if we [are] a group of two and there is a group of three people; we all know what work is gonna be asked: professional communications, programming. So, in my team of three, I’ll tell them, okay you cover one chapter, you cover the other chapter ‘cause we know the work is going to be based of *(sic)* these chapters”. (Student 3)	Reliable IS individual

6.8.4 Subtheme: ‘social determinism’

Group learning and its perceived beneficial qualities (see Table 17) as prescribed in IS curricula guidelines (ACM & AIS, 2010, 2020) and action research (Stringer, 2014), emerged in the form of *social determinism*. The APA *Dictionary of Psychology* (2022) defines social determinism as a phenomenon where interpersonal experiences determine individual behaviour. Consider the field note entry in Table 19, "logistical efficiency in gamification, using group collaboration improved to some extent, but at the expense of focus on individual learning needs". Indeed, group learning through group gaming—at the expense of losing as a collective—appears to be a better alternative than individual gaming and losing as an individual competitor.

Table 19

The subtheme 'social determinism'

Code	Transcript extract	Subthemes
Millionaire_ team	Playing in teams instead of individually avails more gameplay sessions. (Millionaire_Fieldnote 1) "I do not need to rely on myself only and if we lose, we lose as a team." (Student 1) "Individually, we are strong but as a team we can be stronger." (Student 4)	Social determinism

6.8.5 Subtheme: 'group cohesion'

Team cohesion, however, was threatened by poor attendance. Group cohesion was also affected by unengaged students. I define unengaged students to be individuals who are reserved, spend much time by themselves and show little interest in establishing social bonds. Futhermore, I noticed that these students did not actively participate in group collaboration during the gamification sessions. In contrast, teams that showed effective teamwork displayed strong social bonds and energetic collaboration. This behaviour was observable in both the first and second action learning cycles (see Table 20). Hence, students' behaviour does not accord with "*competency 4, work effectively in a team environment"* of the *systems development* competency realm in the ACM and AIS (2020, p. 124) IS competency model

Table 20

The subtheme 'group cohesion' emerged from the first action learning cycle

Code	Transcript extract	Subthemes
Millionaire _team	I was concerned about the small number of participants who attended the pilot session. (Millionaire_Fieldnote 2) Team 4 (Student 5, Student 24 and Student 25) were scheduled to play. Student 5 was the only member of Team 4 who was present. Because Team 5 was one member short in the absence of Student 23 … Student 5 was assigned to Team 5. (Millionaire_Fieldnote 4) It is noteworthy that students who added little to the intragroup discussion at the diagnosis and planning sessions are the same students who contributed little to team collaboration in the gaming session. (Millionaire_Fieldnote 3) Without consulting his two team members, Student 2 answered; it was correct. (Millionaire_Fieldnote 2) Team 2[5] decided to play Millionaire Professional Communications first. Little collaboration occurred between the members. (Millionaire_Fieldnote 4)	Group cohesion
QL_team	I attribute the good team dynamic the Sharks showcased to their strong social ties outside of gameplay activities. I noticed that Student 2 and Student 6 are friends in general and keep each other company in and outside class. (Quizlet_Fieldnote 7) "Student 2 and I have been friends for quite some time, so when it comes to group work involving assignments, then we usually choose each other as group members." (Student 6) I observed how Student 11, Student 12, and Student 13 formed a team there and then. It was noticeable that they did not team up with any of the other participants. These students approached some of the other participants only to find out that the others are already in a team. After the three of them discovered that none of them is part of a team yet, they agreed to form a team. (QL_Fieldnote 7) Student 12 and Student 13 mostly engaged with each other and only pointed to an answer on Student 11 screens as an indication that he must select it. (QL_Fieldnote 7)	

[5] Team members: Student 11, Student 17 and Student 22

6.8.6 Subthemes: ‘exclusion of individual gaming’ and ‘the reliable IS individual’

Individual learning, through individual gaming, is excluded in gamified information systems on the grounds of ineffective group collaboration. Consistent with the IS2020 model (ACM & AIS, 2020), I observe that the ‘reliable IS individual’ theme (discussed earlier) relies on strong personal efficacy and goals to effectively engage in group-orientated environments as an individual. Personal efficacy, however, is harmed when it is subjected to group determinism and its problems (see student remarks in Table 21). In contrast, it appears that strong intrapersonal skills and personal efficacy are significantly strengthened through individual gaming which, in turn, might help an individual to successfully assimilate into an IS group.

Table 21

The subthemes ‘exclusion of individual gaming’ and the ‘reliable IS individual’

Code	Transcript extract	Subthemes
Millionaire_ team	“You only see the level your group is on. You can’t say, *joh*, I knew a lot of the work, I got myself to 800 points. You say the group did even though you did not contribute you still fall under their category.” (Student 3) “In future, you will not always have the option to choose your team members, you can’t always choose who you work with, you must learn how to work with people. But obviously, for now, the convenient choice is to choose people who you know you can effectively collaborate with, you know the person.” (Student 6) “*Ja* well the team I was in, well mostly hadn’t really a good information of the whole subjects. So, it wasn’t really helpful, because sometimes they would depend on me to get some of the questions ‘cause I know some of the work of that *(sic)* subjects.” (Student 7)	Exclusion of individual gaming Reliable IS individual

6.9 High-level Theme 2: The oppressive gamified social system and technical system

6.9.1 Subtheme: ‘fundamental hardware and software knowledge’

Digital games—not intended for instructional design—demonstrate the attribute of sound instructional design. I locate this assertion in Gee’s (2003) concept of semiotic domains. The term *semiotic* denotes the meaning a person assigns to different sociocultural artefacts, ranging from movements (e.g., dance), multimedia (e.g., game aesthetics), objects (e.g., gaming consoles) and other people (e.g., multiplayer gaming). Semiotic domains hold two design grammars: internal and external (Gee, 2003).

Internal grammar describes an attribute typical of a semiotic domain. Student 17's engagement in playing *Cisco Mindshare* is located in the internal grammar of *technical systems* (see Table 22). *Cisco Mindshare* is a game designed to present topics of the Cisco Certified Entry Networking Technician (CCENT) certification. The certification covers the basics of computer hardware and networking (Cisco Learning Group, 2009). External design grammar describes the content that is *representative* of a semiotic domain. Xbox consoles are examples (see the response by Student 9 in Table 22). Microsoft released the Xbox in 2002, it was the first gaming console to include a computerlike hard disk. Therefore, players obtain technical systems knowledge by engaging in the computer's input-processing-output cycle (Stair & Reynolds, 2010). For example, players store their game progress on the hard disk at some point and retrieve it later to continue where they had left off (Gee, 2003).

Table 22

The subtheme 'fundamental hardware and software knowledge'

Code	Transcript extract	Subthemes
Gaming_ status	"On my phone I had games too but not anymore." (Student 2) "I play *Need for Speed* on my laptop." (Student 7) "I play Xbox; usually *FIFA*, *Call of Duty*, *Brawlhalla*, games like that." (Student 9) "Yes. I like games that make me think a lot. And I like computer games, for example, on my computer I like a game that is called *Cisco Mindshare*. It is a networking game and it helps me while I play, I'm learning something. So, it helps me to think of a situation in networking as it happens." (Student 17)	Fundamental hardware and software knowledge

This theme partially aligns with the "*competency 1: classify the components, elements, operations and impact of IS"*, which is part of the *foundations* competency realm prescribed in the ACM and AIS (2020, p. 98) competency model. The key dispositions linked to this competency are *self-directed*, *inventive* and *purpose-driven* behaviour. Therefore, students can *understand* (i.e., a skill in Bloom's cognitive level) the technical components (software, hardware and communication media, data, procedures, people) of an information system. In addition, the student participants display the ability to *apply* operations of information systems, which includes the processing cycle of input, processing, storage output and control ACM and AIS (2020).

6.9.2 Subtheme: 'fundamental programming knowledge'

Skill atom as a gameful approach (Deterding, 2015) was successful in engaging the students with microlearning technical systems, in particular, Programming I concepts (see Table 23). This theme partially aligns with the *"competency 1: demonstrate an operational understanding of the protocols that enable the internet"*, which is part of the *web development* competency realm prescribed in the ACM and AIS (2020, p. 140) competency model. The key dispositions linked to this competency are *self-directed* and *purpose-driven* behaviour. Therefore, students can understand (a skill in Bloom's cognitive level) the *purpose of the client (front-end)* of an information system.

Table 23

The subtheme 'fundamental programming knowledge'

Code	Transcript extract	Subthemes
Programming_ motivation	"The one question we got was what is used in HTML for bullets. Normally, we just know how to make a list but now I know how to make a bullet." (Student 3) "What my team did today, we did speedreading, remembering the keywords. Like, one programming question was: which tag is used for like a bullet list, the tag is . So when we got it wrong, we could just make like a quick variety of this new 'l' in a bullet, so just bullets is *(sic)* your tag." (Student 5)	Fundamental programming knowledge

6.9.3 Subtheme: 'software customisation'

Students identified shortcomings in the respective technical systems that operationalise *Millionaire* and *Quizlet Live* (see Table 24) and the remarks emphasise the topic of software customisation. Because *jQuizShow* has many customisable features, the participants and I could address most of the multimedia issues that we encountered in *Millionaire*. Fortunately, the students held no negative views about accessing *Quizlet Live* or its aesthetical features, considering that its platform is not customisable.

Table 24

The subtheme 'software customisation'

Code	Transcript extract	Subthemes
Gaming_ software	"I think if you compare it to [*Millionaire*] it does take a bit more effort but it doesn't make it … how do you say it … it is not hard, it is not like it is [an] effort but compared to [*Millionaire*] it is effort because with [*Millionaire*] you don't need any devices, you don't need to log in, you do not need to add a name but it doesn't make it hard to play with *Quizlet*, so it is not like it is effort, it is actually very easy. It depends on your internet, if you have good internet speed then it is really easy to do it." (Student 6) "I said the text was sometimes too long and went outside the answer box, it was sometimes hard to read. So, that was one of my problems there. And for *Quizlet*, I think the colours where, uhm, they were all monotone colours, so it can't distract you so that you can focus on the answers and the questions." (Student 12) "I feel like [*Millionaire*] this software was very flexible; you could manage what was asked. But I feel like *Quizlet* was more central; the groups can come together you can be on different devices; it can be accessed at one location. However, with *Quizlet*, you need an internet connection whereas with [*Millionaire*] it is offline software and you have control, so that's *(sic)* some factors." (Student 14)	Software customisation

Table 24 illustrates that the students exhibit the skill (Bloom's cognitive level) to remember, understand, analyse and evaluate user interface design (ACM & AIS, 2020). User interface design is presented as a key competence area, which is part of the *systems development* competency realm prescribed in the ACM and AIS (2020) competency model. The students exhibited the skill to reflect upon interaction and design principles which focus on the use of graphics, typography, colour, symbols and other visual components for optimal user experience.

The internet also emerged as a quintessential technical barrier that stresses the need for custom software (see the comment by Student 14). *Quizlet Live* requires internet access; fortunately, the gamification team had access to computer labs connected to the internet. Notwithstanding this, I involuntarily reflect on the implications of choosing *Quizlet Live* as an online learning technique when it is not possible to conduct face-to-face teaching and learning, due to pandemic diseases like Covid-19. In the context of South African universities, accessing online learning from home might be a problem, considering that many students have limited or no internet access (Mpungose, 2020).

jQuizShow (2001), conversely, was created for face-to-face and collaborative learning. *jQuizShow* is problematic insofar as it is only customisable to certain extents. For example, *jQuizShow* cannot tally digital votes cast from external devices (for example, a smartphone), which I assume would have improved intragroup collaboration. Also, *jQuizShow* was created well before the Covid-19 outbreak. Nevertheless, I cannot shake off the impression that *jQuizShow* and its constitutive rules are not subjugated to the internet. Thus, this theme calls attention to the control that designers impose on the source code of technical systems.

6.9.4 Subtheme: 'assessment of programming skills'

The analysis above highlights the exclusion of the social system by the technical system and the need for free and open-source software (*FOSS*) (Chopra & Dexter, 2007). The remarks in Table 25 emphasise a limitation of *jQuizShow* and *Quizlet Live*: Neither platform can assess practical skills, only theoretical knowledge. Therefore, the gamified platforms do not allow students to assess whether they are competent in the *web development* competency area in the *development* competency realm prescribed in the IS2020 competency model (ACM & AIS, 2020). By implication, students cannot express the *skill* (Bloom's cognitive level) of creating and applying the *algorithmic* knowledge element.

Table 25

The subtheme 'assessment of programming skills'

Code	Transcript extract	Subthemes
Gamification_ motivation	"I think with programming it was really hard as programming is a practical class. So, to hear that we'll get theory questions on programming you don't really know what to do." (Student 6) "I think HTML and *JavaScript* can also show you the error in the browser." (Student 11) "Okay, I think that's fair because in something like *JavaScript* if you code something wrong it just won't work, it won't tell you where the problem is." (Student 12) "It doesn't make it easier if you write it down because you don't know whether it will work or not." (Student 12) "Writing on a piece of paper also forces you to plan first your code." (Student 15) "But in regard to the marking of the paper, when I did IT in high school,	Assessment of practical programming skills

Code	Transcript extract	Subthemes
	the marking doesn't make a difference. So, if your code, if you write a physical program and it doesn't compile it is not that they are gonna subtract marks, they are going to go in the code and mark what you have written, the same as with your paper. So, I always wanna say where it is nice to see that it can show you the error, it also makes you paranoid because then you can gonna fixate on the error instead of doing the rest that you know. Where our paper, you just like, okay, I don't know if it is right or wrong, I'm just gonna continue." (Student 6)	
Gamification_ curriculum	Research candidate: "Would you recommend [*Millionaire*] and *Quizlet Live* to be incorporated on a more regular basis and in other modules of your course as well?" Student 6: "Yes, but with modules such as Networking and the other programming-related modules we have, it would be easier if there is a game where you can physically build networks, and then they award you with points. Or they say built the best network for this thing and then they choose the best network between the three people." (Student 6)	

6.9.5 Subtheme: 'oppressive social systems'

The previous theme illustrates that a lack of custom technical systems can lead to social system exclusion. In a similar vein, social systems (guided by ethical and moral agency) might (indirectly) exclude other social systems. In the discussion of this theme, I highlight the negative consequences that arise from the lack of algorithmic constitutive rules. I present the Ask the Audience lifeline as an example. The Ask the Audience lifeline is not hard-coded in *jQuizShow*. As Chen (2006, para. 6), the designer of *jQuizShow*, states, "all it does is play some music when selected".

Chen (2006) subjects (uncoded) rules of the lifeline to situated action. In abstract terms, he recommends that the audience votes whereby they "raise their hands to vote for what they believe is the right answer" (Chen, 2006, para. 6). The gamification team adopted this approach (see the Millionaire_Fieldnote 1 entry in Table 26). This result was undesired. *Distrust* emerged in the intragroup (see student responses in Table 26). I noted that distrust was informed by the extent to which the intergroups trusted each other. Needless to mention, distrust among intergroups disrupted intragroup cohesion.

I link my call for *FOSS* with this theme, it resonates particularly with Student 2's remark: "[m]y suggestion was that we should create our own lifelines". That is, a social system is at risk of disrupting itself if it is contingent on abstract rules. In the context of technical systems, I link my call for *FOSS* to the idea that custom software is not sufficient, *FOSS* is required. Similarly, 'social customisation', for example, Chen's (2006) human-centred conception of performing the Ask the Audience lifeline, is not sufficient. Similar to how the social system should be allowed to create its own technical system, so too should the social system be allowed to create its own social system.

Assembling an effective functioning social system requires ethical scrutiny to deal with issues of distrust, similar to those that emerged from the Ask the Audience lifeline. Instructors and game-based learning practitioners can incorporate the IS2020 (2020, p. 154) *"IS ethics, sustainability, use and implications for society"* competencies in gamification to help curb discord concerning ethical issues. *"Competency 9: Investigate sustainable processes, actions, and performance to support society at large"* promises to equip students with the skill (Bloom's cognitive level) to *apply* the two knowledge elements: (i) "processes to support ethical behaviour by society" and (ii) "activities to support ethical behaviour by society" (ACM & AIS, 2020, p. 157).

Table 26

The subtheme 'the oppressive social system'

Code	Transcript extract	Subthemes
Millionaire_ lifeline	If the participants choose to persist with the Ask the Audience and Plus One lifeline[s], I proposed that participants not playing [at] that moment take the role of the audience. After each multiple-choice option, that host presents to the audience, they will ask the members of the audience to raise their hand to vote for the answer if they think it is the correct answer. (Millionaire_Fieldnote 1) "My suggestion was that we should create our own lifelines because the Ask the Audience thing had a few flaws with it because they could intentionally give the wrong answer to throw you off so that they have more points than you do." (Student 2) "It is not you making the choice and you are the one who is getting the points." (Student 3) "So, we asked the audience and that caused us to lose!" (Student 8) "I think the point of the audience wasn't a good way to choose because the other team can trick you, can answer the question wrong on purpose just to sabotage because each of our teams we are competing so I want to win, so I can do it on purpose." (Student 16)	The oppressive social system

6.9.6 Subthemes: ‘oppressive AI’ and ‘relearn through replay’

In Table 27, consider student responses about the *progress-reset* feature. I regard the progress-reset feature as artificial narrow intelligence, which is also termed weak artificial intelligence and is restricted to specific tasks. As a perceived ANI, the only task of progress reset is to reset progress to zero if a team answers a question wrong. Progress reset produced the following positive outcome: It emphasises that *replay* (the skill that underpins progress reset) enables players to relearn by replaying a part of the game because they failed at some point of the game or because they want to perfect the game’s skills. In their IS pedagogical context, students can perfect their knowledge of Programming I or Professional Communications 1 concepts through replay (see the response by Student 6).

Table 27

The subthemes ‘oppressive AI and relearn through replay’

Code	Transcript extract	Subthemes
QL_dislikes	“I dislike the progress reset if your team answers a question wrong.” (Student 10) “The fact that you lose your points and go all the way back.”[6] (Student 13)	Oppressive AI
QL_reset	Student 15: “It is not a bad feature but I just don’t like it. It works for what *Quizlet* is and what *Quizlet* gets you to do, I just don’t like doing that all the time.” Research candidate: “Is there a change you would make to that functionality if you could?” Student 15: “Maybe give you two chances to choose the correct answer. So, if you click on one card, it will go red but it won’t kick you out immediately, it will give you one more chance. But I can see that making the game a bit too easy.” “It happened to us, it also happened to another team; they were on their way to win and then their progress was reset to the beginning. I almost want to say that it is extremely brutal because you feel you made such good progress, to the last question and all of a sudden, you return to the beginning. But I would say if your progress is just reduced down one level and not entirely then you wouldn’t really have learned from your mistakes.” (Student 6)	Oppressive AI Relearn through replay

[6] Student 13 is refering to the progress-reset feature in *Quizlet Live*.

Even though Student 6 and some of the participants approve of the progress-reset feature, their suggestion of a more lenient progress-reset feature does not go unnoticed. Suggestions of a progress-reset feature that reduces a team's progress only down one level, reiterate my call for *FOSS*. *FOSS* would allow students to design or facilitate the design of a progress-reset feature that considers broader factors in a decision to reset a team's progress. Indeed, the progress-reset feature is oppressive insofar as it reinforces failure, without a proper understanding of existing sociocultural factors that exert influence over players' performance in a game.

In terms of students' (in)ability to learn via repetition, I consulted the Learning Techniques for Different Levels metric in the IS 2010 (ACM & AIS, 2010) curriculum guide (I present a detailed discussion in Chapter 4 in Section 4.12).

6.9.7 Subtheme: 'language'

I link several progress-reset encounters in Professional Communications I games to insufficient English language skills (see Table 28) and attribute Student 11 and the general problem of language to a conceptually-driven misunderstanding of meaning in English grammar (see the response by Student 6). In other words, Student 11 and some participants struggle to grasp the English lexicon. I also link insufficient group collaboration to insufficient English skills. Insufficient English skills result in a speaker who has trouble communicating verbally. The response by Student 12 (Table 28) illustrates that insufficient individual contribution to group collaboration may be a consequenc of one group member who has trouble with proficient verbal communication.

Table 28

The subthemes 'language' and 'group cohesion'

Code	Transcript extract	Subthemes
Gamification_ language	Student 12 and Student 13 mostly engaged with each other and only pointed to an answer on Student 11['s] screens as an indication that he must select it. The Professional Communications lecturer drew my attention to Student 11 and mentioned that he struggles with English, as his mother tongue is French; he reads slowly to understand what he reads. (Quizlet_Fieldnote 7) "Isn't it like *Java* or something where if you are in a medical area, you say medical words and another person won't understand. It is something like that	Language

Code	Transcript extract	Subthemes
	where you, where it's certain concepts and if you translate it, it doesn't make sense. We couldn't do IT in school; we couldn't do it in Afrikaans because you can't find Afrikaans words that correspond with the English words in IT." (Student 6) "Me personally, I prefer learning in English because that is what most of the subjects are in. For the person in question who is Xhosa, I think it will be better than to discuss the subject in English. Regarding the subject, there is no Xhosa in *Java,* so …" (Student 10).	
QL_dislikes	"No, I don't think there is anything about *Quizlet* that I disliked other than maybe … sometimes the team members are slow but that is part of it, I guess." (Student 12)	Language Reliable IS individual

In contrast to Professional Communication I games, the language problem was not as intensive as in the Programming I games. Students expressed positive views about Programming I in both lesson and gamified form (see responses by Students 10 and 11 in Table 29). Conceptually-driven misunderstanding of English grammar appears not to be pertinent concerning learning a programming language. Indeed, a programming language in itself does not have the advantages of speech and is absent from social contexts (Ruby & Krsmanovic, 2017).

Table 29

The subtheme 'language'

Code	Transcript extract	Subthemes
Gamification_ difficulty	"More difficult for Communications because your terminology needs to be precise. Programming was not difficult, practise programming a lot." (Student 10)	Language
Gamification_ language	"I enjoy programming. I really like it; I enjoy when I do it." (Student 11) "In programming, you just have to read a subject and … you know just attack,[7] attack the stuff like that and you know with that in mind, if you saw the question, that question that came back … what can I say, <header>, or something like that, you know these is like *JavaScript*." (Student 11) "Programming is more easy *(sic)* if you are [an] English speaker when you do programming because there is no other term, you cannot translate it to French. That is why I came to South Africa because they speak English here and you can do programming because there is the type of programming, you cannot translate it. Programming is a programming language but it is in English also. So I think it is better to do programming in English to try to	Language

[7] Student 11 uses the word 'attack' to refer to 'practise'.

Code	Transcript extract	Subthemes
	"Learn English and to do programming." (Student 11)	

As noted, students perform relatively well in Programming I games, despite insufficient English language skills. As I note above, this is because programming languages disambiguates meaning and eliminates contextually-driven misunderstanding.

6.10 High-level Theme 3: Commitment to learn through gamified information systems

6.10.1 Subtheme: 'commitment'

Earlier, in the discussion of the 'group cohesion' subtheme, I emphasise the negative effect that poor attendance at gamification sessions had on group cohesion. In a similar vein, the lecturers[8] struggled to commit to the gamification project (see Table 30). This caused issues with intragroup cohesion which, in turn, led to scheduling challenges in terms of finding a suitable date/time and venue to host game sessions. Needless to say, proposed times and venues could not always accommodate the participants' schedules, which led to high absenteeism.

Table 30

The subtheme 'commitment'

Code	Transcript extract	Subthemes
AL_scheduling	"I'm giving even half an hour of my two periods to allow the project to place within class, I think that was quite a lot to ask … and then in terms of the lecturers' appointments and so on … the thing is, if the lecturer is not in class, high chance is they are busy doing some admin work. And if they are not busy doing some admin work, they are probably in meetings." (Programming Lecturer) "We had to, you also had to cater around the students as well as my schedule. I was on campus luckily and the students who wanted to participate, they did not mind coming in on a Wednesday 10:00 or on a Thursday 14:00 because they were asked." (Professional Communications Lecturer) "A lot of lecturers would want class time for themselves. That's why I know you are put under a lot of pressure; 'cause I know not a lot of lecturers are going to be fine with you taking up their class time so	Commitment

[8] I label lecturers as IS professionals to accord to the ACM and AIS (2020) competency model.

	close to the exam." (Student 3)

However, I link students who contributed and committed to the games schedule to the *integration* competency realm of the ACM and AIS (2020) competency model. I specifically link committed students to the integration competency that focuses on *"Competency 2: use integration management tools, techniques, and processes"* (ACM & AIS, 2020, p. 171). The key dispositions of this competency are proactiveness, inventiveness and self-directed behaviour. In addition, this competency indicates that a student can apply a project management plan and process of change. I also consider this competency to be a reflection of the action research routine of look ⇨ think ⇨ act to solve unexpected problems.

6.10.2 Subtheme: 'competing social activities'

Before and after game sessions, I observed that students who had not been present at game sessions were present on campus. These students socialised with friends in recreational spaces like the cafeteria) or informal learning spaces like the library (Student 3's response in Table 31 substantiates this observation). Gee (2005) asserts that students think of work when students think about learning and its spaces. Gee argues that learning games draw this stance into dispute because it activates learning as a parcel of fun. However, engaging games exoterically (i.e., for the sake of some instrumental purpose) often result in the game feeling work-like (Deterding, 2013a; Stenros, 2015). Programming I, through game-based learning, is seen as work. By implication, gamified social systems compete against other social systems.

Table 31

The subthemes 'commitment and competing social activities'

Code	Transcript extract	Subthemes
AL_scheduling	"I don't know if you remember that one kid that was constantly asking, 'what time are we finishing can we leave after the game?'. Because this is our off time basically, sitting with their friends, talking, just relaxing. So they didn't like that they were gonna sit in the classes the whole time. At the same time, gamification is us learning and working in class, some people look at it as we have class until 16:00 today. Because after this break, we sit in three periods of programming for the whole day and then they['re] like, we have to sit in class, leave class, everyone goes out and now you have to sit in class again for gamification. And as soon as you['re] done, you have	Commitment Competing social activities

	to go again to class for three periods. So people see it as you have class from 08:30 until 16:00 straight." (Student 3)

6.10.3 Subtheme: 'disconnected gaming'

In the 'commitment' subtheme, I emphasised the cycle that connects the consecutiveness of poor attendance and that poor attendance led to ineffective intragroup collaboration. In turn, ineffective intragroup relationships led to scheduling issues. Correspondingly, scheduling issues led to the cancelling of game sessions. Matters were exacerbated because Groups 1A and 1C had different off periods. Consequently, the groups participated in different game sessions. Ultimately, the students felt disconnected from gamification (see Table 32).

Table 32

The subtheme 'disconnected gaming'

Code	Transcript extract	Subthemes
AL_scheduling	"I would have enjoyed it if everyone be *(sic)* in the same class or session playing a game, to actually scope out the competition and see what we need to study." (Student 9) "It just sort of felt we were on an island playing one game where it must **pauses** if it was more like a collective that will help with the momentum." (Student 1)	Disconnected gaming

6.11 Summary

Three high-level themes emerged from applied thematic analysis, informed grounded theory and thematic analysis: (1) social exclusion in gamified information systems, (2) the oppressive gamified social system and technical system and (3) commitment to learning through gamified information systems. I embarked on IS theorising to develop theories for the successful development and application of gamified information systems in an undergraduate IS degree program. However, Hassan et al. (2019) note that concepts and claims made in IS cannot operate separately from other disciplines but must exhibit a coherent connection with others.

For example, the IS2020 (ACM & AIS, 2020) dispositions account (in part) for motivational elements that impelled students to engage with IS learning through games. Notwithstanding that, the ACM and AIS borrowed these motivational elements from the cognitive sciences. Therefore, I engage the theoretical framework of this thesis, social cognitive theory, to provide a comprehensive account of sociocultural-mediated motivational elements that impel IS learning through games.

Chapter 7: A Social Cognitive Analysis of Gamified Information Systems

7.1 Introduction

In Chapter 1, I posed the primary research question: What social and cultural elements affect student motivation for gamification in information systems learning? Gaming in collaboration or competition with others emerged as the most influential sociocultural construct that affects student motivation for gamified IS learning. Using *IS theorising* (discussed in Chapter 7), I found that gamified participation (despite intragroup and intergroup problems) is effective in increasing student motivation for IS. I aligned student behaviour with the ACM and AIS IS2020 competency model. The objective was to understand and highlight the motivational dispositions for IS that gamification produces. I can now claim a new understanding of gamification outcomes; however, I lack an in-depth understanding of the sociocultural influences that precede and mediate motivational disposition towards IS.

In this chapter, I discuss the last phase of informed grounded theory, which involves a description and justification of concepts and the boundaries of theory. I rely on the principles of social cognitive theory to account for the behaviour and dispositions that students displayed in this gamification project. I draw on Heeks (1999) as a *non-discursive practice* to enunciate the impact that group problems have on student behaviour and disposition, as expressed towards gamified IS learning. In a series of papers, Heeks (1999, p. 1) focuses on understanding group problems, which he argues stem from “a tyranny of participation in information systems”. By applying the work of Heeks as non-discursive practices, I bridge the theoretical gap in knowledge between boundary theory (that is, theories on group collaboration in IS) and practice (group problems that emerged from the IS project of this study).

7.2 High-level Theme 1: Social exclusion in gamified information systems

This theme focuses on the first subquestion: What are the essential social and cultural factors that affect student motivation in gamified IS learning? In the present study, the relationship between individual gaming and group gaming emerged as the most compelling sociocultural practice that influences student motivation, cognition and behaviour in gamified information systems. It is important to state that I was only observing the classroom and computer lab gaming standards of the students and not their home gaming norms. Therefore, only interview questioning informs external student gaming norm knowledge as a sociocultural phenomenon that shapes IS learning. However, external gaming norms remain a central aspect of motivation. Therefore, this theme is derived from an exploration of previous gaming encounters.

7.2.1 Individual and group learning of IS is preferred

Individual autonomy does not govern humans. Groups help humans achieve shared goals (Bandura, 1994). In a similar vein, participating as a group is considered basic and praxis toward information system design (Heeks, 1999; Voida, Carpendale, & Greenberg, 2010). As Heeks observes, "participative approaches in the development of information systems (IS) has reached the status of a new orthodoxy" (1999, p. 1). *Quizlet Live* reflects such an orthodoxy insofar as the platform initially only had *teams mode.* Moreover, strong discourse stemming from incorporating the sociocultural perspective (Vygotsky, 1978) and action research (Lewin, 1946) in the present study positioned group collaboration as a central methodological approach.

The students' responses emphasise group gaming as a key activity in their social lives. For example, the interview data indicate that the students engage in group games with friends and family. However, a veneer of positive group gaming, which I observe in the literature and empirical data, could not stop the emergence of problems that are inherent in participation. These drawbacks hampered the motivational drive to participate in gamified IS learning. The students assessed these problems and reassessed them against what each member contributed to the group work. Then, they scrutinised and adjusted the value of individual roles as the game unfolded. As Bandura (Bandura, 1994, 2000) notes, collective efficacy and self-efficacy are inextricably connected. In the context of this study, individual gaming (implicating autonomous learning) arises as a competing discourse amid the dominant game-based learning discourse.

7.2.2 Groups simplify the rationale behind action and research and groups mean 'safety in numbers'

I sought to produce sufficient *Millionaire* games towards observing the sociocultural elements that impact the motivational factors affecting gamified IS. Producing enough *Millionaire* games required implementing group gaming, assuming that a single-player mode would have produced fewer games. Bandura (2000) advances collective power as a key ingredient in helping humans achieve shared goals. However, Bandura (2000) also attributes independent effort towards successful goals as the basis of effective collective efficacy. In my pursuit to produce sufficient *Millionaire* games, *indicative participation* in IS projects emerged as a problem (Heeks, 1999).

Indicative participation means that the participating acts are overt tokens, a presence of external rather than internal consumption (Heeks, 1999). The group approach produced a sufficient number of games, allowing me to gain sufficient knowledge about the sociocultural factors that affect the games. The group approach assisted in the external project goal, namely, building IS theory. That is, group tasks become participation indicators, a source for collecting data for this project. However, the group approach somewhat disregarded the internal project goals, namely facilitating meaningful change through gamified action.

Therefore, the pursuit of quantity diluted meaningful action. For example, after only one team member turned up for gaming, the gamification team formed ad hoc groups to increase the number of games through group gaming. Consequently, ad hoc groups lacked synergy and team contribution lacked balance. *Ad hoc* teams, even those with academically strong members, performed poorly. As reported, academically strong team members responded to the questions with little input from other team members. According to Bandura (2000), it is not uncommon for a team with well-skilled members to underperform because team members struggle to communicate.

However, academically weaker students appeared generally to be more receptive to groups. Here, they seek well-being through the exercise of a *proxy agency* in which individuals subject tasks to proxy control. The idea is not to shoulder the stressors of personal actions alone; “it felt safer playing in a team because I do not need to rely on myself” (Student 1). Here, a person with expertise (for example, academically strong students) acts on behalf of others (Bandura, 2000). However, academically stronger students do not share the same enthusiasm. As Student 7 states, "it wasn't really helpful, because sometimes they would depend on me to get some of the questions cause I know some of the work of that subject[s]".

In IS projects, the Abilene paradox is a potential resulting risk of proxy agency (Heeks, 1999). The Abilene paradox describes a talented individual who produces consensus without the input of other members. As a consequence, other members may engage with the information system in adverse ways. Indeed, I observed the academically stronger students (even in well-established groups) respond to quiz questions without consulting their partners. The positive feedback generated by the gamified technical system (notification that the answer is correct) emerged as a disguise for successful collaborative learning.

7.2.3 The reliable IS individual

Group problems highlighted the benefits of individual IS learning. After one of his teammates did not turn up for a gaming session, Student 3 reflected on whether it could be more "interesting doing it individually" which is reflective of personal efficacy and collective efficacy influencing each other bidirectionally in social cognitive theory. Bandura (2000) observed that individuals regard their efficacy as not detached from that of group members. Assuming that he consistently competes as part of a committed, full team of three students (in other words, not a team that formed ad hoc), Student 3 stresses personal efficacy as critical for effective collective efficacy and he remarks, "in my team of three, I'll tell them, okay you cover one chapter, you cover the other chapter". Therefore, the team relies on each member of the team to demonstrate strong personal effectiveness.

Bandura (2000) further notes that individuals with strong personal efficacy observe teammates, determining who is impeding or enabling collective efficacy. Previously, I attributed the breakdown in group communication to weak interpersonal relationships in *ad hoc* groups. In contrast, students (in misplaced criticism) perceive other inept members as impeding effective collective efficacy, as Student 12 states, "[s]ometimes the team members are slow".

At first glance, the responses by Students 3 and 12 appear to be in their self-interest and are detrimental to the group. However, informed by strong efficacy, the students bring the concept of *bureaucratic participation* in IS projects to the fore (Heeks, 1999). Heeks sees bureaucratic participation as similar to the safety of the 'participating in numbers' approach. Heeks criticises bureaucratic participation as a checklist task that does not produce valuable IS learning or outputs. Indeed, Heeks argues that many should rather not participate in organisation-wide information system projects, "it is more empowering not to participate since this leaves them free to pursue their own agenda" (1999, p. 8). Therefore, group determinism socially excludes individual learning (through individual games), which cultivates strong self-efficacy toward true participation in game-based learning.

7.2.4 Summary and future research

This high-level theme demonstrates that group collaboration should not be considered a universalisable technique in gamified information systems. Participating and making an individual contribution to overarching collective goals, by proxy of individual gaming and personal efficacy, might be more appropriate than collaborating with others. In my postdoctoral work, I intend to examine student motivation for IS education through individual gaming. The following research question emerged from this proposed research idea: What social and cultural elements affect the motivation of the student for individual participation in gamified IS learning?

Strong desires for individual learning stemming from group problems should not dismiss the ongoing need for group collaboration in IS projects. To curtail group problems, Pournaghshband (1990) suggested that team formation should be based on skill rather than randomly assigning students to a group (applied in the first action learning cycle) or students choosing their team members (applied in the second action learning cycle). The extract from the interview below leads to this idea:

> I know it's a group but you first of all have to be sure in your mind because you cannot say like, "okay we will play a game in March, okay now February you have to be close," I think it is not a problem for me. No, you are just coming and choose *(sic)* someone; *(rather)* you have to be sure in your mind first of all. (Student 11)

As I report in Chapter 6 in the 'language' subtheme, Student 11 performed well in gamification but struggled with Professional Communications I gamification due to his ineptitude in English. Pournaghshband (1990) would suggest that Student 11 should be teamed with students who have a better understanding of Professional Communication I but poor comprehension of Programming I. This will allow students to drive a transparent mode of communication cognitively ('be sure in your mind'); for example, team members concede that Student 11's contribution to Professional Communication I gaming is compromised by his ineptitude in English. This might tease out the positive affordances of *proxy agency* (Bandura, 2000). To repeat, a proxy agency denotes someone with certain expertise who acts on behalf of someone limited in the expertise in question:

> In future, you will not always have the option to choose your team members, you can't always choose who you work with, you must learn how to work with people. Realistically it is better if I'm assigned to a group of random members so that I can learn how to work effectively with diverse type of people. (Student 6)

> I thought there was *(sic)* like two things here, skill and reliability. If you need to choose who you want to be with, you are either gonna choose someone reliable. I feel like, for skill everybody should be chosen randomly to get to top teams. For reliability, you should be able to choose who's reliable to get it through with *(sic)*. (Student 12)

7.3 High-level theme 2: The oppressive gamified information system

Here, I focus on the second sub-question: Why does social and cultural experience affect student motivation for gamification in information systems learning? In short, the experience negatively affects the motivational drive of students toward IS because emerging technical systems and competing social systems cannot account for student behaviour that is mediated by sociocultural forces.

7.3.1 Fundamental hardware and software knowledge

As shown, video gaming affinity facilitates IS knowledge and skills; for example, students (indirectly) learn about configuring the hardware and software of game-based information systems. Bandura's (2B001) *retention processes* represent software features that allow *you to store the progress of the game* on the hard drive to retrieve later. For example, *Quizlet Live* facilitates retention processes, whereby a question that was answered incorrectly is asked again.

7.3.2 Fundamental programming knowledge

Iteration is a key aspect of Deterding's (2015) skill atom approach since it includes replay elements. Skill atoms were used as an approach to obtain gamefulness in this study. Here, I refer to replay taking the form of repeatedly exercising in-game skills throughout the game. Bandura's (1977) *imaginable* and *verbal retention* processes explain the positive outcomes obtained from repetition. For example, participants were only familiar with the ordered list <*ol*> (e.g., 1. Item a, 2. Item b, 3. Item c) and not an unordered list <*ul*> (e.g., • Item a, • Item b, • Item c) in HTML. Regarding imaginable retention, participants exposed to the HTML function, 'list', as modelling stimuli can now also invoke knowledge of unordered lists. Regarding verbal retention, students produce knowledge of previously unknown <ul> through verbal coding. As Bandura states, verbal representation, as opposed to visual representation, might facilitate more effective retention.

7.3.3 Software customisation

Although Bandura (1977) cautions against only relying on behavioural science methods to explain behaviour, he acknowledges that internal and external stimuli indeed influence behaviour. I observe the relevancy of behavioural science in the technical shortcomings that I identified in both *Millionaire* and *Quizlet Live*: They cannot assess practical programming language skills. Causation lies at the heart of the issue.

Behavioural science and programming have causation in common. Causation disambiguates the meaning of programming languages, suggesting that routine coding (for example, applying coding skills through games) could prove to be a successful exercise. In contrast to applying practical Professional Communications I skills via a hypothetical gaming platform that can assess practical skills, Programming I would not be at risk of reinforcing conceptually-driven misunderstanding through routine tasks. Indeed, external stimuli (for example, *typing*) produce a *cause* (that is, static input in the form of a source code) that precedes an effect (that is, a concrete executable program) without which the effect in question would not have occurred (Zeller, 2003).

However, even platforms conducive to applying coding skills position students solely as consumers of gamification (Kenny et al., 2017). Custom game software can help to solve this problem by allowing the removal, modification or personalisation of game elements to align with learning goals. Notwithstanding high customisation, custom gamified tools remain pre-designed. Pre-designed information systems are composed of an ecosystem of technical systems and social systems supporting different processes such as development and collaboration (Van Der Poll et al., 2019); it might be challenging to integrate all processes into a common gamification framework (Pedreira, Garcia, Piattini, Cortinas, & Cerdeira-Pena, 2020). Consider the inclusion of custom tools in *jQuizShow*. *jQuizShow* does not have an option to enable or disable the internet where online learning is a viable option and face-to-face learning is not possible, for example, due to pandemic diseases such as Covid-19.

Given this, custom software is not sufficient for IS learning. In light of my discussion on group problems in the first high-level theme, I also believe that professional designers who include end-users (for example, IS students) in designing educational gamification applications are insufficient. Instead, I support the idea of Kenny et al. (2017) that the design of gamified information systems should be student-generated projects. Students can design and customise gamification information systems for specific learning goals that fit their unique IS context.

7.3.4 Oppressive social systems

In this thesis, my methodological point of departure was based on the sociotechnical perspective of IS; that is, IS knowledge emerges from reciprocal interaction between social and technical systems (Sarker et al., 2019). However, following analysis of the subthemes '*oppressive AI'*, '*relearn through replay'* (Section 6.9.6) and '*language*' (Section 6.9.7) that illustrate how technical systems oppress and exclude social systems, I conclude that social systems should always precede technical systems. Therefore, I reject the sociotechnical perspective of IS and offer **the sociocultural perspective of IS learning**. I underpin this perspective with the stance that technical system constituents, for example, computer programmers are social system constituents by virtue of possessing intrinsic human agency. Based on this assertion, I argue that different social systems, for example, computer programmers (design culture) and users (software end-user culture) inform the meaningful design and use of information systems.

The form of collaboration that I describe above is not pertinant to this study because *Millionaire* and *Quizlet Live* are predesigned applications. Regardless, the students and I participated as an intragroup, discussing the collective goal of the project. We were specifically discussing *jQuizShow* and *Quizlet Live* as technological strategies for achieving our collective goal. We also discussed the implications of intragroup competition for shared goals while using and sharing collective resources. I consider this a form of collaboration where different social systems interact towards incorporating technological strategies to achieve an information system that fulfils organisational and social needs.

However, I acknowledge issues emerging from such a sociocentric grounding of IS. Moral and ethical aspects were particularly problematic issues in intragroup collaboration. Here, I am specifically referring to disagreements regarding the Ask the Audience and Plus One lifelines in *Millionaire*. Bandura's (2000) concept of *moral agency* is useful for understanding divergent and convergent behaviour in the coordination of social systems. According to Bandura, people self-sanction themselves positively or negatively, based on whether personal conduct breaches or abides by personal morality standards. Self-sanctioning essentially serves as a motivational regulator of moral conduct (Bandura, 2000).

Bandura (2000) observed that the acts of individuals who adopt strong communal ethics are altruistic. Examples are the remarks by Students 5 and 6 about the controversy that surrounded the lifelines:

> I'm a very trusting person, so I like to believe that people are playing in like the good intentions of the game, you know? But I guess that you don't really know what's going through everyone's minds. (Student 5)

> I think we all voted with the hope that nobody will have bad intentions when voting for the answer doing the audience or doing the call a friend. ‘Cause we all said that it all depends on morals and honesty if you are going to give the team the right answer, so if you are going to lie to your own benefit. (Student 6)

Previously, I identified the Abilene paradox as a risk that can result from a proxy agency in IS projects (Heeks, 1999). The Abilene paradox is also reflected in the students’ responses. Here, the Abilene paradox is rooted in group determinism that germinated from mostly action research. The Abilene paradox is specifically linked to the following strategy that I recommended to curtail the distrust that surrounds the lifelines:

> I understand the controversy and distrust around the two lifelines but I urged the students to consider the long-term effectiveness of intragroup collaboration. While intergroup competition is encouraged, students should not lose sight of the goal of this gameplay project; namely, to improve IS learning for all participants. This goal is best achieved by working together. Therefore, these two lifelines are a two-way process of trusting and giving trust. In other words, teams should trust that other participants will try their best to help when they call on the Ask the Audience or a Plus One lifelines. Similarly, the audience or the Plus One should show integrity when acting as a lifeline. (Millionaire Fieldnote 3)

Although this strategy is laudable, intergroup actions during games have not correlated with the participants’ apparent verbal consent to abide by the ethical and moral principles enmeshed in my suggested game rule. In other words, the intergroup was overtly competitive and focused on winning such that it disregarded ethical and moral principles which they regarded as unjust. Bandura (2000) holds that it is not uncommon for the self-worth of individuals to be deeply rooted in certain beliefs insofar as they would rather be subject to punitive treatment than agreeing with what they consider to be unjust:

> For me, the least one is the lifelines that I mentioned in the interview where the audience were *(sic)* your competitors, your enemies more, like that! If you ask them, I'm pretty sure they wouldn't give you the answer because some people have black hearts. (Student 9)

> The same. I'm the person with the black heart by the way … I mean, it is impossible to ask the audience, there is a conflict of interest there. (Student 1)

In light of the student responses above, the Abilene paradox translates to what Heeks (1999) terms *groupthink*. Groupthink refers to groups that become insular in their enactment of behaviour that they regard as fair, acceptable or in the best interest of all—even those outside or not a part of the group. According to Heeks, insular groups enact information systems regardless of the ethical and moral consequences.

7.3.5 Oppressive AI and relearn through replay

Bandura (2000) would recognise the progress-reset feature of *Quizlet* live as replicating human cognition. Human cognition is presented in the form of a progress-reset that exhibits goal-oriented behaviour; that is, the features achieve their goal of quickly and effectively resetting the team's progress to zero (to the start of the race) when a question is answered incorrectly. However, Bandura would also argue that the smart computing that underpins progress reset is void of human consciousness. In the context of progress reset, *Quizlet Live* is not 'conscious' of ad hoc group problems that add to the frustration arising from many progress reset encounters in a single gaming session. Glass (2018) would describe progress reset as a technical feature that oppresses players.

Progress reset is oppressive insofar as it reinforces 'failure' by progress reset. This is problematic as the digitised reset of the progress process cannot account for the root social and cultural issues that amount to failure. Moreover, end-users are unable to modify the source code towards being less stringent, for example, moving team progress back one or two levels if they answer a question incorrectly. This theme brings a broader problem into focus, namely, another act of domination by the Western world that imposes Western beliefs, norms and views, enforcing them through ICT

(Brown & Czerniewicz, 2010; Glass, 2018). The scope of this assertion is expanded in the following subsection.

7.3.6 Language

Bandura (1994) suggested that language is a symbolic mode through which people reflect on their experiences. Moreover, language is a symbolic means through which others communicate their aptitudes to them; thereby increasing their self-knowledge of what they can and cannot do. As I reported, students whose English was less fluent (such as Student 11) struggled to perform in Professional Communications I gamification. As I explained, this is due to a conceptually driven misunderstanding of 'meaning' that characterises English, a natural language. I further reported that students (even those less fluent in English) reported that they had no issues with programming in terms of language, primarily because programming languages disambiguate meaning. Aside from programming scripting to eliminating ambiguity, students also link the ability to program with English as a natural language:

> English is a universal language; it doesn't mean we should lose our home languages in a sense. So, it is rooted in English … you don't need to be the best English speaker in the world to be able to understand programming. If you just have the basic concept of it, you can understand it. So, it is not the number one priority you need to have if you want to become a programmer. If you have a basic concept of it, you can be the best programmer if you want. (Student 6)

The remark is related to the broad idea of English, a Western tool, as the *de facto* language that one requires to communicate efficiently in the business, academic and political sectors as well as globally (Nudelman, 2015). This inference is especially significant in South Africa, where eleven official languages are used. This is consistent with Bandura (1994) who noted that students, across all types of languages, generally evaluate themselves as efficacious. Self-efficacy beliefs vary in predictive strength, depending on the activity that a person is asked to predict. Efficacy beliefs generally indicate the best performance on a task that is consistent with those beliefs. Although the student participants in the present study are not fully proficient in English, they show strong self-efficacy in learning programming through English and English through programming:

> Programming is a programming language but it is in English. So, I think it is better to do programming in English to try to learn English and to do programming. (Student 11)

7.3.7 Summary and future research

Students expressed sociocultural learning of hardware, software and programming knowledge through digital games. Unfortunately, learning technical skills occurs under overarching technological determinism, which expresses oppressive qualities. These oppressive qualities support the production of passive IS students who are unable to make sense collectively or use learnt technical skills, considering that they cannot access and modify the source code to fit their needs and interests. Additionally, I examined the superficial qualities that underlie the veneer of positive intragroup collaboration. For example, ethical issues emerged from overt intergroup competitiveness. Over-competitiveness impedes joint efforts to achieve collective goals.

In my postdoctoral work, I intend to build on the idea by Kenny et al. (2017) of student-led gamified projects to improve IS learning. Here, students can access and transform the source code of the gamified application for their own learning needs. In postdoctoral work, I also intend to explore the concept of spectator–participation in gaming to address ethical issues emerging from overt competitiveness. Spectator–participation in games refers to the act of watching real competitive gaming without taking part (Brissette-Gendron et al., 2020). Here, I am allocating a small group of students exclusively to the role of the audience in *Millionaire*. I anticipate that this participation model will curtail intragroup distrust. To counter the learning exclusion of students in spectator-participation roles, I position spectator–participation as a form of *vicarious learning* (Bandura, Ross, & Ross, 1963) of IS knowledge and skills.

The following research question emerged from the proposed research idea: "How do the ethical factors that spectator–participation in games affect student motivation for IS?".

Last but not least, the idea that developing IS content in other languages is not important should not be fostered by perceptions of English as the de facto language. Gamification can provide solutions. Von Holy, Bresler, Shuman, Chavula, and Suleman (2017) built BantuWeb, an online repository, as a tool to encourage people to contribute indigenous languages. Game elements include users receiving points for adding content to the website. To encourage user competitiveness to create material and compete for a high rank, points are presented on a leaderboard.

7.4 High-level 3: Commitment to learning through gamified information systems

This high-level theme focuses on the impact of sociocultural space and time on the level of commitment to the gamified information system project. I aim to answer the sub-question: "How do social and cultural spaces affect gamification in information systems learning?". In summary, general patterns of poor attendance (absence from the gamified learning space) and lack of commitment (lack of time for gamification) reduced the motivation for gamified IS learning.

7.4.1 Commitment

The lack of commitment to this project, to a degree, through poor attendance (by both students and lecturers) of the gaming sessions defines this theme. The lecturers found it difficult to make time and venues available to integrate gamification into their daily schedule or to avail resources to facilitate gaming sessions:

> I'm giving even half an hour of my two periods to allow the project to place within class, I think that was quite a lot to ask … if the lecturer is not in class, high chance is they are busy doing some admin work. And if they are not busy doing some admin work, they are probably in meetings. (Programming Lecturer)

Bandura's (2001a) concept of *forethought* is in tandem with busy academic schedules and demanding responsibilities. Included in forethought is the unspoken perspective that gamification and action learning are obtrusive and time-consuming; hence, students and participants exclude gamification from academic schedules. Students showed low efficacy (in the form of low participation rates) as a consequence of the low efficacy (rooted in busy academic life) that the lecturers exhibited. Bandura calls such an efficacious link *vicarious reinforcement* (Bandura et al., 1963). Student 3's remark illustrates the link to efficacy:

> A lot of lecturers would want class time for themselves. That's why I know you are put under a lot of pressure; 'cause I know not a lot of lecturers are going to be fine with you taking up their class time so close to the exam. (Student 3)

Heeks' (1999) concept of *resource-deficit participation* is useful for describing vicarious reinforcement in IS contexts. The concept holds that proponents of participation consider individuals and groups as innate resourceful capacities with latent capabilities that need cultivation through participation. In the spirit of collaborative learning, it made sense during the participant recruitment phase to recruit the lecturers who teach Programming I[9] and Professional Communications I , respectively, as informants. In reality, this idea of participation can be flawed considering that members of an organisation "have heavy workloads and have no time to invest in new processes of participation" relating to information systems (Heeks, 1999, p. 7).

7.4.2 Competing social activities

When students think about learning and its spaces, they regard it as *work*. However, learning games might dispute this stance because it activates learning as a fun activity (Gee, 2005). That being said, engaging games exoterically (that is, for the sake of some instrumental purpose) often results in the game feeling 'work-like' (Deterding, 2013a; Stenros, 2015). For the students, gamification session that focused on the Programming module felt work-like at times. The students also felt that the gamification infringed on the time they allocate to social activities:

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[9] At the time, representative of gaining knowledge about technical systems.

> [T]his is our off-time basically, sitting with their friends, talking, just relaxing … gamification is us learning and working in class, some people look at it as we have class until 16:00 today. (Student 3)

Deterding (2013a) ponders whether ‘controlled motivation’ is the reason why gaming declines as a consequence of feeling work-like. Controlled motivation means motivation is externally regulated, for example, an individual who does not engage in play spontaneously, but rather because that individual have to. Deterding dismissed this assessment since e-sports athletes (e.g., in competitive multiplayer online battle arena games) compete professionally because they want to. Deterding rather infers that gamers self-regulate (Bandura, 2001b) in terms of their current needs. In truth, other social needs that coincide with the game are more fun. Therefore, gamified information systems compete for time against other social systems in the same academic space. As an example, consider the remark by Student 3, “that is why a lot of people … want to play pool” in campus recreational spaces instead of engaging in gamification during time off between periods.

7.4.3 Disconnected gaming

This subtheme inverts the *commitment* subtheme discussed in Section 7.4.1. Similar to participants struggling to commit to the gamification project, the gamified information system struggled to commit to the social system. This theme is marked by student participants spread across two class groups, participating in different game sessions. As a consequence, separate gaming sessions slackened the increase in motivation, leaving students feeling disenfranchised:

> It just sort of felt we were on an island playing one game where it must … if it was more like a collective that will help with the momentum. (Student 1)

> I would have enjoyed it if everyone be *(sic)* in the same class or session playing a game, to actually scope out the competition and see what we need to study. (Student 9)

Bandura's (2001a) concept of *symbolic modelling* can help to describe how students feel disconnected from socially charged gaming in time and space. According to Bandura, it is hard for people to disentangle themselves from the collaborative praxis that powerful social phenomena such as games institute. Indeed, the empirical data of this study show that gamification has the potential to augment extant, strong human and technology-dependent environments such as universities. Additionally, game-based learning shows great potential to improve interpersonal skills and a sense of social belonging and connectedness (ACM & AIS, 2020).

Heeks' (1999) concept of indicative participation in IS projects (discussed in Section 7.2.2) is also relevant to the present theme. Indicative participation has potential benefits, which, needless to state, contrast with its various problems. In the earlier discussion, I agreed with Heeks' observation that mere attendance does not equate to successful participatory outcomes. However, the empirical evidence of the present study suggests otherwise. The mere attendance at a gamification contest involving all students, regardless of the class group, could have increased the connection that shared learning goals establish.

7.4.4 Summary and future research

From a sociocultural point of view, educational institutions are not exclusive academic spaces; people also learn outside of these spaces. People learn in their daily lives when they interact with friends and family. The opposite is also true; students engage in social activities in academic spaces. Social and cultural learning spaces influence gamified IS by imposing time demands associated with work responsibilities. The time-consuming nature of action research and action learning placed additional pressure on the time demands of academic duties. In response, reputable IS computing societies such as the ACM and AIS can espouse and integrate gamification as a non-compulsory competency area in IS curricula models. This will inspire IS faculties to adopt, include and commit to gamification in academic schedules.

I endeavour to address the issues that stem from competing social activities and disconnected gaming in postdoctoral research. I propose that curiosity, produced by volitional play, has potential solutions for addressing weak attendance and disenfranchisement. Indeed, the ACM and AIS IS

2010 curriculum guide encourages IS professionals to "demonstrate … curiosity" (ACM & AIS, 2010, p. 8). I am interested in adopting the *epistemic curiosity* that Loewenstein (1994) advanced. Instead of viewing curiosity as an innate desire to gain knowledge, epistemic curiosity views it as purpose-driven knowledge discovery to answer novel questions that suggest gaps in our knowledge.

I propose that the goal-directed actions that curiosity underpins will produce students who show high levels of commitment to learning IS through games. I am proposing a voluntary, unorthodox participation model to ground goal-directed actions. This model encourages students to attend gaming only when they are so inclined. Here, students are subject to their own volition. Students are encouraged to attend other social events that coincide with gamification should they consider that their time would be better spent at those events. The idea is to challenge competing social activities by using social persuasion (Bandura, 1989). In this context, social persuasion facilitates a curious longing for IS knowledge through games. As a consequence, I anticipate behaviour by which students do not cancel gamified IS learning but instead make time for and include it with other events on their socioacademic schedule.

The following research question emerged from the research idea that I propose in the previous paragraph: How does voluntary play affect student motivation for IS learning?

7.5 Chapter summary

Gaming either in collaboration or in competition with others emerged as the most influential sociocultural construct that affects student motivation for gamified IS learning. Group gaming served as the central premise from which I explored, explained and described the motivation for gamified IS to build IS theory. Based on my analysis in this chapter, I urge that IS researchers be more critical of participation in IS projects. I identified three critical matters that must be addressed to improve gamified participative learning in IS projects: (a) individual learning should precede group learning to first build strong personal efficacy; (b) students should be motivated to design their own gamification information systems to meet their learning needs; (c) play must ALWAYS be voluntary, to achieve collective intragroup learning goals successfully.

Chapter 8: Contribution and Conclusion

8.1 Introduction

In this chapter, I conclude the thesis with theoretical, methodological and practical contributions generated throughout this study. I describe and contextualise these contributions to the field of IS research that focuses on the design of information systems. I discuss each contribution in detail below.

In Chapter 1, I observed that most gamification research in information systems assumes a dichotomous view of games and people (Van Der Poll et al., 2019; Vermeulen et al., 2016). Dualistic perspectives in gamification research suggest that students and digital games are closed systems which are governed by one-way causation. Moreover, dualistic perspectives argue that digitised game elements are capable of extrinsically motivating students to exhibit positive behaviour towards achieving learning goals. Dualistic perspectives recognise the presence of play leading towards games but view it as valueless. I reject this view and instead espouse a dialectic perspective to examine people and games (Vygotsky, 1978). In the scope of the IS research study, deploying Vygotsky's (1978) dialectic view led to two theoretical contributions: (i) a dialectical perspective of play and games in information systems learning and (ii) a dialectical perspective of information systems.

8.2 A dialectic perspective of play and games in information systems learning

I selected Bandura's (1989) social cognitive theory as a dialectic perspective to interpret behavioural disposition. Social cognitive theory is dialectic insofar as it treats behaviour as both influencing and being influenced by external and internal stimuli. Causation, therefore, is bidirectional. SCT holds that a person's behaviour, personal disposition and social environment exert influence on each other through bidirectional causation (what Bandura calls the triadic causation model). In the present research, personal disposition manifested as personal efficacy; the social environment manifested as collective efficacy. To meet the demands of complex information systems, information systems generally apply human cognition in collective (group collaboration) rather than individual form (Bourgeois, 2014).

However, problems inherent in group participation emphasised why the examination of personal factors (on the triadic causation model) should not be abandoned. The ACM and AIS (2020) recognize the critical role of individual foundational competencies outside the immediate IS competencies domain in IS learning contexts. In revising the IS2010 curriculum guide, the ACM and AIS increased the focus on the significance of individual competencies: "The 'user' in IS has expanded from just considering industry employees to now considering all types of individuals. Therefore, IS has become more society-centric, not simply organization-centric" (ACM & AIS, 2010, p. 26). Indeed, the IS 2020 competency model (ACM & AIS, 2020) advances individual foundational competencies as one of three high-level competencies (the other two are IS competencies and domain of practice competencies).

Despite the exclusion of individual learning competencies, the gamification team managed to achieve learning outcomes through group collaboration in some cases. For example, we conjured learning motivation through play (that is ostensibly valueless) through group collaboration. An example of play involved the gamification team collaboratively choosing a unique name for this study's version of *Millionaire*. The chosen name, *Who Wants to Pass This Year* in itself is evidence of demonstrating an IS2020 (ACM & AIS, 2020) competency concerning collaboration skills in IS projects. Therefore, I am not dismissing such self-improvement activities that occur on the periphery of games as unproductive but rather a playful activity that augments strong group efficacy for gamified IS learning.

Chapter 6 (particularly, the theme 'groups simplify the rationale behind action and research and groups mean *safety in numbers*') demonstrated that games or gameful activities are capable of producing successful collaboration that aligns with ACM and AIS (2020) competencies. However, conflicting social and cultural elements in information systems impede gamification. Consider *Quizlet Live*'s replay (progress-reset) feature which reinforces failure and cannot account for root social and cultural factors that cause failure. For example, the progress-reset tool cannot determine how a lack of language ability affects an individual's success in team collaboration.

In a dialectical fashion, problems that typify groups bring a personal disposition towards gamification to the fore. In short, efficacy for single-player gaming was and will always be strong.

Therefore, it appears that a general desire prevails among students; to explore their individual abilities to master (on their own) a learning skill in a game format. The study's data and themes suggest that individual skills mastery can build towards strong personal efficacy for the benefit of group collaboration. Consider the language problem: Non-native English-speaking students indicated an inclination to learn English through programming and programming through English (see Guo, 2018). Guo (2018) reports that students—after improving their English proficiency—have a higher inclination for group participation. In this regard, information systems research can explore the potential of gamified programming courses that aim to produce language skill competencies.

Notwithstanding the overwhelming preference for English proficiency amongst non-native English-speaking students, I, as a non-native English speaker, gamer and IS scholar advance social cognitive theory to guide game design and the integration of non-Western objects. Figure 29 illustrates the conceptual relationships as follows on the triadic causation model: (1) Indigenous knowledge, communicated through language, emerged alone and isolated as a personal artefact of the self; (2) Western epistemology, practice (such as information systems) and language is an inevitable dominant environmental factor needing critical reflection to accommodate indigenous knowledge; and (3) user behaviour is a unit of analysis in information systems research to reflect on whether resulting gamified information systems successfully assimilate and develop indigenous knowledge.

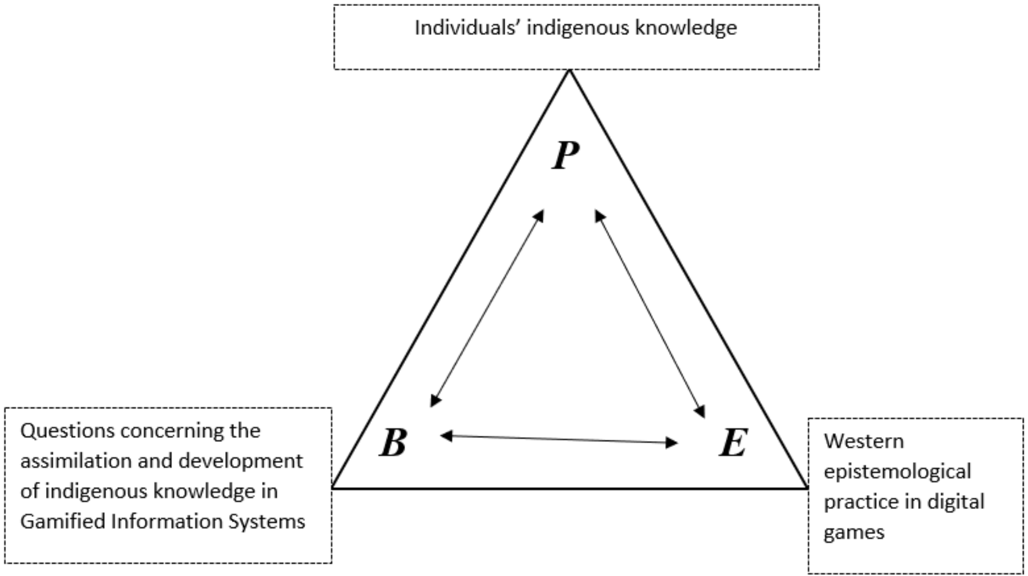

Figure 29. A triadic causation model depicting a reciprocal relationship informing the development of indigenous knowledge in gamified information systems (based on Bandura, 1989).

Ultimately, I reject the idea of unidirectional causation between game elements and people. Instead, I exhort the idea of bidirectional causation between game elements and people. My ideation departs with an examination of the personal disposition of game elements. Facilitating an understanding of personal disposition (through solo player mode) of games can allow strategic application of positive and negative behaviour towards strong group efficacy. An example is Pournaghshband's (1990) espousal of *proxy agency* in IS projects. Pournaghshband (1990) suggest that strong individual skills (not random selection) must be the basis for team formation in information systems projects. The author argues that strong individual skills can compensate for another individual demonstrating ineptitude in the same skill. In turn, personal efficacy for gamification is increased by strong collective efficacy. Figure 30 illustrates these conceptual relationships.

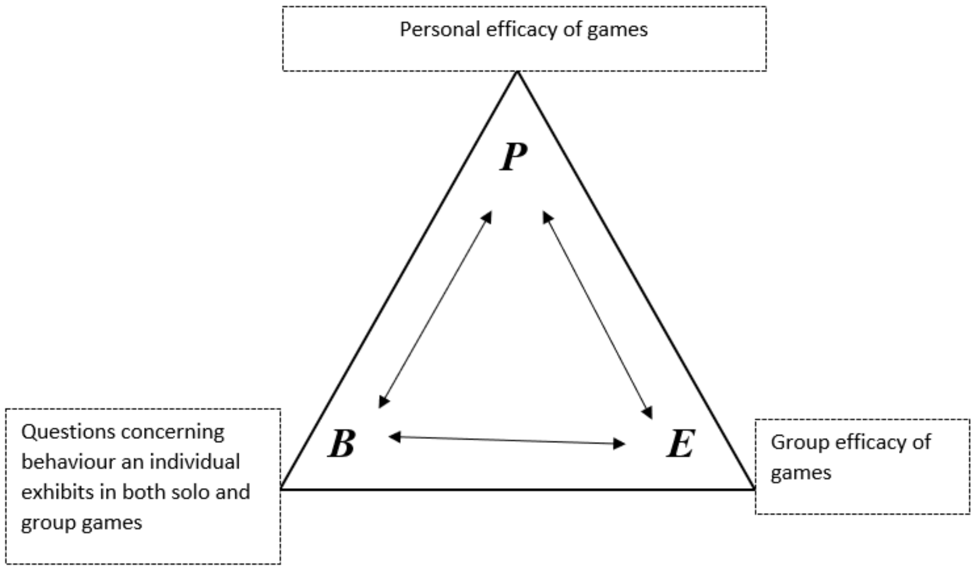

Figure 30. A triadic causation concept that illustrates a reciprocal relationship between game behaviour that both personal and group efficacy can produce (based on Bandura, 1989).

8.3 A dialectical perspective of information systems

The literature review, research design and methodology of this thesis were informed by the sociotechnical perspective (Sarker et al., 2019), which reflects Lee's (2004) conception of IS. The sociocultural perspective, according to Sarker et al., "privileges neither the technical nor the social, and sees outcomes as emerging from the interaction between the two" (2019, p. 696). In a similar vein, Lee holds that an information system "emerges from the mutually transformational interactions between the information technology and the organization" (2004, p. 11).

For Deterding (2013a), the prevalent perspective about the rules that substantiate technical systems is ill-informed. These perspectives confine the rules to executable programs. Arguing against this view, Deterding invoked the fact that we, humans, write the code that performs application functions. This implies that technical system rules are not executable programs, but rather dispositional resources. Here, behavioural dispositions are not only mediated by external stimuli (for example, technology to enhance human ability), but also by both explicit and implicit social and cultural factors that impede or enable people's ability to optimally learn about and with technology (Brown, 2011).

Bandura (2002) added culture to social cognitive theory to improve the understanding of human behaviour. To accentuate the influence of culture, Bandura juxtaposes culture with biological life to discern its influence on behaviour. In this regard, Bandura suggests people can express their acquisition of knowledge both biologically and culturally. As an example, consider the present study. In cases where teams answered a question correctly, they clapped their hands and laughed joyously. However, the cultural variant of knowledge acquisition can also be regulated by underlying ideology. An example of this is the students who lack English proficiency. They expressed relief in reaction to Programming I questions being answered correctly, which I link to the observation that programming languages are free from the ambiguity of language.

Culture converged in a complex ecology of individual and group learning with digital technology in this IS project. Figure 29 illustrates that *indigenity* emerged alone against a dominant Western knowledge system. In terms of technology design, information systems science must first examine the relationship between personal efficacy and individual understanding, design and the adoption of technology. This requires synthesising designer and user disposition of technology design. Accessing and modifying source code is not the essence of technology design, its friendliness and embeddedness relating to usage. Achieving such technology requires adopting and enacting *technical conviviality*. Technical conviviality "indicate[s] a desire to break software sovereignty or technical nationalism" (Mitcham, 2009, p. 300). From a non-technical perspective, software design is no more than an instance of technology invention broadly construed.

8.3.1 Technical conviviality

Technical conviviality is a term created by Mitcham (2009). Technical conviviality refers to the process of conceptualising software from the perspective of an end user, with less emphasis on direct access and manipulation of a software program's source code. Instead, the end user is more concerned with breaking the constraints of technical nationalism and promoting the freedom to study, critique and appropriate software design techniques for the personal well-being of their users.

As an example, I draw from Mitcham's concept of transparency. Mitcham criticises *Microsoft Word* for designing toolbar icons that are opaque, mysterious and difficult to understand and adjust. In a similar vein, he criticises proprietary software designers for not only cluttering users' screens but also their technical lives with artefacts. As a case in point, Mitcham remarks, "some of us would like to live with a computer screen that has the aesthetic feel of Shaker or Scandinavian furniture" (2009, p. 308). Mitcham's criticism is reminiscent of Dalvit et al. (2008) criticising software designers for incorporating Western knowledge as a point of reference to transfer meaning through the design of graphical user interfaces. By implication, people in non-Western settings find it difficult to make sense of graphical user interfaces that are based on Western metaphors.

Mitcham (2009) starts formulating the conception of technical conviviality by rejecting inventing for the sake of invention. Mitcham criticises software designers who create an end-user need that can be satisfied by software. More often, the need is unfounded or does not align with an end user's level of ICT proficiency. For example, Mitcham observes that the process of software design is not a part of end-user utilisation because software design is a specialised field, requiring high levels of analytical and abstract thinking. The result is a technical product that is not focused on satisfying apparent end-user needs but is focused on promoting software design techniques themselves.

Mitcham (2009) traces the challenge of aligning software design and intervention with end-user needs back to the 1700s and 1800s, when the civil engineering ethos emerged. The military inspired civil engineering. Indeed, the first civil engineers were military engineers who designed war equipment like battering rams. Mitcham notes that civil engineering adopted some of its ethics from the military. For example, similar to how soldiers are expected to obey authority, there is an (implicit) expectation from civil engineers to be loyal to the company that pays their salaries. Such criticism can be extended to software insofar as software engineers focus less on clients' needs and more on completing a software project within budget.

8.3.2 Towards technical conviviality

In this section, I draw on Mitcham's (2009) concept of technical conviviality to promote a dialectic perspective of a designer–user relationship. I synthesise technical conviviality, the subthemes 'self-evaluative software design' (Section 6.9.3) and the subtheme 'oppressive AI and relearn through replay' (Section 6.9.6). The first subtheme hints at students' desire for *FOSS* that gives them full control to plan, create, structure and assess source code. In the second theme, students express the desire to modify digital elements to accommodate different user needs. From this synthesis, I offer a dialectical perspective that promotes the concept of students taking on the role of the designer and vice versa, to design software that is enmeshed in students' personal learning needs.

By designing their own educational gamified software, students critically engage and guide design ethics structured around their own and others' social and cultural needs. I term the resulting software product a *convivial information system (c-is)*. I suggest the theory of *convivial information systems (c-IS),* to delineate the discourse of convivial information systems. I connect the theory of *c-IS* to IS education that focuses on the design of learning technologies. El-Masri and Tarhini's (2015) study is an example of an IS study in the domain of educational technologies. El-Masri and Tarhini (2015) investigate the design principles of game-based learning platforms by designing a game-based platform for a classroom setting. Another example is Kabudi (2021) developing design principles for an AI-enabled learning system that adapts to students' learning preferences. Therefore, *c-IS* accentuates discourse relevant to IS in the domain of educational technologies and not, for example, IS in psychology. At best, psychology students can inform software design from a social and cultural perspective but it is not in their interests to enact software design through coding an information system.

Figure 31 illustrates my concept of the designer–user relationship. I refer to this model as the *triadic causation model of convivial information systems* (based on Bandura, 1989, p. 3). The dialectical relationship functions as follows:

Personal ⇔ behaviour (p⇔b). I position the personal student perspective of a convivial information system as a personal factor that exerts influence and is being influenced by student-led design, implementation and use of an information system. This conception of a student-led design underpins the methodological considerations of this thesis (discussed in Section 8.4).

Environment ⇔ personal (e⇔p). Encourages students to consider designating their idiosyncratic technology as open-source software. Regardless of their choices, students are encouraged to demonstrate to their peers how their technological artefact represents their ethical, social and cultural values. In turn, students are encouraged to assess feedback. The student can decide whether to build feedback (for example, technical recommendations) into the artefact or whether it is best to ignore, owing to potential conflict. For example, the values that the recommendations embody might be at odds with those of the student. I infer this ideation of e⇔p from Mitcham (2009, p. 300), suggesting that it is best to avoid inventions "that promote invention itself". I regard this as Gyekye's (1997) concept of decolonising, which he explains through his organ-transplant metaphor. Gyekye holds that the suppression of indigenous knowledge arises from unidirectional technology transfer. Here, Gyekye refers to the harm that Western technology causes when it is ostensibly implemented to empower indigenous communities and argues that an element of a foreign culture cannot simply be transferred to a recipient. For Gyekye, such an approach imposes passivism on the recipient who has little input regarding the foreign object to be inserted into their body. Van Der Poll, Van Zyl and Kroeze (2020) link this metaphor to the decolonisation discourse in computing education:

> Analogically, the indigenous group's goals and needs would guide a technological artefact whereby they make decisions about which foreign technological tools they wish to acquire and become active participants who positively and willingly engage with the process of appropriating such tools. (Van Der Poll et al., 2020, p. 48)

Behaviour ⇔ environment (b⇔e). Students incorporate the feedback they consider valuable into their information systems and reject feedback they consider at odds with their values. Students are furthermore encouraged to make the source code available to fellow information systems students. It is important to stress that rejection does not imply that values—emerging as oppressive and inconsiderate to other value systems—remain obscured in the artefact. Furthermore, open source does not imply that the artefact is at risk of having its fundamental social ethos supplanted. I advance the opposite: a dialectic interaction to promote true participation. I draw from three convivial ideals that Mitcham (2009) offers to conceptualise this relationship.

Academic citizenship: By making artefacts available as open source, students contribute to public intelligence. Therefore, students contribute to scientific research and technology, a domain traditionally dominated by technology experts. In the process, students learn about the limitations and power in technology design.

Improved sociotechnical decision-making: In this regard, Mitcham (2009, p. 304) argues that "local knowledge, non-expert knowledge, what is often called indigenous knowledge, when appropriately utilized, has the power to enhance even the technical aspects of technical decisions". For example, I support *Quizlet Live* (2018) adding a single-player mode to a team mode. This technical change is relevant in light of my proposition that it is best for students who experience language barriers to commence with individual gameplay.

Educate and consult: This ideal marks a shift from the technical expert who "knows best" to the technical expert who "advises best" (Mitcham, 2009). In the methodological framework, the researcher, lecturers and fellow students equip the student with advice so that they can make free and informed decisions about technical changes they may or may not want to incorporate.

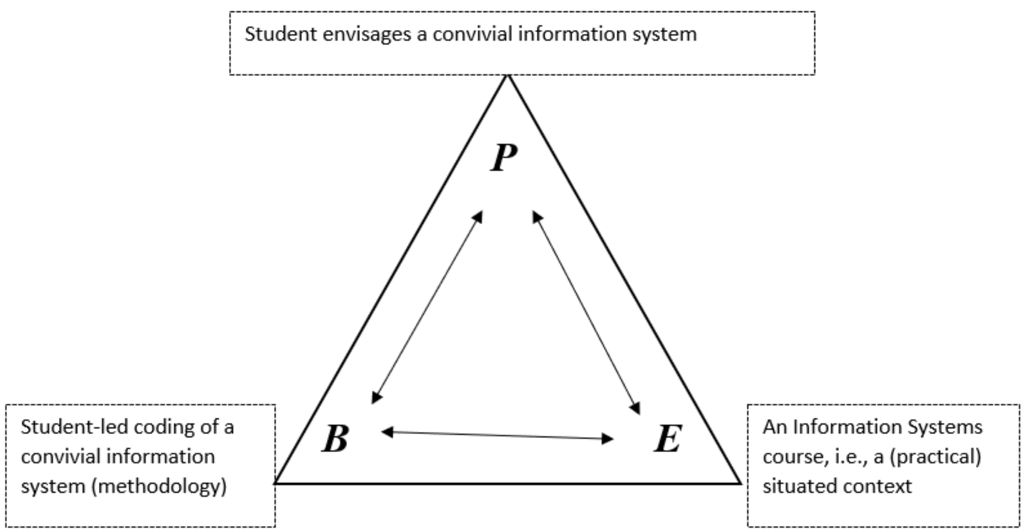

Figure 31. A triadic causation model depicts a reciprocal relationship that informs the development of a convivial information system (based on Bandura, 1989, p. 3).

8.4 Design action learning for convivial information systems: A methodological framework

As reported, action learning was not entirely effective in conjuring motivation for information systems learning. The participatory nature of action learning did not compensate for the sociocultural difficulties that emerged from a lack of focus on individual gameplay. Indeed, one of the research questions accompanies problematic issues (concerning participation) of why social and cultural experiences affect student motivation for gamification in information systems learning. According to dialectical analysis, experience typically emerges from guided participation in cultural and social activities (Scott & Palincsar, 2009; Vygotsky, 1978).

In educational contexts, 'guided' means a student learns from their teacher and fellow students to help shape social and cultural ways of learning. Group collaboration emerges under such conditions (Scott & Palincsar, 2009). For this study, I incorporated play and games—as fundamentally social and cultural activities—into information systems learning. I chose action research as a methodology based on its theoretical tenets of democratic participation. Democratic participation promotes goal-directed action taken by the gamification team (the action researcher, lecturers and students) to improve teaching and learning practice (Mertler, 2017; Stringer, 2014). At times, however, the principles of democracy and improvement evaded this study's gamification team. Indeed, these principles were discernable only from the vantage point of students who preferred autonomous learning.

Ultimately, student input in the project's intra- and intergroup formations did not convert into shared decision-making. In terms of intragroup formation, strong rhetoric emerged that contested not only the idea of a game that includes competition, but also requires that opponents share resources. For this idea, I could not attain buy-in from all the students, which harmed the project's shared goal of achieving improved motivation as a collective. In terms of intergroup formation, communication problems that are linked to students who had withdrawn and language usage curtailed effective group collaboration. As a result, students started to feel more inclined to enact individual choice through individual learning. The intention to achieve individual goals through group-orientated activities must be respected in IS projects, according to Heeks (1999).

In addition, at the inception of this research project I did not anticipate that student input or participation would require more than verbal or mundane human–computer interaction. An example of verbal interaction is a verbal answer to a quiz question in *Millionaire*. In terms of human–computer interaction, I regard actions like the mouse-clicking of options in *Quizlet Live* as mundane because it comes naturally to IS students. However, the focus group transcripts indicate a crucial student need, namely the desire for game technology that is capable of validating programming code through interaction feedback (for example, indicating a syntax error in the programming code). All the same, negative encounters with the problematic progress-reset feature of *Quizlet Live* make me wary of existing technology and its built-in features.

In light of the observation that there is a general lack of consideration for the role of social and cultural elements in the conventional design of digital technology, I recommend that each student designs their own gamification technology. The possibility to align action learning to design science research (DSR) then arises. Oates defines design science research as a strategy that "focuses on developing new IT products, also called artefacts" (2006, p. 125). Design science research can produce an instantiation as a type of artefact. Oates defines an instantiation as "a working system that demonstrates that constructs, models, methods, ideas, genres or theories can be implemented in a computer-based system" (2006, p. 125). My alignment of action learning and DSR is guided by the work of Peffers, Tuunanen, Rothenberger and Chatterjee (2007).

Peffers et al. (2007) offer an abstract model that links facets of design science to information systems theories but leaves the actual design process to the researcher's inference. In this conception, researchers seek recourse to information systems literature for process models that can be integrated into design science research. In the forthcoming subsections, I align action learning to Peffers et al.'s (2007) phases of DSR; I term this methodological framework **Design Action Learning (DAL)**. In the subsections below, I conceptualise the design action learning cycle. I draw on the IS2020 competency model (ACM & AIS, 2020) to account for the quality and scope of the resulting *knowledge*, *skill* and *disposition*.

8.4.1 Action learning Phase 1 (plan): Linking DSR Step 1 (identify the problem) and Step 2 (define objectives and solutions)

I align the first phase of action learning, the planning phase, to phase 1 and phase 2 of design science research. In the planning phase, participants identify the problem and plan what they need to do to solve the problem. In this vein, I position ethical, social and cultural elements that are being excluded from the proprietary design of gamification and educational technology as the core problem (Mitcham, 2009). Furthermore, participants reflect on the phases they need to undertake to solve the problem (Zuber-Skerritt, 2015). In Table 33, the learning outcomes of the planning phase are aligned with the IS2020 competency attributes (ACM & AIS, 2020).

Table 33

Aligning the planning phase on the IS2020 competence area, knowledge element, skill and disposition (ACM & AIS, 2020; Peffers et al., 2007)

Action Learning Phase	IS2020 Competency Area	IS2020 Knowledge Element	IS2020 Skill (Bloom's Cognitive Level)	IS2020 Key Disposition
Plan	"Foundations of Information Systems" (ACM & AIS, 2020, p. 97)	Explain the IS Professional's attributes, duties and roles	Apply	"Self-directed, Inventive, Purpose-driven" (ACM & AIS, 2020, p. 98)
	"IS Ethics, Sustainability, Use and Implications for Society" (ACM & AIS, 2020, p. 154)	Examine performance, actions and processes to support the individual	Apply	"Professional, Responsible, Proactive" (ACM & AIS, 2020, p. 154)
	"Systems analysis and design" (ACM & AIS, 2020, p. 122)	Define systems with an explanation of how they are developed	Understand	"Self-directed, Responsible, Proactive" (ACM & AIS, 2020, p. 122)

Design science research – Step 1 (identify the problem)

Participants identify the problem and technological solution to solve the problem (Peffers et al., 2007). In this regard, Peffers et al. (2007) extend the primary goal of design science research, which is to create and test innovative technologies, to include conceptual problems and solutions. I position my proposition of a convivial information system as a conceptual problem. Inquiry can, for example, depart from the following research question (formulated in Chapter 7): What social and cultural dynamics affect the motivation of students to participate individually in gamified information systems learning?

Design science research – Step 2 (define objectives and solutions)

In this step, the technical resources that are required to translate the problem into information system objectives (also called meta-requirements) are being considered. These resources are built implicitly into data collection, programming and other design activities (Peffers et al., 2007). I link the sociocultural concept, namely, 'prior knowledge of software design' as a knowledge resource. As an example, consider the programming knowledge of third-year students, which far exceeds that of first- and second-year students. In this regard, I recommend exposing first- and second-year students to open-source, low-code development platforms such as *Codecademy* (2022).

Low-code platforms enable end users to take on the role of the programmer. The idea is that software artifacts on these platforms can be created by people with fewer technical skills than a professional programmer while still being able to configure these platforms' powerful underlying engines, such as machine learning and web development. Low-code platforms typically leverage graphical interactive interfaces (that is, drag-and-drop interfaces) through which users can select and manipulate code elements (Lethbridge, 2021). Assuming students gain advanced programming skills, they are presumably ready to engage in more advanced programming practices that are less dependent on machine learning. In Table 34, the learning outcomes of DSR Steps 1 and 2 are aligned with the IS2020 competency attributes (ACM & AIS, 2020).

Table 34

Mapping steps 1–2 of DSR on the IS2020 competence area, knowledge element, skill and disposition (ACM & AIS, 2020; Peffers et al., 2007)

Design Science Research Phase	IS2020 Competency Area	IS2020 Knowledge Element	IS2020 Skill (Bloom's Cognitive Level)	IS2020 Key Disposition
Step 1: Identify Problem	Digital Innovation	Critically reflect on the features and methods that technology might offer	Remember Apply	"Inventive, Self-directed, Purpose-driven" (ACM & AIS, 2020, p. 164)
Step 2: Define objectives and solutions	Digital Innovation	Identify and gather the human and technical resources to produce the digital artefact	Evaluate Create	Inventive Self-directed Purpose-driven

8.4.2 Action learning Phase 2 (act): Linking Step 3 (design and development) and Step 4 (demonstrate)

I align the second phase of action learning, the act phase, with the third and fourth steps of design science research. In the act phase, action is taken to execute the plan (Zuber-Skerritt, 2015). This synthesis firmly locates the activities of this phase in the required Foundations of Information Systems competency area (ACM & AIS, 2020) specifically, Competency 8:

> Demonstrate an ability to solve basic computational and design problems using IS development with appropriate methodologies, software tools and innovative methods for improving processes and organizational change. (ACM & AIS, 2020, p. 97)

This competency area cements the idea that only assessing theoretical IS knowledge is inefficient. Hence, I promote the idea that students must demonstrate practical IS skills through digital simulated modes of assessment. I regard this act as an attribute of the positive change that action research seeks to affect by teaching and learning practice (Stringer, 2014). In the context of this study, change denotes actions that alter the cultural components of an organisation.

My ideation of design action learning challenges the nature of participation. I espouse autonomous actions as imperative to achieving a group's primary goal. Therefore, I position design action learning as a group action that regards individual software design as a true act of participation. I acknowledge the reality of sociocultural learning that occurs outside the formal structure of software design. For example, I anticipate that some of the ideas that a student incorporates into their system are informed by an informal conversation about the project. Indeed, students will always (and must be encouraged to) brainstorm, exchange and reflect on ideas together (Scott & Palincsar, 2009). In this light, I recommend that students start this phase by first engaging in DSR Step 4, namely, 'demonstrate' (discussed below), i.e., to pitch and receive feedback on their plan, objectives and solutions (Step 1 and Step 2).

Design science research – Step 3 (design and development)

This step involves the actual construction of the technological artefact. The student departs with a concept design that illustrates how the student's ethical, social and cultural values reflect in and through the artefact. The idea is to emphasise a solution to the misrepresentation of convivial values that prevail in gamification technology. The student then proceeds to create the artefact. In Table 35*,* the learning outcomes of the design and development phase are aligned with the IS2020 competency attributes (ACM & AIS, 2020).

Design science research – Step 4 (demonstrate)

This step entails the demonstration of the new information system by solving one or more cases that are linked to the problem. In DSR, this typically involves a transfer to a real-world setting (Peffers et al., 2007). I draw from Mitcham (2009) to reconceptualise Step 4. It is not in the interest of the convivial ideal to transfer the artefact to another setting; therefore, the focus in design action learning is for the student to demonstrate the artefact facilitating social, cultural and ethically responsible ways of learning information systems. Table 35 also aligns the learning outcomes of the demonstration phase with IS2020 competency attributes (ACM & AIS, 2020).

Table 35

Aligning the design and development and demonstration phases with the IS2020 competency area, skill and disposition (ACM & AIS, 2020; Peffers et al., 2007)

Design Science Research Phase	IS2020 Competency Area	IS2020 Knowledge Element	IS2020 Skill (Bloom's Cognitive Level)	IS2020 Key Disposition
Step 3: Conceptual design	Ethics, use and implications for society	Identify moral issues that relate to data usage and storage	Understand Evaluate Apply	Professional Responsible Proactive
	Digital innovation	Formulate and articulate the functions that the *c-is* offer	Remember Apply	Inventive Self-directed Purpose-driven
Step 3: Hard-design	IS practicum	"Utilise tools for code and version control" (ACM & AIS, 2020, p. 179)	Understand Apply	"Meticulous, Self-directed, Purpose-driven" (ACM & AIS, 2020, p. 179)
Step 4: Demonstrate	Digital innovation	Give a demonstration of the artefact the new artefact	Evaluate Create	Inventive Self-directed Purpose-driven

8.4.3 Action learning Phase 3 (reflect): Linking Step 5 (evaluate)

I align the third phase of action learning (the reflect phase) with the DSR evaluation phase. In the reflect phase, students evaluate positive learning outcomes attained through the experiential learning process and reflect on causes that led to failed goals (Zuber-Skerritt, 2015).

Design science research – Step 5 (evaluate)

The student and researcher observe and determine how well the artefact addresses a solution to the problem. The student and researcher compare objectives and a solution offered to observe the outcomes that the artefact produces in a demonstration. As an example, consider participants' calls for a less stringent progress-reset feature in *Quizlet Live*; in the case of an incorrect answer, it should maybe reset progress one or two levels down instead of to zero. In consideration of a lack of English proficiency, this may be an appropriate handicap that still facilitates meaningful replay (that is, learning from one's mistakes).

In terms of data collection, Peffers et al. (2007) recommend various techniques, among others, client feedback. I recommend the use of qualitative data collection techniques such as participant observation, semi-structured interviews and focus groups. Table 36 aligns learning outcomes from the evaluation phase with IS2020 competency attributes (ACM & AIS, 2020).

Table 36

Aligning the evaluation phase with the IS2020 competency area, skill and disposition (ACM & AIS, 2020; Peffers et al., 2007)

Phase	IS2020 Competency Area	IS2020 Knowledge Element	IS2020 Skill (Bloom's Cognitive Level)	IS2020 Key Disposition
Design action learning – Phase 3: evaluate and reflect	User interface design	Assess how user experience is affected by user-focused technology	Apply Understand	Purpose-driven Professional Inventive

8.4.4 Action learning Phase 4 (learn): Linking Step 6 (communicate)

I align the fourth phase of action learning, the learning phase, with the sixth step of design science research (see Table 37). In the learning phase, the student and researcher engage in critical reflection on what, why or how ideas and approaches were influential in the success and failures of the design project (Zuber-Skerritt, 2015).

Design science research – Step 6 (communicate)

In DSR, Step 6 involves the researcher documenting the design process in scholarly publications (Peffers et al., 2007). Within the conceptual scope of design action research, IS research examines how effective student-produced technology appropriates individual ethical, social and cultural values. In this step, the researcher reverts to the problem that has been formulated in Step 1 (identify the problem). To reiterate, the problem stems from the convivial principle that individual freedom is achievable through autonomy and by implication, intrinsic ethical, social and cultural values. This principle, however, diminishes insofar as (even the individual) use of digital technology is engineered by capitalist technology vendors, software marketers and other external managers (Glass, 2018; Mitcham, 2009). To this end, the researcher examines the extent to which a student designes a convivial information system that satisfies his/her learning need.

Application designers communicating the design process are generally included in the practice of report writing. In the IS2020 model, report writing is a web development competency area, specifically described as the ability to “[i]mplement good documentation practices in programming” (ACM & AIS, 2020, p. 141). As a knowledge element, the student learns how to document the design process. Documentation, however, focuses on technical aspects of the application such as an explanation of the source code. For design action learning, I recommend that researchers deploy participant journalling as a data collection technique, to extend the IS2020 notion of report writing. In my ideation, I include the practice of documenting an application, a student blog or vlog that documents their experience of designing a convivial information system.

Table 37

Aligning the communication phase with an IS2020 competency area, skill and disposition (ACM

& AIS, 2020; Peffers et al., 2007)

Phase	IS2020 Competency area (reconceptualised for DAL)	IS2020 Knowledge element (reconceptualised for DAL)	IS2020 Skill (Bloom's Cognitive Level)	IS2020 Key Disposition
Design action learning (DAL) – Phase 4: communicate	Information systems development	Documentation of application and experience of designing for conviviality	Create Understand	Meticulous Purpose-driven Self-directed

A final goal of a design science research approach is to produce a process model for the attributes of research outputs. This process model is a small-scale representation of the reality of imagination, perception or comprehension of a discourse (Peffers et al., 2007).

Figure *32* illustrates design action learning as a methodological representation of the *c-IS* discourse.

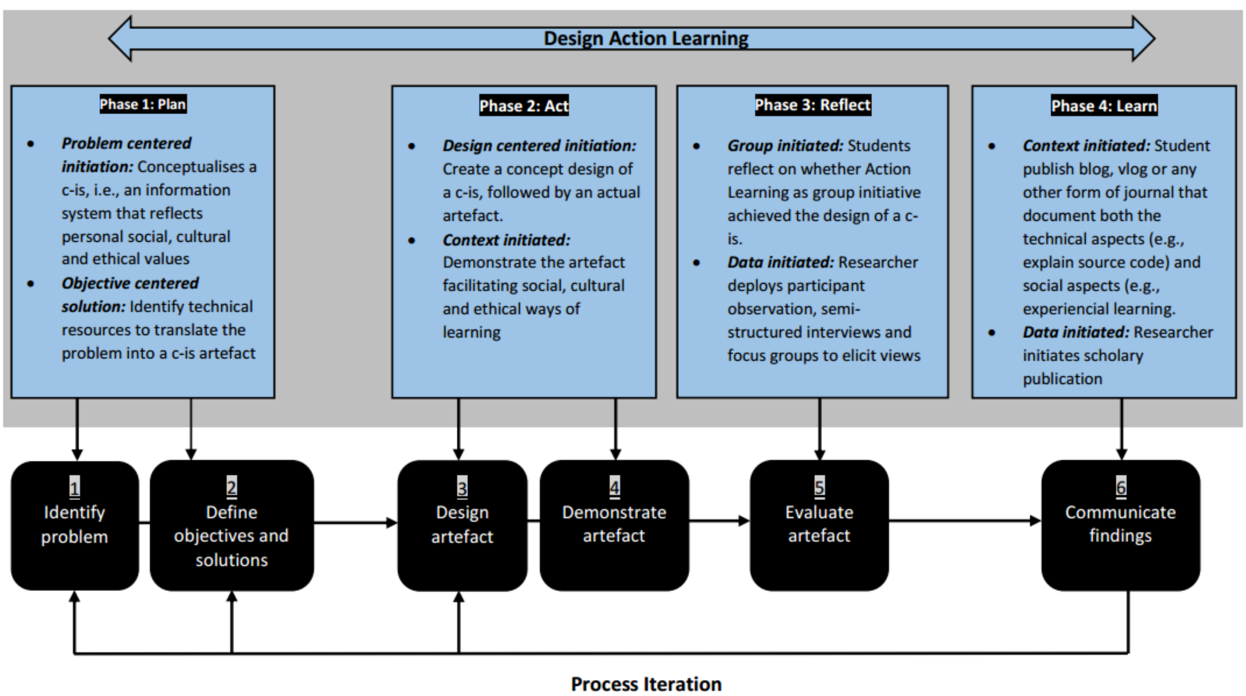

Figure 32. Design action learning process model (adapted from Peffers et al., 2007; based on Zuber-Skerritt, 2015).

8.5 Practical considerations for design action learning

From my ideation of design action learning, I make two practical contributions to the larger information systems body of knowledge: (1) The *design action learning routine of look ⇨ think ⇨ act* and (2) *vicarious learning in design action learning*. I discuss these two contributions in the subsections below.

8.5.1 The design action learning cycle of look ⇨ think ⇨ act

Design action learning being propositioned as a self-directed design approach might imply that its proponent(s) will struggle to collaborate in software design teams. The self-directed design might further imply that individual designers will not be considered as of feedback, which indicates that the ethical values (to be coded into the artefact) are dismissive of the social and cultural traits of a specific group. For example, an AI that is biased or discriminates against a specific group of people might emerge from a self-directed design. As an illustration, in 2015, *Google Photos* considered advanced facial recognition software which categorised two black people as gorillas (Baweja & Singh, 2020). To counter oppressive technologies, I recommend incorporating Stringer's (2014) action research routine cycle of look ⇨ think ⇨ act into DSR's *demonstrate* activity. I term this synthesis the **design action learning cycle of look ⇨ think ⇨ act**.

In my view, *demonstrate* should not be an activity that only applies in the second phase of design action learning. Therefore, I suggest incorporating the cycle of *look ⇨ think ⇨ act* within and between the phases of design action learning. For example, demonstrating the *objective and solutions* of their *c-is* in the first phase of design action learning might be a good way to note early ethical issues that might manifest in a student-produced artefact. In this vein, I draw on Mitcham's (2009) convivial ideal, namely, *education and consultancy* to conceptualise feedback that follows the demonstration of the artefact. To repeat, this convivial ideal does not position student peers and lecturers as those who "know best", but rather as those who "advise best" (Mitcham, 2009). This way, indigenous people can highlight and help designers to prevent coding misrepresentations about indigeneity into artefacts.

8.5.2 Vicarious learning in design action learning

In Section 6.9.7, I deemed the use of verbal input as the only mode of communicating the action in gamified learning that was insufficient for IS learning. Indeed, I observed that students expressed a need to also enact the practical application of programming skills. In response, I formulated design action learning to engender student-led designing of artefacts. However, I am not dismissive of verbal input as a viable mode of gaining and imparting knowledge. Indeed, for design action learning, I promote integrating verbal roleplay/dialogue into 'low-processual participation'. I conceptualised and derived low-processual participation from Stenros' (2015) term *low-processual gaming*.

Low-processual gaming denotes games which focus on ease of use, low computational speed and other factors of efficiency. As Stenros notes:

> [The] efficiency of playing together and of concentrating on just the moves that have meaning as part of the game-artefact is a key consideration, then having a computer facilitate the playing (handle the set-up, rules, random elements etc.) would always be preferable to having players handle the system. However, this is not the case. For example, players still want to roll and count dice (Stenros, 2015, p. 159).

In a similar vein, I argue that a student must be allowed to choose whether or not they want to engage in software design activities. To imply the contrary is indicative of *bureaucratic participation* (Heeks, 1999). Again, I revert to Heeks' (1999) assertion that a person's wish not to participate in IS projects should be respected. Heeks argues that such individuals should be given agency to pursue their own agendas.

I conceptualise such agendas to include a participatory approach where a student's act of participation involves observing how aspects of design action learning unfold. I envisage such participation to be similar to the spectator–participation of e-sports (discussed in Chapter 7). To repeat, spectator–participation refers to the act of observing competitive gaming without taking part (Brissette-Gendron et al., 2020).To repeat, spectator–participation refers to the act of observing competitive gaming without taking part (Brissette-Gendron et al., 2020). In the context of social cognitive theory, I regard spectator–participation as *vicarious learning* (Bandura et al., 1963). As an example, consider the field note excerpt and the student response below:

> As arranged, non-playing teams took the role of the audience in *Millionaire* games in which they themselves were not competing. Aside from participating in the Ask the Audience and Plus One lifelines, the audience observes other teams compete. In comparison to their nervous behaviour and lack of confidence exhibited while playing *Millionaire*, they quietly and keenly observed the performance of competing teams. I pondered whether the audience might obtain knowledge better through observation and not having to cope with the pressure of producing a good performance while playing a game. (Millionaire_Fieldnote 2)

> Research candidate: Would you like *Millionaire* and *Quizlet Live* to be incorporated on a more regular basis and in other modules of your course?
>
> Student 1: If I'm honest with you, I'm just not into it but I can see how other people are. You just sort of learn from other people if you watch them. So, for those who don't really participate, they still benefit from it. And those who do, benefit.

In light of the excerpts above, I subsume the concept of spectator–participation in the *'look, think and act'* activity of the **design action learning cycle of look ⇨ think ⇨ act** (formulated in Section 8.5.1). I suggested that researchers incorporate the cycle of look ⇨ think ⇨ act within and between the phases of design action learning. To enact vicarious learning, I recommend that students who are reluctant (for whatever reason) to engage in software design through design action learning, take the role of spectator–participant. In turn, spectator participation can be embedded in the design action learning cycle of look ⇨ think ⇨ act. I anticipate vicarious learning to occur when a spectator–participant observes a demonstration and thereafter, engages in verbal interaction on the ethical, social and cultural issues that are reflected in the conceptual or artefactual design.

8.6 Pedagogical reasoning for the design of convivial information systems

In Chapter 1, Section 1.6, I draw attention to smart pedagogies that are being explored in the face of prolific AI (Lorenzo & Gallon, 2019). Since AI cannot account for lived experience (which embeds social and cultural dimensions) (see discussion in Section 2.10.2), I reject the notion of smart pedagogies to support the design of a *c-is*. In this section, I draw on Webb's (2002) pedagogical reasoning framework for teaching and learning ICT to support the teaching and learning of a *c-is*. In the following passages, the five phases of the pedagogical framework align: (i) *comprehension*, (ii) *transformation*, (iii) *instruction*, (iv) *evaluation* and (v) *reflection.*

8.6.1 Comprehension

This phase involves the instructor and students investigating the content to be taught, bearing in mind its interconnectedness with other topics within the same as well as other knowledge areas (Webb, 2002). Initially, instructors introduce students to the theory of convivial information systems (discussed in Section 8.3.2). The instructor can then present ethnocomputing (Sutinen & Vesisenaho, 2006) as the closest empirical representation of a *c-is* (Sutinen & Vesisenaho, 2006). Sutinen and Vesisenaho (2006) offered an ethnocomputing course called Contextualised Introduction to Programming at a Tanzanian university. The central premise of the course maintains that Western learning content and resources, such as ICT, are often irrelevant in Global South settings. In response, researchers deploy ethnocomputing, aiming to implement ICT that is representative of local perspectives and needs in Global South regions. The course starts with students examining and evaluating how ICTs can be designed in culturally relevant ways (Sutinen & Vesisenaho, 2006). In the context of this proposed pedagogy, the students consider designing a gamified information system that meets their own learning needs.

8.6.2 Transformation

The transformation process requires the instructor to transform ideas into learnable knowledge and skills. The transformation phase contains the following five phases: (i) *preparation*, (ii) *representation*, (iii) *instructional selection*, (iv) *adaptation* and (v) *tailoring* (Webb, 2002).

Preparation

Preparation involves the instructor choosing the content from his knowledge and a syllabus that would meet the outcomes established in the comprehension phase (Webb, 2002). In an ethnographic study by Sutinen and Vesisenaho (2006), students were trained in general knowledge of the methodology of designing applications. To prepare students for the technical task, the students were introduced to the *Java* programming language. The pedagogy of the present study recommends that students are taught the principles of design action learning to support application design. Additionally, instructors should hold knowledge and skills in a variety of front- and back-end programming languages and choose the language(s).

Representation

This process requires an instructor to present ideas, knowledge and skills in a way that makes sense to the students. For example, in the study by Sutinen and Vesisenaho (2006), the researchers used a village as an instructional interface to analogise the course content (consisting of six units) (see Figure 33).

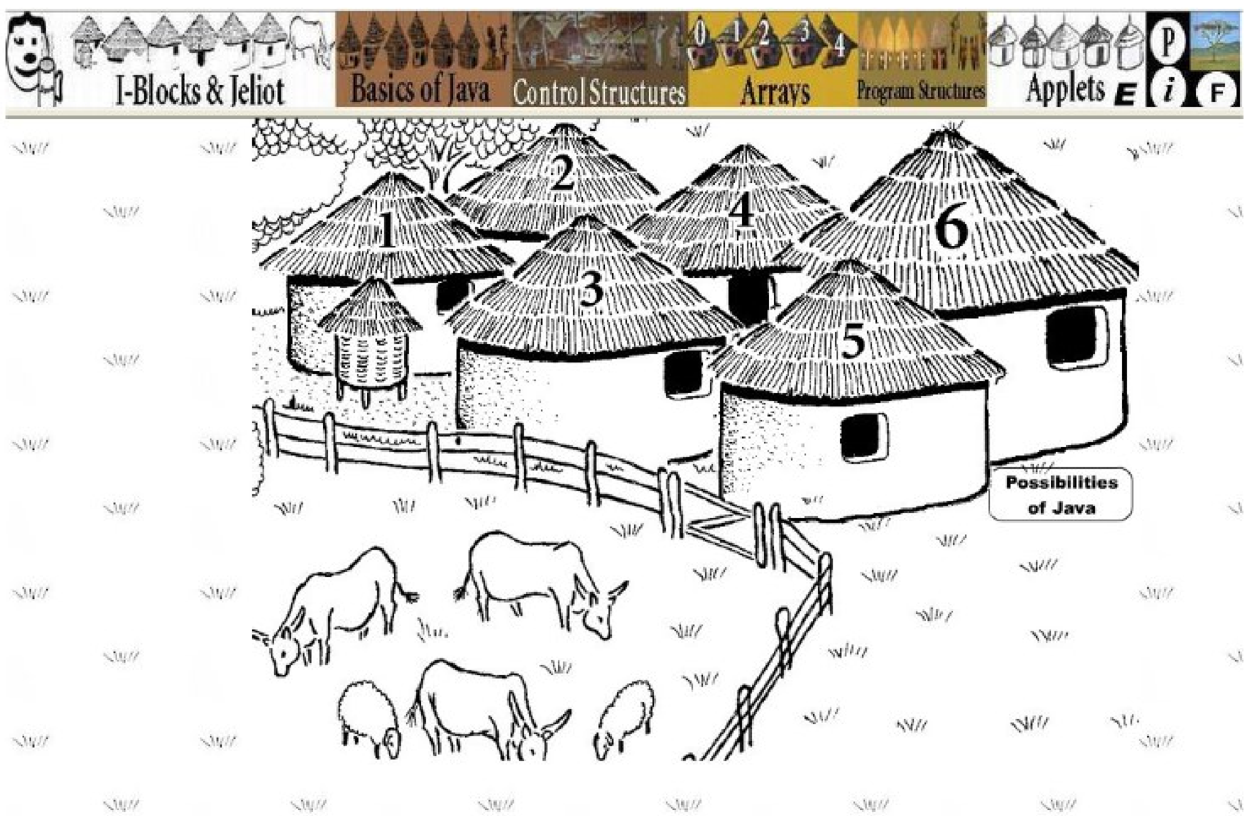

Figure 33. The 'learning village' as a visual analogy of the course content (Sutinen &

Vesisenaho, 2006, p. 249).

As a means of analogy, the phases (and associated IS2020 competency areas) of design action learning can incorporate a storyline (discussed in Section 2.3) or storytelling (discussed in Section 2.4.2). To reiterate, a storyline/storytelling is considered symbolic play elements that enable the player to 'pretend' (Noran, 2016; Tseng & Sun, 2017). As mentioned, designing a *c-is* is mainly an individual endeavour intermixed with group-orientated activities. In this light, I recommend Campbell's (2004) *The Hero's Journey* as a fitting narrative archetype for a student-led *c-is*. As described in Section 2.4.2, the hero's journey is about a hero going on an adventure. The hero must overcome several obstacles, some alone and others with the help of allies (Campbell, 2004). Table 38 summarises the alignment between the DAL phases (derived from Figure 32) and the hero's journey organised into three main acts, namely Act 1, departure; Act 2, initiation and Act 3, return.

Table 38

The hero's journey aligned to design action learning as a metaphorical storyline

Phase	*The Hero's Journey* (Campbell, 2004)	Design action learning
Act 1, departure; DAL Phase 1, plan	The hero receives a call to undertake an adventure into the unknown. The hero is sceptical but received encouragement from a mentor.	The student conceptualises a *c-is* that reflects social and cultural values. The instructor helps the student to translate sociocultural values into information system objectives.
Act 2, initiation; DAL Phase 2, act	The hero enters the unknown and is confronted with trials and tasks that must be faced alone or with the help of allies. The hero then faces a main challenge or enemy to obtain the ultimate reward (victory, reward, etc.).	The student brainstorms ideas with peers and creates and demonstrates the *c-is* that embodies social and cultural values. Peers provide help and feedback.
Act 3, return; DAL Phases 3 and 4, reflect and learn	The hero returns home; enemies from the unknown world may still be pursued. Assistance from home may help him/her to fend off and escape enemies. The hero returns home transformed with new wisdom	The student reflects on the successes and failures of DAL in achieving a *c-is.* The student also engages in academic citizenship by documenting and sharing successes, failures, source code, techniques, etc.

	gained.	

Instructional selection

Instructional selection means the instructor applies their knowledge about learning theories to choose strategies that will help students learn the learning content (Webb, 2002). For the design of convivial information systems, I suggest that instructors adopt the *sociocultural perspective of IS learning* (introduced in Section 7.3.4). I define the sociocultural perspective of IS learning as a process that promotes an ICT artefact that assimilates and reflects student values, behaviour and beliefs. I propose this perspective to underpin software design in contrast with the sociotechnical perspective (see Section 7.3.4). As stated in Section 7.3.4, underpinning a software design process from a sociotechnical perspective is problematic, as shown by technical systems that could suppress the needs of social systems (as an example, see Gyekye's (1997) organ transplant metaphor discussed in Section 8.3.2.

From a sociocultural perspective, ICT design is student-led. As discussed, student-led design is a software design approach that resides in both design and end-user culture. Therefore, the student is both the designer and user of ICT, in dialectical progression between an ICT artefact that they envisage and the ICT that they continually create and modify, as well as to provide access to its source code for critique. From this perspective, human thought fundamentally underpins ICT and AI design (Deterding, 2013a). To support students in their goal of designing an ICT that reflects their convivial ideals, I recommend using design action learning as a methodology.

Adaptation

The adaptation phase involves the instructor selecting learning content that fits the student's characteristics by taking prior knowledge, language, culture and skills into account (Webb, 2002). I link adaptation to *design science research – Step 2 (define objectives and solutions)*, which I discussed earlier in Section 8.4.1. Instructors should bear account meta-requirements in mind when they decide on the type of ICT design project to present to the students. I will briefly repeat the ideas enunciated in Section 8.4.1, i.e., the recommendation that first- and second-year students design the *c-is* on open-source, low-code development platforms. I based this idea on the assumption that first-year students, who do not yet have advanced programming skills, are nevertheless able to configure the underlying components of these platforms. Assuming that third-year students have more advanced programming skills than first- and second-year students, the instructor could expose them to more advanced coding practises that do not rely too extensively on machine learning.

Tailoring

Tailoring involves altering the plan for a specific subset of students (Webb, 2002); for example, exposing first- and second-year students to low-code development platforms while exposing third-year students to platforms that are less reliant on machine learning. The concept of *vicarious learning in design action learning* (introduced in Section 8.5.2) can also be linked to tailoring. The proposed practice this concept encapsulates is based on the spectator–participation model (Brissette-Gendron et al., 2020) or low-processual participation (derived from Stenros, 2015). These approaches to participation enable students to participate in only certain facets of design action learning. For example, students might not have enough time in their academic schedules to accommodate the design of a *c-is*; however, the student may still choose to learn software design by observing and proposing feedback to *c-is* demonstrations (occurring in Phase 2 of design action learning, see Section 8.4.2).

8.6.3 Instruction

Instruction is a process during which an instructor is required to perform a variety of teaching management activities. In the context of IS teaching and learning, the process refers to ICT teaching, which involves software and hardware (Webb, 2002). In the context of the present study, the instruction process should entail the students receiving training in software design applications and programming languages.

8.6.4 Evaluation

In the evaluation process, students are assessed to determine the effectiveness of the learning process, as well as their skills acquisition and learning needs (Webb, 2002). For design action learning, instructors can give students the assignment or project of designing a student-led convivial system. Therefore, this project assesses whether students can code their social and cultural values into technical systems.

8.6.5 Reflection

The reflection process involves the student reflecting along with their peers and instructors on pedagogical outcomes (Webb, 2002). Thus, I refer to the plan and problem formulated in the first phase of design action learning (Section 8.4.1) and the comprehension phase of this proposed pedagogy (Section 8.6.1). These sections indicate that idiosyncratic ethical, social and cultural values are being excluded from proprietary software design. In this regard, reflection entails the students comparing the pedagogical outcomes to purpose. In other words, the students reflect on the extent to which they managed to instantiate convivial values in an information system.

8.6.6 A model for pedagogical reasoning of a convivial information system

Figure 34 illustrates the proposed pedagogical model to support the design of a convivial information system. The pedagogical processes are informed by knowledge of different educational practices and student ideas, beliefs and values.

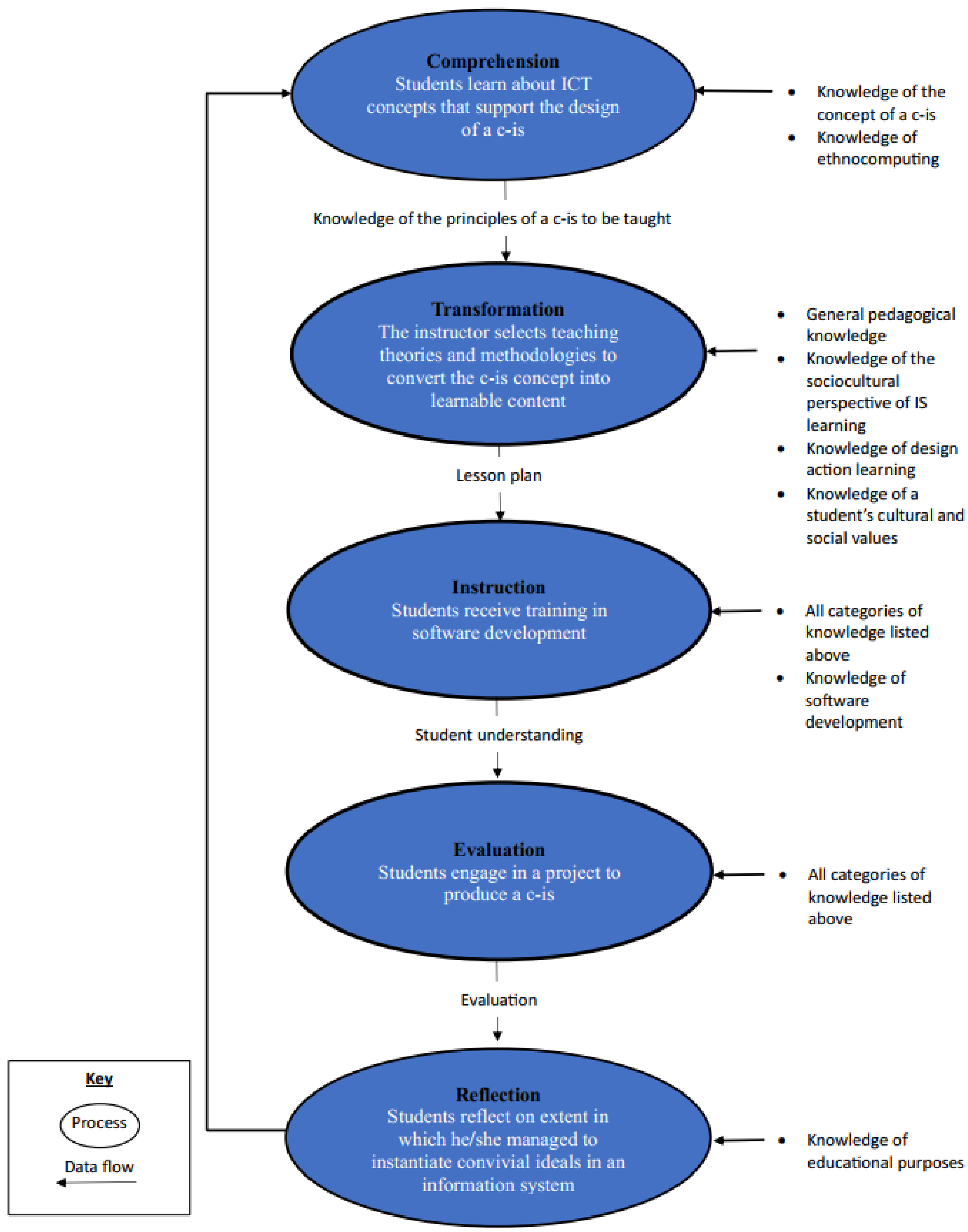

Figure 34. A model of pedagogical reasoning for the design of a convivial information system (based on Webb, 2002).

In Section 8.6.2, I indicated that the transformation phase contains five phases. Figure 35 illustrates the details of these phases.

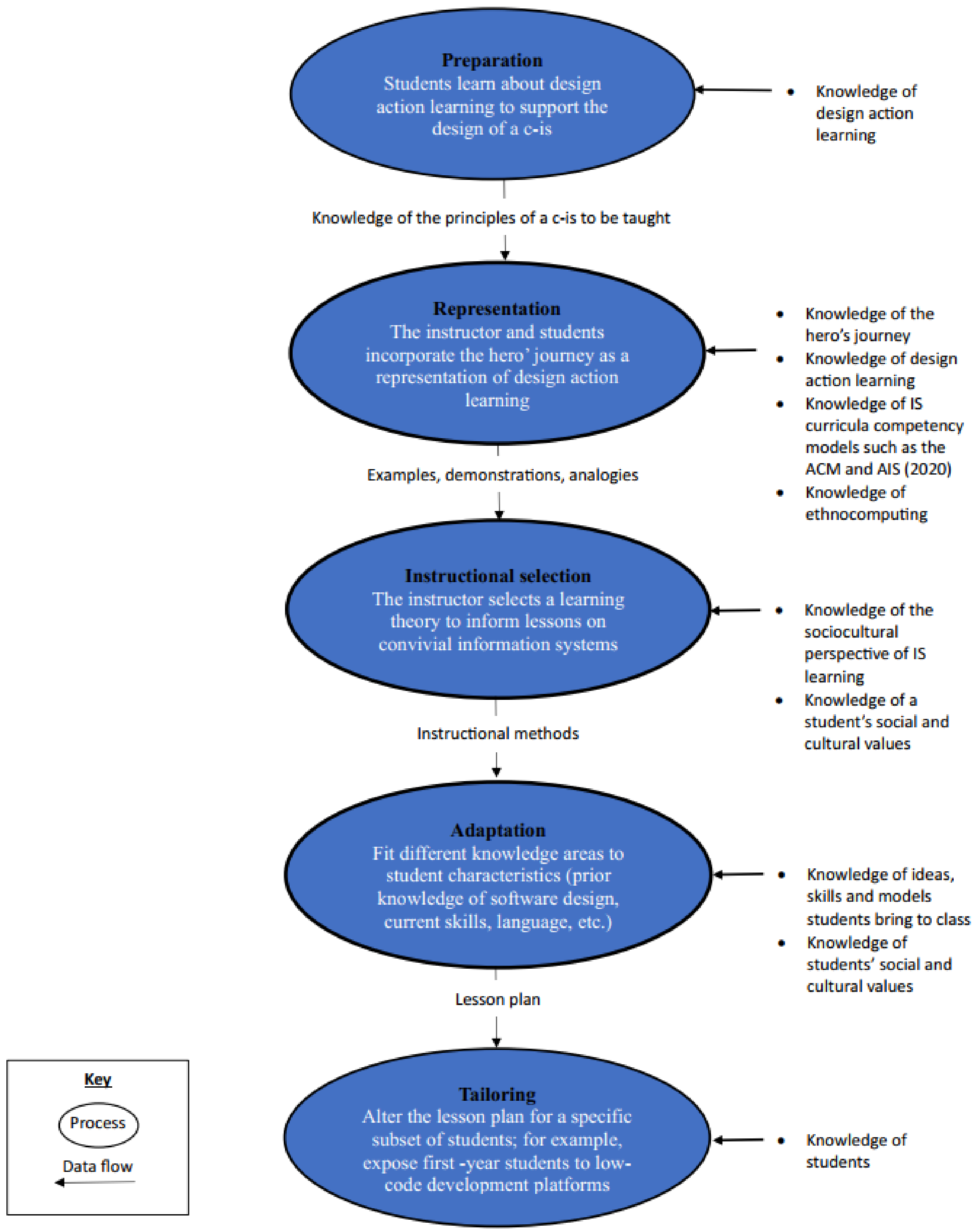

Figure 35. A model of pedagogical reasoning of the transformation process (based on Webb, 2002).

8.7 Study limitation: Revisiting the principle of suspicion

The study limitation of this thesis is situated in Klein and Myers's (1999) principle of suspicion (discussed in Chapter 3). Interpretivists apply the principle of suspicion to reduce bias in collected data, aiming to achieve data validity. Section 3.9.3 indicates that I adopted the following data validation techniques: (i) member checking, (ii) data triangulation, (iii) prolonged engagement in the field and (iv) data refinement through iteration.

The member-checking technique was a valuable validation approach to verify that the interpretation of verbal or physical expressions recorded during participant observation was correct. An event that justified using the member checking technique is the first *Millionaire* gamification in which Student 3 participated:

> Student 3 was unhappy when they had to exit the game and insisted that this game session and the 300 points they won should not count since Student 20 did not pitch. He felt it were *(sic)* unfair since there was *(sic)* only two of them compared to the other teams who had three members; full teams had a better chance of excelling in the game, he argued. I accepted his request and explanation and informed him that the match between Team 7 today is not valid, and they will have the opportunity to play their 'first game' on 28 April 2019. (Millionaire_Fieldnote 3)

In the subsequent semi-structured interview, Student 3 explored the idea of engaging in gamification as an individual player in light of the problems that emerged from team collaboration. Despite Student 3's preference for individual gamification, he inadvertently clung to the idea that 'groups provide safety in numbers' (an important subtheme of this thesis that I discuss in Section 6.8.2). Later in the semi-structured interview, I deviated from the interview protocol to explore in detail the idea to confirm confirming the accuracy of my interpretation:

> Research Candidate: The day your team played, you fell out earlier. You requested a second change arguing that there are only two of you; your third teammate did not pitch. Can you elaborate on why you wanted a second chance and the absent teammate?

> Student 3: The way I look around it is if we [are] a group of two and there is a group of three people, we all know what work is gonna be asked: Professional Communication, Programming. So, we are now a group. I'm not saying this did happen, but if this was like a real game situation because this is just feedback, if, in my team of three, I'll tell them, okay, you cover one chapter, you cover the other chapter 'cause we know the work is going to be based of *(sic)* these chapter[s] 'cause we know there is *(sic)* three in a group, but now we [are] two. So, I cover one chapter, he covers another chapter, what about the other chapter? So, it is basically they could divide the knowledge easily amongst them then *(sic)* the two of us. Because the two of us, we do know the work, but there is one question that is not our expertise but our one friend, he did study that chapter, he would know the answer. So that one person missing could be the link between us winning the game and us losing the game. And the other teams, some of their players that they do have in the team, if they were not there, and it was two-two, the outcome wouldn't be the same. You wouldn't play a soccer game with ten men on the field, and the other team have 11, that is a disadvantage. *(sic)*

Data triangulation also served as a valuable data validation technique. Consider the data that relate to the 'groups mean safety in numbers' theme. Aside from from the field notes, patterned responses to the safety in numbers that group collaboration offers were also observed in semi-structured interview transcripts and focus group transcripts. Regarding the responses below by Student 1 and Student 13: Student 1's response was extracted from the semi-structured interview transcript and Student 13's response from the first focus group transcript. It is worth mentioning that both responses were linked to the 'millionaire_team' code.

> I felt safer playing in a team because I do not need to rely on myself only. (Student 1)

> I am very anti-social. For me to be in a team and actually discuss. I actually even hardly talk within the team. It opened me up a little, to communicate. (Student 13)

I further spent a prolonged period of four months at the data collection site, from which I implemented two action learning cycles. Owing to the iterative nature of action learning, the data and methods employed became iteratively refined as the research progressed from one cycle to the next. When the action learning phase began, I rooted experiential gamified learning within the pragmatic ontological assumption; that is, to effect the desired changes, "action must be guided by purpose and knowledge" (Goldkuhl, 2012, p. 7). At the time, I chose *Millionaire* as a gamification strategy, which I believed would facilitate student motivation for information systems learning. When the research progressed to the second cycle, the research problem and questions became more detailed. Consequently, gamified action learning improved. Indeed, greater emphasis on the democratic quality of action research led to the shared decision to deploy *Quizlet Live* as a better gamification strategy to effect the desired changes.

The second cycle of action learning, therefore, was the most structured. Subsequently, it is within the second cycle where gamification produced greater motivation for IS learning. Nevertheless, critical reflection on the findings of the first cycle was influential in refining action learning for the second cycle. Subsequently, gamification was continuously honed to optimally generate motivation for information systems learning, which I mainly attribute to Stringer's (2014) continuous routine of look ⇨ think ⇨ act. Consequently, the study's interpretive lens constricted analysis to the experiential learning by students who were committed to the gamification project. I am not implying that these students were not taking the problems seriously. Instead, I call attention to the missing views of students who had withdrawn from the study. Therefore, these students' internalisation of gamification have not been explored. This demographic of students, therefore, is underrepresented in the overall findings and conclusions.

The University of South Africa's (2016a, p. 14) Policy on Research Ethics stipulates that researchers should allow participants to "withdraw their previously given consent without demanding reasons". In my view, this and similar guidelines need revision. The use of language, specifically the term 'demanding', is problematic insofar as it suppresses unrevealed opinions. An example of this is a student who had stopped attending gamification sessions. I made contact with him after I had noticed his prolonged absence. The student sent the following *WhatsApp* message: "I'm a little bit behind with some of the work because I kinda skipped classes weeks ago due to transportation issues". Shortly thereafter, he withdrew from the study. Additionally, consider the following interview excerpt:

> Research candidate: Attendance was quite poor. What would [you] attribute that to?
>
> Communications Lecturer: Okay what I did not know at the time was that other lecturers gave them assignments to do … some of them had travelling issues … there were quite a few things happening at the time.

Mbara and Celliers (2013) examine the transportation challenges that students at a South African university (who reside off-campus) experience. Mbara and Celliers report that these students stay far from campus, struggle with travel expenses and consequently "are less likely to make a strong commitment to their studies" (2013, p. 2). Including an exploration of travel by off-campus students might have produced interesting insights into facets of participation in action learning. Indeed, the problems of student travel closely resemble those of the Coronavirus pandemic, namely, limited access to face-to-face learning. Because of the pandemic, academics sought recourse to online learning (e-learning) to accommodate learning amid lockdown regulations (Mpungose, 2020). Relatedly, future research can investigate online gamification as an alternative method to help address the limitations of face-to-face learning.

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Appendix A: UNISA ethics clearance letter

UNISA university of south africa

UNISA COLLEGE OF SCIENCE, ENGINEERING AND TECHNOLOGY'S (CSET) RESEARCH AND ETHICS COMMITTEE

19 April 2018

Ref #: 011/AEP/2018/CSET_SOC
Name: Mr Arthur Emil van der Poll
Student #: 39475964
Staff #:

Dear Mr Arthur Emil van der Poll

Decision: Ethics Approval for 5 years (Humans involved)

RECEIVED
2018 -04- 25
OFFICE OF THE EXECUTIVE DEAN
College of Science, Engineering and Technology

Researchers: Mr Arthur Emil van der Poll
34 Sparman Avenue, Monte Vista
39475964@mylife.unisa.ac.za, +27 82 678 5591

Project Leader(s): Prof IJ van Zyl, vanzyliz@cput.ac.za, +27 21 469 1115
Prof JH Kroeze, kroezjh@unisa.ac.za, +27 11 670 9117

Working title of Research: A Social Cognitive View of Student-led Gamification

Qualification: PhD in Information Systems

Thank you for the application for research ethics clearance by the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee for the above mentioned research. Ethics approval is granted for a period of five years, from 19 April 2018 to 19 April 2023.

1. The researcher will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee. An amended application could

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

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Open Rubric

Appendix B: Application letter

Request for permission to conduct research at Cape Peninsula University of Technology (CPUT)

08 June 2018

Dr Boniface Kabaso
Room 2.23/4, 2nd floor, Engineering Building, Cape Town Campus
Acting Head of Department: Information Technology
Faculty of Informatics and Design
Tel: +27 21 460 3713 e-mail: KabasoB@cput.ac.za

Dear Dr Kabaso

My name is Arthur Emil van der Poll, and I am doing research towards a PhD in Information Systems at the School of Computing, University of South Africa. I am conducting the study under the supervision of Prof Izak van Zyl, Faculty of Informatics and Design, CPUT, and Prof Jan Kroeze, School of Computing, UNISA. I have applied for the UNISA Doctoral Study Bursary in order to facilitate full-time study towards the qualification.

I am conducting this research to find out how a student-led gamification strategy can guide and inform an increase in student motivation to attain learning goals. The study entails an inquiry involving students and educators towards the integration of gamification technology into an empirical IS setting. Your institution has been selected because the research aims to improve the learning motivation and engagement of students enrolled in the first year of the Information Technology course offered by CPUT.

I kindly request permission to research the educators and students involved in the Higher Certificate in ICT qualification. If permission is granted, I prefer to use the names of CPUT in subsequent publications. The names of educators and students will, however, be kept anonymous. CPUT annually attempts to enrol a maximum of 230 students in the qualification. Eight lecturers are responsible for managing and delivering academic content of the modules that are prescribed from the curriculum model. After extending an invitation to participate in this study, I hope that approximately 30 students and two of the educators teaching the modules in the first year will volunteer to participate in the study.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

While you may not personally benefit, the knowledge gained from your participation may in future help students and educators in the Information Systems domain. With the findings, the study can make recommendations to institutional policymakers about the most effective application of educational gamification. Moreover, the findings can help determine what and how gamification techniques can be utilised efficiently to enrich academic delivery.

If you would like to be informed of the final research findings or contact the researcher about any aspect of the study, please contact Arthur Emil van der Poll at 082 678 5591 or 39475964@mylife.unisa.ac.za. Prof IJ van Zyl will store hard copies of respondent data for a minimum period of five years in a locked cupboard/filing cabinet at CPUT for future research or academic purposes. Electronic information will be stored on the candidate's password-protected computer and secure cloud storage platform. The final thesis will be available in the UNISA Institutional Repository.

Should you have concerns about the way in which the research has been conducted, you may contact Professor Izak van Zyl at vanzyliz@cput.ac.za. Contact the research ethics chairperson of the UNISA School of Computing Ethics Review Committee, SocEthics@unisa.ac.za, if you have any ethical concerns.

Yours sincerely

University of South Africa
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www.unisa.ac.za

Appendix C: CPUT ethics clearance letter

Cape Peninsula University of Technology

Office of the Deputy Vice Chancellor:
Research, Technology Innovation & Partnerships
Bellville Campus
P O Box 1906
Bellville 7535
Tel: 021-9596242
Email: NhlapoC@cput.ac.za

09 May 2018

Mr Arthur Emil van der Poll
34 Sparman Avenue
Monte Vista
Cape Town

Email: 39475964@mylife.unisa.ac.za

Dear Mr van der Poll

RE: PERMISSION TO CONDUCT RESEARCH AT CPUT

The Institutional Ethics Committee received your application entitled: "A social cognitive view of student-led gamification" together with the dossier of supporting documents.

Permission is herewith granted for you to do research at the Cape Peninsula University of Technology.

Wishing you the best in your study.

Sincerely

APPROVED
Chair Senate Ethics Committee
08 MAY 2018
Cape Peninsula University of Technology
Sign: ....

PO Box 1906 Bellville 7535 South Africa
086 123 2788

Appendix D: Consent letter

UNISA university of south africa

CONSENT TO PARTICIPATE IN THIS STUDY

I, Arthur Emil van der Poll, conducts research towards a PhD in Information Systems at the School of Computing, University of South Africa. I am conducting the study under the supervision of Prof Izak van Zyl, Faculty of Informatics and Design, CPUT, and Prof Jan Kroeze, School of Computing, UNISA. I have applied for the UNISA Doctoral Study Bursary in order to facilitate full-time study towards the qualification. We are inviting you to participate in a study entitled: A Social Cognitive View of Student-led Gamification.

I, ________________ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet. I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the semi-structured and focus group interviews. I agree to keep the discussions of focus group sessions and individual interview confidential. I understand that my participation in the study involves the researcher observing me as I participate in the planned research activities.

(Turn over)

I have received a signed copy of the informed consent agreement.

Participant Name & Surname………………………………………… (please print)

Participant Signature………………………………………………Date…………………

Parent Name & Surname……………………………………………… (please print)
(Parental consent required for participants under the age of 18)

Parent Signature……………………………………………………Date…………………

Researcher's Name & Surname………………………………………(please print)

Researcher's signature…………………………………………….Date…………………

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
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Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
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Appendix E: Participant information sheet

UNISA | university of south africa

My name is Arthur Emil van der Poll and I am doing research towards a PhD in Information Systems at the School of Computing, University of South Africa. I am conducting the study under the supervision of Prof Izak van Zyl, Faculty of Informatics and Design, CPUT and Prof Jan Kroeze, School of Computing, UNISA. I have applied for the UNISA Doctoral Study Bursary in order to facilitate full-time study towards the qualification. We are inviting you to participate in a study entitled: A Social Cognitive View of Student-led Gamification.

What is the purpose of the study?
I am conducting this research to find out how a student-led gamification strategy can guide and inform an increase in student motivation to attain learning goals.

Why am I being invited to participate?
You have been identified as a potential participant for this research study given your involvement as a student or educator in the first year of the Information Technology course offered by [the] Cape Peninsula University of Technology. An Information Systems (IS) engagement and inquiry into this program are relevant and valid as the ICT practitioners (i.e. the researcher, educators and students in this instance) are situated in the IS discipline, the social science branch of Computing.

What is the nature of my participation in this study?
The study involves the use of field notes to document the researcher's observations on the behaviour students, and educators express through verbal and non-verbal communication. Furthermore, the researcher will deploy focus group interviews and semi-structured interviews to acquire rich knowledge of gamified learning from participants' experiences, perceptions, beliefs and thoughts.

Can I withdraw from this study even after having agreed to participate?
Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason. Your information will be treated confidentially; no information that might identify you will be used in the publication of this study. Furthermore, no emotional or physical harm will befall you during your participation. This study will not affect or interfere with your duties and responsibilities as a student and educator.

What are the potential benefits of taking part in this study?
While you may not personally benefit, the knowledge gained from your participation may in future help students and educators in the Information Systems academic domain. With the results and findings, the study can make recommendations to institutional policymakers about the most effective application of educational gamification. Moreover, the findings can help determine what and how gamification techniques can be utilised efficiently to enrich academic delivery.

Are there any negative consequences for me if I participate in the research project?
Participation is not compulsory, but voluntary. There will be no negative consequences if you choose not to participate in this study. Moreover, if you become a participant, but wish to withdraw at any stage during the study, you will be free to do so without negative consequences.

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While you may not personally benefit, the knowledge gained from your participation may in future help students and educators in the Information Systems domain. With the findings, the study can make recommendations to institutional policymakers about the most effective application of educational gamification. Moreover, the findings can help determine what and how gamification techniques can be utilised efficiently to enrich academic delivery.

If you would like to be informed of the final research findings or contact the researcher about any aspect of the study, please contact Arthur Emil van der Poll at 082 678 5591 or 39475964@mylife.unisa.ac.za. Prof IJ van Zyl will store hard copies of respondent data for a minimum period of five years in a locked cupboard/filing cabinet at CPUT for future research or academic purposes. Electronic information will be stored on the candidate's password-protected computer and secure cloud storage platform. The final thesis will be available in the UNISA Institutional Repository.

Should you have concerns about the way in which the research has been conducted, you may contact Professor Izak van Zyl at vanzyliz@cput.ac.za. Contact the research ethics chairperson of the UNISA School of Computing Ethics Review Committee, SocEthics@unisa.ac.za, if you have any ethical concerns.

Yours sincerely

Appendix F: Participant observation and field notes protocol

Document Name:

Document Title:

Date:

Description of activity

Here the researcher provides a detailed description of the activity. This section typically includes the names (pseudonyms) of participants involved in an observational activity and where, why and how it takes place. The researcher gives a verbatim transcription of excerpts from spoken dialogue, non-verbal actions, voice recordings and video recordings.

Reflections

The researcher reflects on his experience of the activity, which includes how his involvement or presence might have affected events, definite highlights and negative constraints, and general feelings about the event.

Emerging Questions

The researcher notes questions that might yield rich data from focus group- and semi-structured interviews.

Future Inquiry

The researcher list activities, inspired by his observation that he wants to address in future. A timeframe accompanies each event.

Appendix G: Student interview protocol

Student Interview Protocol

1. Action Research Cycle One

1.1 Stage 1- Introduction: The researcher introduces himself and explains the purpose of the study. The respondent is informed of their ethical rights. The research candidate draws attention to the voice recorder and requests consent from the respondent to record the dialogue exchange.

1.2 Stage 2- Interview commences:

1.2.1. Do you play games in your leisure time?
1.2.2. What games do you play?
1.2.3. At what difficulty level do you play your games?
1.2.4. How many hours do you spend playing games?
1.2.5. What is the primary reason why you play games?
1.2.6. Do you play games with other people?
1.2.7. Do you enjoy participating in this study?
1.2.8. What aspect(s) do like the most about Who Wants to Pass This Year if any?
1.2.9. What aspects(s) do you dislike about Who Wants to Pass This Year if any?
1.2.10. What are your views on the difficulty level of the questions?
1.2.11. What are your views of the points system?
1.2.12. What are your views on the lifelines?
1.2.13. What do you think about students playing in teams?
1.2.14. Has gamified learning increased your interest and motivation for Programming and Professional Communications?
1.2.15. What do you think about students and lecturers being active participants in the planning of this gamification strategy?
1.2.16. What are your thoughts on the scheduling of the gamification activities? e.g., when a game takes place, who will play, arranging interviews, etc.

1.3. Stage 3- Conclusion: The research candidate expresses thanks to the participant for their willingness to participate in the semi-structured interview.

2. Action Research Cycle Two Interview

2.1. Stage 1- Introduction: The researcher introduces himself and explains the purpose of the study. The respondent is informed of their ethical rights. The research candidate draws attention to the voice recorder and requests consent from the respondent to record the dialogue exchange.

2.2. Stage 2- Interview commences:

2.2.1. What aspects of *Quizlet* do you like?
2.2.2. Is there any aspect of *Quizlet* that you dislike?
2.2.3. In *Quizlet*, if a team answers a question incorrectly, they are navigated to a separate screen. This screen indicates that the question was answered incorrectly and provides the correct answer. This screen is only visible for five seconds and then return[s] to the questions. Furthermore, the question that was answered incorrectly will reappear later in the game, giving the team another opportunity to attempt it again. What is your opinion of this feature?
2.2.4. In *Quizlet*, teams' progress against each other is displayed as a race on the data projector screen; if a team answers a question incorrectly, their progress is reset to zero. What are your thoughts on this feature of *Quizlet*?
2.2.5. Who were your team members and how did you become a team?
2.2.6. In the first cycle, I randomly assigned participants to a team, in cycle two I informed participants that they can choose whom they want to be with on a team. Which of these two ways of forming a team do you prefer?
2.2.7. The reward for playing the games is a movie voucher worth R300,00. The reward for the winners of the final game session, the reward is smart watches. What are your thoughts on this reward and to what extent did the reward influence your decision to pitch up for the final game?
2.2.8. I mentioned on the *WhatsApp* group that participants have the option to suggest a different reward other than [the] movie vouchers and smart watches. Did you think about other rewards to replace the movie voucher rewards and smartwatches?
2.2.9. Did you prepare for the team pitch for the final gameplay session or did you just pitch?
2.2.10. Did *Quizlet* increase your interest in Professional Communications and Programming?
2.2.11. Would you recommend *Who Wants to Pass This Year* and *Quizlet* to be incorporated on a more regular basis and in other modules of your course as well?
2.2.12. Is there anything else you would like to share regarding this gamification experience?

Appendix H: Lecturer interview protocol

Lecturer Interview Protocol

1. Action research Cycle One

1.1. Stage 1- Introduction: The researcher introduces himself and explains the purpose of the study. The respondent is informed of their ethical rights. The research candidate draws attention to the voice recorder and requests consent from the respondent to record the dialogue exchange.

1.2. Stage 2 - Interview commences:

1.2.1. What were your views regarding the notion of gamification and what impact do you think it has on the students?

1.2.2. What aspect of *Who Wants to Pass This Year* did you like?

1.2.3. What aspect of *Who Wants to Pass This Year* did you dislike?

1.2.4. What were your thoughts about the lifelines?

1.2.5. What are your views on participants becoming active planners in the gameplay strategy; in other words, having a say [in] customising the game in this context?

1.2.6. Would you like gamification to become a regular learning activity to be incorporated into the curriculum?

2. Action Research Cycle Two

2.1. Stage 1- Introduction: The researcher introduces himself and explains the purpose of the study. The respondent is informed of their ethical rights. The research candidate draws attention to the voice recorder and requests consent from the respondent to record the dialogue exchange.

2.2. Stage 2 – Interview commences:

2.2.1. What did you find interesting about *Quizlet Live*?

2.2.2. Is there any aspect of *Quizlet Live* that you did not like?

2.2.3. In *Quizlet*, if a team answers a question incorrectly, a new screen appears that indicates that the question was answered incorrectly and provides the correct answer. This screen is only visible for five seconds and then return to the questions. Furthermore, the question that was answered incorrectly will reappear later in the game, giving the team another opportunity to attempt it again. What is your opinion on the explained feature of *Quizlet*?

2.2.4. What would you change about the progress-reset feature if you were on the development team?

2.5.5. What are your thoughts regarding the structuring of gamification around your full-time academic activities?

Appendix I: Focus group protocol

Focus Group Protocol

Action Research Cycle One

1. *Stage 1– Introduction:* The researcher introduces himself and explains the purpose of the study. The respondents are informed of their ethical rights. The research candidate draws attention to the video recorder and requests consent from the respondents to record the dialogue exchange.

2. *Stage 2 – Focus group rules:* The researcher explains the following basic rules that will frame the discussion:

   - Only one participant speaks at a time;
   - All participants are encouraged to express opinions freely;
   - The moderator might call on a participant if he has not heard a response from him or her in a while;
   - All opinions are valid, so no answer is correct or incorrect;
   - All ideas will be heard and will be allowed to develop;
   - No lateral conversation;
   - The discussion should stay on topic so that all the relevant material can be covered; and
   - participants are allowed to criticise and disagree with each other's responses but they should do so respectfully.

3. Stage 3 – Focus group discussion:
   3.1. When you initially decided to volunteer for this study, what did you hope to gain from it?
   3.2. Do you play games and home or on campus? What games do you play?
   3.3. What is the main reason why you play games?
   3.4. If you think about gaming, what is the first thing with which you associate it?
   3.5. Was your experience with this gameplay project overall satisfactory or not?
   3.6. This *(sic)* gameplay strategy of this project was based on the British television game show, *Who Wants to Be a Millionaire*. We have decided to rename the game to *Who Wants to Pass This Year*. Does anyone have any thought[s] on this *(sic)* name *Who Wants to Pass This Year*?

3.7. Who finds Professional Communications uninteresting? Do you think gamification made the subject more interesting?
3.8. Who finds Programming uninteresting? Do you think gamification made the subject more interesting?
3.9. Identify one aspect of *Who Wants to Pass This Year* that you like and one aspect that you dislike.
3.10. What is your opinion of the countdown timer?
3.11. What is your opinion on playing in a team?
3.12. Has your general relationship with your fellow teammates improved as a result of teamwork?
3.13. Has your general relationship improved with your fellow participants as a result of collaborating on this project?
3.14. Identify one aspect of *Who Wants to Pass This Year* that you like and one aspect that you dislike.
3.15. What is your opinion about the countdown timer?
3.16. Would you recommend gamification becoming a permanent arrangement in your Information Technology course?
3.17. Which of the topics that we discussed in this focus group did you find the most interesting?

Action Research Cycle One

1. Stage 1– Introduction (the same as AR Cycle One)
2. Stage 2 – Focus group rules (the same as AR Cycle One)
3. Stage 3 – Focus Group discussion:

3.1. The first questions focus on game aesthetics. First, allow me to make a statement about game aesthetics. Game aesthetics refers to the use of visual design features such as sound and colours to help set the tone and mood of a game. For example, if you play a horror game, in some part[s] of the game, tense music is inserted to set the mood of the game; if you play an action game like *Call of Duty* which is a war-based game, you will hear upbeat music and military music to just sort of set the tone of the game. In terms of colour, if you play a war-based game, they will use a variety of green shades. If soldiers are fighting a war in a forest, they camouflage themselves with green uniforms to blend into that environment. If you consider wars that take place in desert-like areas like Afghanistan, which is a sand and mountainous country; the war-based game's colours will match the colour of the sand and ground to sort of match that environment. What is your opinion about the music of *Who Wants to Pass This Year?*

3.2. What do you all think of the graphical user interface of *Who Wants to Pass This Year?*

3.3. Also, what is your opinion on the graphical user interface of *Quizlet* in terms of colours and positioning of text?

3.4. Do you feel when you look at it that it is not too cluttered, and you understand what is going on on the screens?

3.5. With *Who Wants to Pass This Year*, the lecturer or I started the game; you did not need any devices with you. You essentially take a seat, and you discuss the possible correct answer amongst yourselves. With *Quizlet*, each player needs a device like a laptop, a computer or a smartphone. Their lecturer then initiates the game by telling you to go to a specific website, Quizlet.com/live. To access the specific game that was prepared for you, you need to insert a code that was generated by the website. To identify yourself, there is a step where you enter your name. After that, I can assign the players to a team randomly, or it allows me to allocate you to a specific team. How much effort does it take to access the game?

3.6. Was there an increase in motivation and interest for Programming and Professional Communications from *Who to Wants to Pass This Year?*, the first cycle, to *Quizlet*, the second cycle?

3.7. For *Who Wants To Pass This Year?*, I randomly assigned three participants to a group. The challenge was that many people complain about unreliable teammates; they would pitch for a game session whereas their teammates won't. In *Quizlet*, I gave participants a choice to choose whom they want as their team members. Some of you said in the one-on-one interviews that you prefer this option because you can select fellow participants whom you can rely on as your team members.

3.8. Here is the interesting dynamic on which I want to base my question. Some participants said that they are not the type of people who are socially interactive with their classmates. Those are people who, for example, are introverts. They would refer to other teams as having an advantage because all team members are good friends. The person mostly hinted that the team have, to an extent an unfair advantage because they know each other. As a consequence, they will perform better. The opposite side of the coin is that participants who liked the idea of choosing their own team members said that they could rely on the members they chose and also because they know how the other person thinks. At the end of the day, most games have a strong element of competition. In my view, humans are fundamentally competitive, they want to win. What are your opinions on my summary of the team dynamics?

3.9. Do you think gamification can help to overcome language barriers? How do you think gamification can accomplish that?

3.10. In conclusion, is there anything you want to share regarding this gamification experience?

Appendix J: Levels of knowledge, depth of knowledge achieved, and newly attained knowledge associated with 'replay' via *Millionaire*

Levels of knowledge, depth of knowledge achieved, and newly attained knowledge associated with 'replay' via Millionaire

IS curriculum depth of knowledge (ACM & AIS, 2010)	Bloom's (1956) six-level knowledge metric	Depth of knowledge related with achieving level (ACM & AIS, 2010)	Knowledge level linked with *Millionaire* 'replay'
0: No knowledge			Programming concepts not covered in previous lessons
1: Awareness	1: Recognition of knowledge	Recall and recognition; reading, group discussions; watching videos; the student can recognise, but not differentiate; does not entail use	Through'replay', students expressed immediate recognition and were able recall knowledge researched on the programming code with which they were unfamiliar.
2: Literacy	1: Context distinction	Acquired knowledge of concepts; the student can recognise and differentiate; does not entail use	Students were able to differentiate between closely related concepts, e.g., {font weight: bold} is a CSS property and <strong> is a html element.
3: Conceptual knowledge / skill application	2: Extrapolate comprehended knowledge	Ability to conceptualise and use knowledge/skills; presentation and developing of knowledge/skills	A limitation of replay through *Millionaire* is that the empirical fieldwork cannot account for the practical application of newly learned programming concepts.
4: Detailed conceptual knowledge / skill application	3: Extensive knowledge and skill application	Search and apply current knowledge without hints; the student generates own solutions; the student can present, develop and explain solutions	Another limitation of replay through *Millionaire* is that the empirical fieldwork cannot account for students practically applying newly learned programming concepts unassisted.

Appendix K: Data types for analysis in qualitative research

Data Types for Analysis in Qualitative Research

As mentioned in Section 6.1, Appendix A discusses all qualitative data analysis that is illustrated in Figure 25. The purpose of the supplementary discussion is to advance qualitative data analysis as a framework of theory and practice in the IS discipline—Bernard and Ryan (1998) discuss the use of qualitative data analysis techniques in the social sciences, anthropology in particular. Bernard and Ryan (1998) distinguish between two primary types of qualitative data analysis approaches: *Text as a proxy for experience* and *text as an object of analysis* (see Figure 25). Below, I discuss both concepts in depth.

Text as proxy for experience

Text as a proxy for experience techniques deals with an individual's knowledge, feelings, behaviour and perceptions, as exemplified in the text—these are generated by the interactions the researcher has with the research participants. Two categories denote text as a proxy for experience: *Systematic elicitation* and *free-flowing text*.

Systematic elicitation

Researchers use this technique to identify links between these terms and items (Ryan & Bernard, 2000). There are six approaches to systematic elicitation: Free lists, pile sorts, paired comparisons, triad tests and frame substitution tasks.

Free lists

Researchers interpret the frequency that a phrase or word occurs in some text (Ryan & Bernard, 2000). For example, following an interview with system developers, the data analyst counts how often they talk about 'user' (assuming one user represents all) and how often about 'users' (recognising multiple and differing views) (Oates, 2006). The data analyst then uses pile sorts, paired comparisons and triad tests to explore the relationship between items.

Pile sorts

This technique involves research subjects that sort items into piles. The similarity between items is the number of times a pair of items appear in the same pile (Ryan & Bernard, 2000). Rojas and Macías (2019) use pile sorting (among other techniques) to help identify the most relevant and important requirements for software development projects. In Rojas and Macías's study, decision-makers of a project were asked to assign a level of priority to project tasks to determine the overall relevance of activity concerning other tasks.

Paired comparisons

Researchers ask research subjects to compare the important similarities of items about an attribute both have in common (Ryan & Bernard, 2000). Dede, Varoutas, Kamalakis, Goni and Javaudin (2009) use paired comparisons to prioritise functionalities of high definition television (HDTV) and Voice over Internet Protocol (VoIP) services on home networks. The researchers identify 'service performance' as a shared evaluative criterion. One of the service performances attributes they assess is bit rate—whether the two services transmit the required number of bits per second (bps) along with the network.

Triad tests

Research subjects study items, in sets of three, to identify similarities (usually between two items that set them apart from the third) (Ryan & Bernard, 2000). Zhuk, Ignatov and Konstantinova (2014) use triadic comparison to improve HIP (Human Interactive Proof) systems. HIPs protect a website against spam or brute-force attacks launched by bots. ASIRRA (Animal Species Image Recognition for Restricting Access) is a HIP, a system that asks users to identify images of animals before they can access a website service. Zhuk, Ignatov and Konstantinova presented, for example, three different animated drawings of cats to users and asked them to assign a tag to each image. While AI might accurately guess and assign 'cat' to one of the images, it is more difficult to identify the images by human assigned tags such as 'kitty', 'kitten' or 'puss'. Nevertheless, AI can learn to more accurately predict whether an image is a cat based on hypotheses derived from human-assigned tags.

Frame substitution tasks

Research subjects connect each item in a list with a list of attributes. An example is a medical researcher who asks a visitor to a medical facility to fill out the blanks in frames such as 'you can be infected with ____ and not be aware of it' and 'other people can infect you with ____ (Ryan & Bernard, 2000). Mihalcea, Sinha and Mccarthy (2010) discuss the computational equivalent of frame substitution tasks, *lexical substitution*. Lexical substitution involves semantic analysis systems that are designed to suggest alternative substitute words or phrases for a target word in context. For example, the patient is severely injured; a semantic analysis system may suggest the terms 'critically', 'seriously' and 'grievously' as substitute terms.

The data these techniques produce can be refined through further analysis techniques, namely *componential analysis*, *taxonomies* and *mental maps*.

Componential analysis. Researchers use this technique to produce models based on a minimal set of features to distinguish or identify similarities in kinship items (Ryan & Bernard, 2000). Wilson (2019) uses componential analysis to explicate contrasting and similar aspects from nurses' understanding of ICT utilisation at a Ugandan community hospital. 'Items' of study, among others, were ICT beliefs and attitudes embedded in *local culture* vs. *service culture*. Both cultures consider ICT to support healthcare, for example, disease outbreaks such as Ebola, through international perspectives and research. However, superstitious beliefs pervade local culture; Some research subjects attach a 'magical' connotation insofar as management needs to 'bless' technology.

Taxonomies. Taxonomies that depict items akin to culture are called *folk taxonomies*. Folk taxonomies illustrate a set of similar terms/phrases in a hierarchical, branching tree diagram (Ryan & Bernard, 2000). Figure 36 visualises a folk taxonomy of views on satisfaction with an information system. The folk taxonomy illustrates that administrative users view developers as 'arrogant' because they do not take user concerns into account; likewise, the developers view the administrative users as 'ignorant' because users want to persist with manual systems (Oates, 2006).

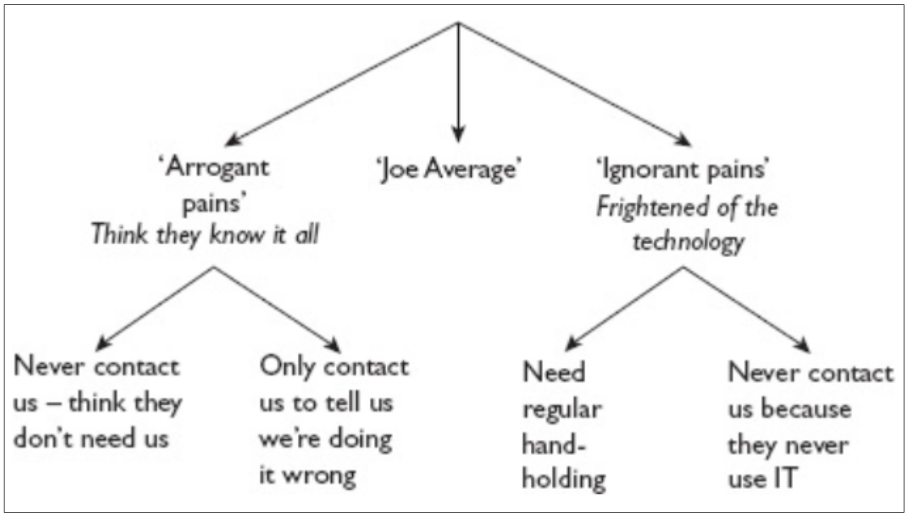

Figure 36. A taxonomy of satisfaction with an information system (Adapted from Oates, 2006, p.288).

Mental maps. Like folk taxonomies, mental maps provide a visual display of a set of terms (Ryan & Bernard, 2000). Figure 36 illustrates a cognitive mapping technique, namely *semantic mapping*, which produces an organised structure composed of key terms/phrases around the main idea. Figure 37 illustrates key concepts around a Unified Modelling Language (UML), which visualises key aspects with concern to the architecture, design and implementation of an information system. For example, Figure 37 illustrates that information system design involves compiling 'books' such as a 'user guide' on how to use the information system (Siau & Tan, 2008).

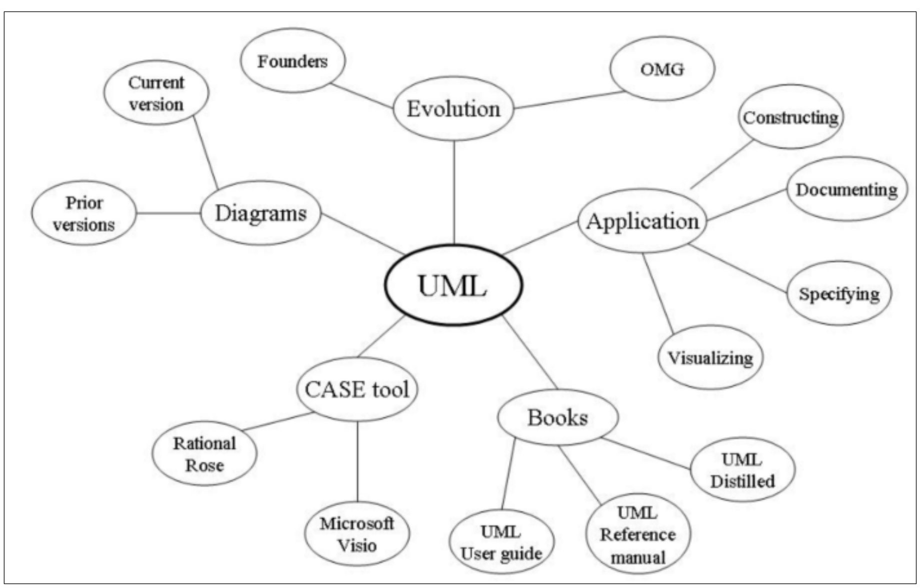

Figure 37. A mental map of a UML (Adapted from Siau & Tan, 2008, p. 50).

Free-flowing text

Free-flowing text is a text that has been derived from audio recordings of interviews and focus groups. Two categories denote the analysis of free flowing text: *words* and *themes and codes*.

Words

To analyse words, researchers use techniques that involve *key-words-in-context (KWIC)*, *word counts*, *semantic networks* and *cognitive maps* (Ryan & Bernard, 2000).

KWIC. KWIC is formulated by searching the frequency of a particular phrase/word in a text and discussing it in the context of another concept (Ryan & Bernard, 2000). Pasley (2013) used KWIC to compare neoliberalism and humanitarian access through educational and ICT policies used in ASEAN[11]. Pasley found that neoliberal-related terms appear in both sets of policy documents, while access-related terms appear three times more often in educational than in ICT policies. This suggests that policymakers think differently about humanitarian access enabled through education compared to those enabled through ICT. The low frequency of access-related terms in ICT policies can be attributed to Southeast Asian countries (except the Philippines) that filter and censor content (e.g., apparent illegal information) to their citizens (Pasley, 2013).

Word counts. This technique searches a body of text for words that frequently appear. Frequent words can be an indication of a *pattern of ideas* (Ryan & Bernard, 2000). Mcmaster, Rague, Wolthuis, and Sambasivam (2017) used word counts to describe a sample of 14 data analysis documents and 12 data science documents. They discovered that the words "problem" and "solution" appear in the top 25 word counts for data science but not for data analytics. These words, what McMaster et al. (2017) regard as statistical concepts, reveal that Data Science focuses more on *inferential* activities. Data Analytics, on the other hand, retains more of an *exploratory* focus, such as finding data patterns.

Semantic networks. A semantic network is a graph structure that represents semantic interrelationship between concepts in a knowledge domain (Ryan & Bernard, 2000). Nikolova and

[11] Ten member states countries: Vietnam, Thailand, Singapore, Philippines, Myanmar, Malaysia, Laos, Indonesia, Cambodia and Brunei

Cook (2010) designed a visual vocabulary application for assistive communication devices. An assistive communication device helps people with speech impairments communicate without verbal speech. Figure 38 presents a semantic network of the vocabulary application that focuses on word suggestions related to 'doctor', should the user wish to book a doctor appointment. Nikolova and Cook assessed the approach of their application to vocabulary organisation with research subjects to determine whether its suggested words are appropriate concerning a concept.

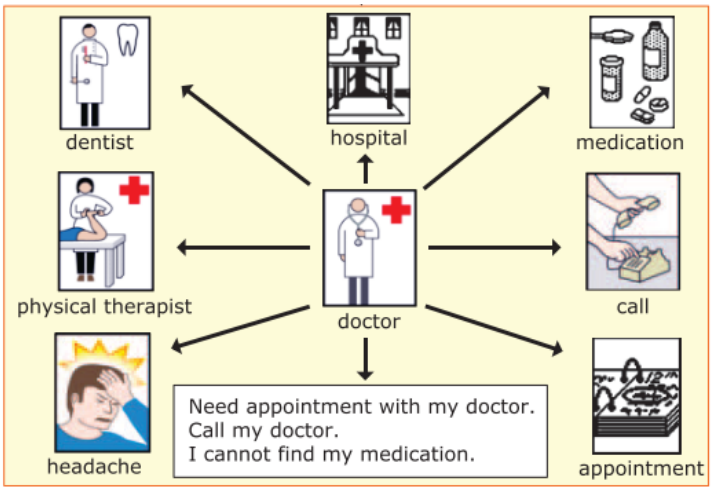

Figure 38. A semantic network of proposed vocabulary centred on making a doctor's appointment (Nikolova & Cook, 2010, p. 21).

Cognitive maps. Cognitive maps are also called *causal maps*. Cognitive maps visualise a set of causal links among constructs in a particular individual's reasoning system (Ryan & Bernard, 2000). Figure 39 illustrates a cognitive map that models the reasoning of a student with regards to taking an object-orientated systems analysis and design course. (Siau & Tan, 2008). Course designers can compare students' cognitive maps to plan or modify the course to accord reasoning systems that are similar.

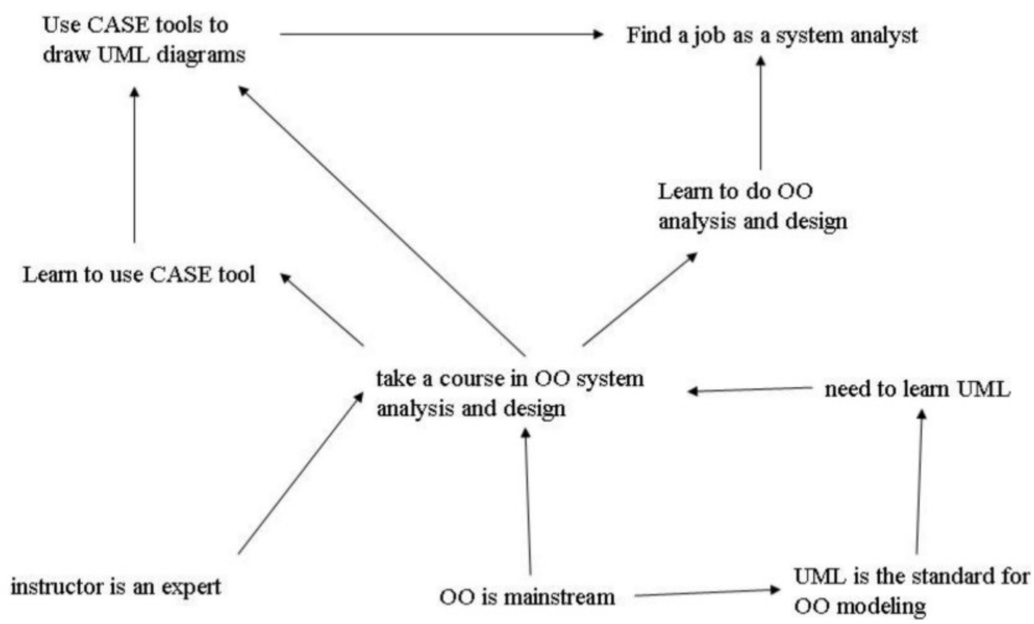

Figure 39. A cognitive map that illustrates the reasoning of a student with regard to taking an object-orientated systems analysis and design course (Siau & Tan, 2008, p. 50).

Themes

As stated earlier, themes and codes are categories of free-flowing text. Techniques involve grounded theory, schema analysis, classic content analysis, content dictionaries, analytic induction/Boolean algebra and ethnographic decision models (Ryan & Bernard, 2000).

Grounded theory. Grounded theory involves the production of theory without a predetermined theoretical framework. This approach is called *theoretical sampling*, which means that data collection is based on the theory that emerges from the data. Hence, researchers are not bounded by theoretical relationships and concepts when they embark on fieldwork. However, it is permissible to deploy prior theory to outline the research gap, motivate the persistence of a particular study, and connect grounded theory results to an existing body of knowledge. Data collection and analysis involve the following systematic phases: (1) Commence with participant recruitment by using the purposive sampling; (2) data collection follows; (3) verbatim transcripts are thoroughly read; (4) emerging themes are compared and contrasted for consistencies and differences; (5) contribute a grounded theory, model or rich description which are continuously verified against emerging data (Tie et al., 2018).

According to Dixon, Igo and McGuire (2017), IS researchers frequently use grounded theory to examine technological change and socio-technical behaviour in emerging research domains. Boudreau, Robey and Boudreau (2016) examine the socio-technical behaviour of organisational members after they migrate from a legacy system to an integrated enterprise resource planning (ERP) system. In particular, the researchers studied the role of human agency in the enactments of technologies. The human agency position holds that users enact technologies in different ways. Hence, the researchers aim to elicit and understand these different enactments. The human agency then serves as an existing theoretical concept to outline the research gap. For the researchers, human agency is not an embodiment of technological features or existing social systems that are often the basis for predictions about development, experience and behaviour.

Boudreau et al. (2016) depart from the purposive sampling to gain direct and convenient access to the project leaders and end-users of the ERP system. The researchers use participant observation, interviews and system documents as sources of data. They then apply open,[12] axial[13] and selective[14] coding. A finding from the study shows that end-users exhibit a behaviour that is comparable with Orlikowski's (2000) theory of inertia. Inertia is a practice where end-users use old technologies to persist with their existing way of doing things. Moreover, these users (initially) show little or no interest to integrate new technologies into their ongoing work practices.

Classic content analysis. This technique involves the researcher determining themes within categories and codes that are assigned to the text. A *code* refers to a label that is assigned to a word or short sentence, e.g., 'first-person shooter' is an apt code for each mention in the text of any video game focused on weapon-based combat in a first-person perspective. A *category* refers to a grouping label that is assigned to similar codes; for example, 'shooter games' is an appropriate category for a text that is coded as 'first-person shooter' and 'third-person shooter'. A theme is a form of high-level categorisation that is used to generate a major theme for the entire analysis of text, e.g., 'World War II-themed first-person shooter games and learning history'. To contribute

[12] The disaggregation of data into codes;
[13] The process of identifying relationships between codes;
[14] The integration of codes to generate a theory (Saunders et al., 2007).

to and clarify the credibility of their interpretations, researchers include carefully chosen extracts of verbatim quotes made by participants (Guest et al., 2012).

Tsybulsky and Levin (2019) examine the worldviews of teachers in the context of teaching a discipline that is influenced by the digital revolution. After the audio recordings of the interviews were transcribed, categories were developed. Two codes were assigned to one of the categories, *objective beliefs*. The first one is 'beliefs that do not indicate any shift in worldview' and the second one is 'beliefs that express a shift in worldview'. This participant represents the former verbatim:

> I feel like the internet reduces the value of full human life. Children, for example, might be searching for one particular term on the Internet, but in the process, they find a-thousand-and-one additional related—or unrelated—topics which excite them; they enjoy this, but it does not always work in their favor. (Tsybulsky & Levin, 2019, p. 6)

This participant represents the latter verbatim: "Everything is available … we live in a sea of information … I think that we are undergoing a dramatic change and this is only the beginning" (Tsybulsky & Levin, 2019, p. 6).

Schema analysis. Schema analysis incorporates principles of anthropological linguistics and cognitive psychology in text analysis (Bernard, 2006). It is rooted in the idea that humans use cognitive simplifications to help them understand complex information that they are constantly exposed to. Quinn (1997) analysed the 'American marriage schema'. Quinn's method involves searching for metaphors in 'married life' rhetoric and inferring the underlying tenets that can generate those metaphors. Quinn's research subjects often drew parallels between marriage and durable products. For example, much to their surprise after learning about divorce, research subjects made statements like 'it was nailed in cement' or that the marriage was like 'Rock of Gibraltar' (1997, p. 157). Therefore, the schema for American marriages is 'lastingness'.

Methodologically, schema analysis and grounded theory are similar. Prasad (1993) adopted a grounded theory approach to understanding the symbolism that underlies the digitisation of everyday work. The scholar began with a careful reading of the verbatim text. Prasad (1993) then looked at speech patterns. Here, Prasad (1993) devoted particular attention to participants' use of symbolism and similarities in their reasoning about the digitisation of work. The researcher then reported that a cluster of symbols represented digitisation in terms of *anthropomorphism*. Anthropomorphism refers to the attribution of human behaviour to objects. The schema for manual work tasks, which became digitised in the early 1990s, is computers executing tasks with sharp-witted human intelligence. Participants made statements like "It does your thinking for you when you are too tired to think" or "I mean this thing is one big brainy monster" (1993, p. 1416).

Content dictionaries. Content dictionaries are digitalised content analysis tools that automate the coding of text. Coding refers to a process where labels are assigned to phrases to identify significant (and recurring) themes in each response (Ryan & Bernard, 2000). Ryan and Bernard (2000) observe that automated coding might be an offset against data validity. Corich, Hunt and Hunt (2006) investigate the critical thinking skills of students in a computer systems degree course; the researchers compare content dictionary assigned codes with manually assigned codes to increase the reliability of results. One of the codes formulated is 'solution', which is related to the ability (or lack thereof) of students to critically think about the ideation, design and implementation of a solution to a computer system problem. The content dictionary assigned 12% of the text to 'solution'; the manual coders assigned 12.4 % of the text to 'solution'. This close similarity suggests that automated coding is relatively reliable under assumptions that only humans can elicit certain subtleties of meaning reflected in context.

Analytic induction. Analytic induction can be defined and divided into two stages: First, define the phenomenon that needs to be explained and develop a hypothesis to present an explanation; second, investigate a case to see if the hypothesis fits; if it does, investigate another case. Until a new case contradicts the hypothesis, it is the 'truth' of the population under study. When the results of a case do not fit, the researcher can develop a new hypothesis or rearticulate the phenomenon in order to rule out the deviant case (Ryan & Bernard, 2000).

Özkan, Davis and Johnson (2006) use analytic induction to examine the renewal of teacher education programs by using and integrating ICT in student-centred learning environments. Özkan et al. (2006) define 'educational renewal' through ICT as a continuing process of change, reflection and self-examination as a result of ICT-mediated teaching and learning. The researchers initially adopt the CREATER model (Havelock & Zlotolow, 1995) to explain the transformation in teachers' teaching practices. CREATER is a change model that serves as a guide in dealing with changes in an educational system. Özkan et al. (2006) discovered that CREATER is inadequate for explaining renewal in systematic change; e.g., it provided no information regarding social interactions and processes during renewal. The Bosserman model of institutional change (Hiler & Bosserman, 2011) was added to bridge this gap; the analysis processes and outcome of the model shed light on stakeholders' understanding of changes needed for renewal (Özkan et al., 2006).

Ethnographic decision models. Ethnographic decision models, also known as decision trees, are causal (and qualitative) analysis techniques that predict behavioural choices. Researchers explore their participants' choices along with the available alternatives. Mwangi and Brown (2015) deploy ethnographic decision models in an IS research context. The researchers examine the decision criteria that Kenyan small and medium enterprises apply when they decide whether they should (or should not) register for mobile banking. Figure 40 provides a microanalytical glimpse from a decision tree where the researchers endeavour to build decision criteria related to loans on mobile banking platforms. From the decision tree, data analysts can infer client-focused education to help potential adopters make informed decisions and take advantage of potential features that mobile banking technology avails.

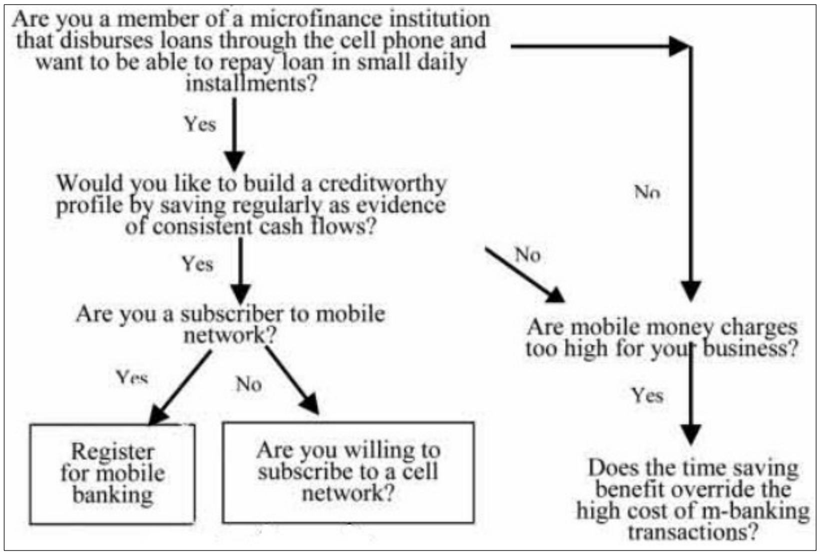

Figure 40. A fragment of an ethnographic decision tree (adapted from Mwangi & Brown, 2015, p. 245).

Text as object of analysis

The second level of category in the Ryan and Bernard (2000) typology of qualitative analysis techniques is the *text as an object of analysis* (Figure 25). The text as an object of analysis category situates text as an object in and of itself. Linguistic analysts who are concerned with meaning and structure within words and text use this strategy. Four types of analysis denote *text as object for analysis: conversation, performance, grammatical structurers and narratives.*

Conversation analysis

Conversation analysis is an exploratory approach that seeks to discover conversational topics that represent unique patterns of orderliness in everyday, mundane verbal and non-verbal interactions (Bernard, 2006). Ngaleka and Uys (2013) deploy conversation analysis to analyse students' use of *WhatsApp* Group communication to support IS learning in a group research assignment. The researchers discovered a pattern of orderliness that relates to conversations about group members who are not able to access *WhatsApp*. The researchers attribute limited access to the affected students not having sufficient airtime or not owning a smartphone that is compatible with *WhatsApp*. Therefore, these 'absent' group members are disadvantaged insofar as they cannot contribute to decisions that affect the entire group.

Performance analysis

Performance analysis involves identifying narrative devices to discover regularities in oral and written communication. For example, linguists analysed Native American languages and noticed that recurring markers like ‘now’, ‘then, ‘now then,’ and ‘now again’ signal the introduction or end of a new line, verse, scene or act. Recurrent markers also include paralinguistic features. Paralinguistic features refer to a form of communication outside the use of words themselves, e.g., non-verbal cues such as the speed, intonation and the volume of a voice.

According to theorists, the act of communicating is performed to comprehend situations and to set precedents for future actions. People frequently tell stories to explain and clarify unclear situations. Patterns, noticed from recurrent markers in the teller’s story, signify variations in meaning that the speaker tries to impose on a discourse (Bernard & Ryan, 1998). The closest example of performance analysis in an IS context is documented in a study by Alvarez and Urla (2002).

Alvarez and Urla (2002) deploy narrative analysis to investigate the information requirements during an ERP implementation. Figure 41 illustrates an excerpt from an interview about requirements analysis. I regard the “I don’t think” (line 251), “I think” (line 252), “I don’t think” (lines 252-253) and “I think” (line 255) as recurrent markers. These markers dismiss the discourse/narrative (by Elizabeth*)* as “too specific, historical or an artefact of the pre-existing system, making it irrelevant, according to the analyst, for providing information requirements” (Alvarez & Urla, 2002, p. 47).

Int – Do you have to go in there and take away credits/because they have too much?
Elizabeth – I did not know that/
Marie – the other day, I had a case Friday, the student was continuing education. They can take twelve credits prior to enrollment, this is a fresh start. So he got all As and one A-. And when you take a course over at continuing education it's just pass-fail, you have nothing to compare with, so usually you get the A-, in this case he did but he also took courses prior to that. I had to go and take the credit away from him/from a previous semester…
Int – I don't think we need to concentrate/on that level of specifics I think those are artifacts of our existing system I don't think the new system/will have
Elizabeth – we don't know that yet/
Int – I think we need to concentrate just on the rules, we need to enumerate every field and every algorithm calculation of that field [laughter from Elizabeth and Marie]

(12. Reg, 241)

Figure 41. An excerpt from a requirements analysis interview (Alvarez & Urla, 2002).

Grammatical structurers

Broadly, grammatical structures refer to the analysis of the structural relationships of words in sentences (O'Donnell, 1962). In anthropology, a narrower approach is taken to grammatical structures—analysts examine the relationship between grammatical devices to determine the variation of meaning in discourse. To illustrate grammatical structures, Bliss and MacCormac (1979) selected for analysis a poem by Stevens (1954) titled *The Sense of the Sleight-of-Hand Man*. Consider the last four lines:

It may be that the ignorant man, alone,
Has any chance to mate his life with life
That is the sensual, pearly spouse, the life
That is fluent in even the wintriest bronze.

Nominal phrases can be observed in the excerpt (Bliss & MacCormac, 1979). A nominal phrase comprises the subject or object of a sentence. To understand a subject, it helps to explain concerning a predicate verb. Consider the sentence, “the child is swimming in the lake”; “The child” is the subject and the “swimming in the cold lake” is the predicate verb. A predicate verb indicates to the reader what the subject is doing. To understand an object, it helps to explain it concerning a subject and predictive verb. Consider the sentence, “He touched the glass”; “glass” is the object that is part of the action (i.e., the predicate verb “touched”) of the subject (i.e., “he”). Moreover, an object, unlike a predictive verb, does not follow the predicate verb (Eastwood, 1994).

In light of the above, the first nominal phrase is “that the ignorant man, alone”; the second nominal phrase is “mate his life with life”. In the first nominal phrase, the adjective, “alone”, gives information about the subject, “man”|; i.e., man is alone. In the second nominal phrase, the predicate verb, “mate”, describes the action of the object, “life”; i.e., the suggestion of mating (a cosmic marriage) man with “life” (i.e., a spouse) with processes occurring on earth (e.g., passing of the season, i.e., “wintriest bronze”). In summary, the grammatical structure explicitly gives a definite structure to join man’s despair (loneliness) with life (marriage and process) (Bliss & MacCormac, 1979).

To present an example of grammatical structures in an IS research context, I again draw on Alvarez and Urla (2002). The authors use narrative analysis to investigate the information needs of an ERP implementation. Figure 42 illustrates an excerpt from an interview about requirements analysis. The interviewer interviews Beth, who is working for the university’s housing services. The interviewer asks Beth to suggest other forms of communication that they would like to have but currently do not.

81	**Beth** – the other part is communication
82	it's community development,
83	if we could have an electronic bulletin board for things to talk
84	about.
85	For instance, there was a big snow ball fight last year.
86	Lots of people were involved, it got really out of hand, you know.
87	And Public Safety was even there, it was bad.
88	Lots of windows were broken/last year
89	**Int** – it's something that shouldn't be done, oh dear/ (laughs).
90	**Beth** – yeah, but we'd like to be able to do some sort of message
91	back to students, where we could say this cost residents hall
92	students such and such amount of money,
93	this is what the consequences are of/that kind of behavior
94	**Int** – and wasn't that foolish/(hmm).
95	**Beth** – right, right. And there was someone who got hurt, or there
96	was somebody who, you know (2) did something, without giving
97	too much thought.
98	We wouldn't want it [bulletin board] for everything but there are
99	certain times like this where we would use it.
100	
101	(5 Hous. 81/203)

Figure 42. An excerpt from a requirements analysis interview (Alvarez & Urla, 2002).

Beth provides information on the subsequent topics of her narrative in lines 81 to 84. In line 81, contained in "it's", Beth uses the verb "is" to describe the noun pair, "community development". In this instance, "is" acts as an operational definition, e.g., A is a tool for doing B (Ryan & Bernard, 2003). In the context of the narration in Figure 42, Beth identifies community development as an area that can be improved through digital tools. Beth's use of the conjunction, "if", in line 83 indicates a conditional relation. Beth hypothetically suggests that communication to and among the academic community will improve *if* they can have an electronic bulletin board (Alvarez & Urla, 2002).

In line 85, Beth uses the preposition and noun pair, "for instance", to signal that the story is about to start, and continues to narrate the theme of destructive student behaviour. More importantly, Beth employs and combines grammatical structures to highlight the importance of a communication system for exchanging information about the consequences of irresponsible behaviour (Alvarez & Urla, 2002).

Narratives

Broadly speaking, narrative analysis can be understood as a cluster of approaches (which may include conversation, performance and grammatical structures) that use stories to examine human experience and action (Clandinin & Connelly, 2004). Bernard and Ryan's (1998) conception of narrative analysis is narrower insofar as they regard it as a distinctive approach to the analysis of a text. The authors refer to narrative analysis as an approach taken to understand how people construct narrative from personal experience. Narrative analysts consider why people cast the narrative in a certain form when they tell a story and its impact on the narrator's social role (Riessman, 1993).

Ryan and Bernard (2003) refer to the work of Matthews (1992) for a detailed discussion of narrative analysis. Matthews (1992) collected sixty narrations of La Llorona (the weeping woman), a Mexican morality tale. In most stories, La Llorona marries and starts a family with a good man. She goes insane one day and starts walking the streets looking for men. When her husband found out, he beat her. Because of the shame she felt, she drowned herself. The moral of the story is that if women abandon their families to wander the streets looking for men, they will suffer the same fate (Mathews, 1992).

In another story, La Llorona commits suicide after her husband becomes inebriated and loses all their money. In another, La Llorona commits suicide after discovering her husband has been cheating on her by paying women on the streets. Mathews (1992) constructed a 'grammar' (schematic analysis) of La Llorona's various narrations, which she interpreted against the cultural model of rural *mestizo* Oaxaca. According to the findings, men perceive women to be sexually promiscuous. Unless they control themselves or are controlled, women will eventually wander the streets in search of sexual gratification. Women's accounts of the narration, on the other hand, show that they regard men as sexually insatiable. Men will even abandon their family responsibilities to satisfy their sexual desires.

In her schema, Mathews (1992) learnt that women in the village where she conducted her study indeed take their own lives when their marriages fail. Therefore, Mathews moves beyond simply identifying the schema; she explains how the social structural elements in society (embedded in and reflected on through narrative) exert influence on consequent perception and behaviour. For example, suicide is the outcome in virtually all narrations of La Llorona, regardless of the variations in narrations by men and women.

To present an example of narrative analysis in an IS research context, I draw again on Alvarez and Urla (2002) and revert to Figure 42, the interview with Beth, to illustrate the narrative analysis. Alvarez and Urla note that the interviewer, also a woman, frequently punctuates Beth's narrative with short utterances. In sociolinguistic research, it has been long noted that 'women's talk' exhibits an inclination to make utterances to encourage responses from fellow speakers. In Figure 42, lines 89 and 94, the interviewer's remarks indicate that the interviewer shares Beth's disapproval with the actions of the students. The non-lexical, positive minimal responses in lines 89 '(laughs)' and 94 ('hmm') also suggest certain solidarity is developing between the women. More importantly, it strengthens Beth's conviction about the need for a communication system to help curtail destructive student behaviour (Alvarez & Urla, 2002).

Summary

This appendix provided an overview of all the techniques that Ryan and Bernard (2000) advance for data analysis in qualitative research. The overview purports to illustrate that IS scholars who focus on and customarily deploy one or two qualitative data analysis techniques have a wide array of data analysis techniques at their disposal.

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