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Abstract. Gamification is broadly defined as the use of game-related features and practices (e.g., points, rewards, and competition) in environments that are not related to entertainment. In Information Systems learning, gamification can be considered to improve students' interpersonal skills and to develop their digital literacy. This study highlights that gamification can have the opposite effect; we argue that gamification's technical systems often have oppressive qualities that socially exclude students. We recommend that educational software designers and vendors include students as co-designers of technical systems, thereby allowing for participatory and representative Information Systems learning.

Keywords: Gamification, Information Systems, Digital Exclusion, Social Exclusion, Africanisation, Decolonisation, Artificial Intelligence.

1 Introduction

The theme of the i3e2021 conference is *"Responsible AI and Analytics for an Ethical and Inclusive Digitised Society"*. In this paper, we depart from the assumption that Artificial Intelligence (AI), analytics, and information systems create positive opportunities. It also have negative consequences for individuals and societies [cf. 1, 2]. Despite the social and economic benefits of information systems in the domain of AI, its ethical concerns, including social exclusion, must be understood.

In this paper, we explore some of the negative aspects that emerge from using gamified information systems, and particularly for higher education students from resource-limited backgrounds in South Africa. In what follows, we report on some of the experiences of students enrolled in an Information Systems (IS) undergraduate course that was gamified to encourage learner motivation. We argue that gamification software (technical systems) may have oppressive qualities that stifle engagement and autonomy. Additionally, we shed light on the possibility of Africanising gamification through reflection from both inside and outside Western epistemology.

In the next section, we describe gamification in the context of information systems and AI. Thereafter, we describe the concept of a gamified information system. We present Social Cognitive Theory as the theoretical basis of our research and give an overview of the study's research method. Supported by empirical data, we then explore how students are unintentionally excluded through gamification. We conclude with recommendations that promote social inclusion of students/players in gamified information systems.

2 Gamification and AI

Gamification is broadly defined as the use of game-related features and practices (e.g., points, rewards, and competition) in environments that are not related to entertainment [3]. A systematic literature review by Khakpour and Colomo-Palacios [4] indicates that gamification and Artificial Intelligence (AI) – machine learning (ML) in particular – are used in a cooperative manner to augment the effect of one another towards a predefined task. AI is defined as the use of machines and computers to simulate the decision-making abilities of human intelligence [5]. ML (a branch of AI) refers to applications that learn from data and enhance predictive accuracy over time without being programmed to do so [6]. López and Tucker [7] applied ML for affect state (i.e., emotion) recognition to predict student performance on a gamified learning task. The authors used a multimodal infrared Kinect sensor to record facial keypoint data while students engaged in obstacle avoidance. Students performed a series of body motions (e.g., jump, bend) to pass through sets of obstacles without making physical contact. A gamified application – on a data projector screen – displayed, for example, points awarded to the player for successfully passing through an obstacle or win states, indicating whether they lost or won.

2.1 Gamification and social inclusion in IS learning

Social inclusion is broadly defined as having a sense of being part of a group [8]. Vygotsky [9] argues that a learner cannot comprehend a new concept or idea without the support of a peer or teacher. In a meta-analysis, Yiping, Abrami and D'Apollonia [10] find that small cooperative groups achieved improved learning with computer technology compared to individuals. Indeed, students in groups tend to acquire more individual knowledge than students learning with computer technology individually [10]. In IS usage, individual tasks are often embedded in group tasks or routines. Therefore, some form of collaboration occurs [11]. In addition, the speed of current technological advancements calls for AI interventions in team composition, according to Webber et al. [12]. To adapt to rapid organisational changes, today's teams/groups need fluid membership that changes in accordance with the project's specs and resource needs. AI can learn from such changes and make recommendations to improve team formation [12].

Bilgin and Gul [13] investigate the effect of gamification on group cohesion and academic achievement. Their research sample was pre-service teachers enrolled in an Information Technology course. The authors conducted an experiment which compared a gamified (experimental) group with a traditional (control) group. Game elements such as badges, points, leaderboards, and challenges were introduced in the gamified group while being absent in the traditional group. For example, students in the gamified group received badges on their scores, earning recognition from their teachers and peers. The comparison revealed that gamified groups indicated higher group cohesion than traditional groups.

Despite the promise of group learning, individual learning should not be dismissed. Social inclusion is also characterised by individuals who pursue personal goals through group interaction, while still making a meaningful contribution to the group – the result is reciprocity [8]. Individual learning has an important role in IS [14] and game-based [15] learning contexts. The ACM and AIS state that IS graduates and professionals should be able to “collaborate with other professionals as well as perform successfully at the individual level” [14]. McFarland [15] argues that individual play gives students more learner autonomy to demonstrate their individual learning progression through gameplay.

2.2 ‘Intelligent’ information systems

According to Lee [6], information systems comprise three primary systems: social, technical, and knowledge. The social system includes the people who interact with the technical system; the technical system includes data structures, networks, hardware, and software. The examination of the design, properties and behaviour produced by the mutual transformational exchange is the knowledge system. The “mutually and iteratively transformational interactions” among the three systems result in an information system [6]. Lee [6] argues that the technical system does not have to be digital technology but can also be the coordination of human resources that support the processing of materials into services and products.

Lee [16] criticises conceptions of ‘information systems’ that emphasise information requirements. The information system is instead the result of reciprocal transformational exchange between the social system and the technical system. The exchange is transformational insofar as the technical system is changed (i.e., transformed) when the social system fulfils requirements the technical system poses to it. This change triggers different and new requirements for the social system to satisfy.

We argue that Lee’s notion of a social system is not workable in Artificial General Intelligence (AGI). AGI is also known as ‘strong AI’ and the term derives from the idea that human intelligence is a general phenomenon that can be replicated by a computer. Although AGI can emulate many human-like properties, it is often still conceived as artificial narrow intelligence (ANI). ANI, also known as ‘weak AI’, is restricted to specific tasks. An example is Deep Blue, which was designed to outplay humans in chess. In 1997, Deep Blue defeated Garry Kasparov, a world champion of chess. Although emulation of intelligence is impressive, one can hardly claim that it has gained human intelligence [17, 18].

Descartes’s Cartesian dualism [19] rejects the hypothesis of a machine that is phenomenologically indistinguishable from man. Cartesian dualism is the belief that the mind is non-physical; namely, the mind is separate from the body. Here, the mind is associated with consciousness and distinguishable from the seat of intelligence: the brain. In view of Cartesian dualism, the core idea of AI is problematised, based on theories which maintain that brain processes and mental processes are the same [20]. In Cartesian dualism, subjectivism (i.e., thought) is inseparable from a 'thing that thinks'. The thing that thinks is 'I'. I am "a thing that thinks; that is, I am mind, or intelligence, or intellect, or reason" [19].

Therefore, as a thinking thing 'I' have a subjective experience of the world. By implication, the subjective mind cannot be mapped digitally onto a computational system. As Fjelland [17] points out, humans are subjective, social beings who function in a social world. Furthermore, AI – in a strict sense – is not part of our social world – AI is an assembly of algorithms and numbers. Fjelland concludes that learning about another person does not warrant scrutiny into the chemistry of their brain, but instead requires engaging with their subjective lifeworld.

2.3 Gamified technical systems

The gamified technical system used for this study is Quizlet Live, an online game-based learning platform [21]. Of particular interest to the authors is its 'progress-reset' feature. In a Quizlet Live game, students take a quiz – based on their learning content – on a digital device (i.e., PC, tablet, smart phone). While students play, the instructor displays their progress as a race via an interactive leaderboard. If a question is answered incorrectly, the system resets players' progress to zero; they must start again. In addition, the incorrectly answered question will reappear later in the game [21].

We regard Quizlet's progress-reset feature as ANI. Aside from ANI's focus on single tasks with accurate precision, it is also bound by predefined algorithmic rules. One of ANI's primary benefits is the rapid automation of time-consuming tasks [17, 18]. It is conceivable that an instructor can emulate Quizlet Live's progress-reset functionality in a non-computerised setting. However, they will not be able to assess wrong/correct answers and progress-reset as quickly and effectively as the technical system. The progress-reset feature as an ANI is consistent with Rich's [22] definition of AI: "the study of how to make computers do things that people are better at". Computers outperform humans in rapid calculations, but are not (yet) able to emulate the complex scope of human capabilities.

Quizlet's progress-reset feature is an example of a 'replay' game element. When players replay a part of a game, they typically do so to master their gameplay skills [15]. In a pedagogical context, McFarland defines replay as the redoing or relearning of skills and concepts to master [11]. We observe a connection between replay and the Depth of Knowledge Metric in the ACM and AIS curriculum guide. The metric entails learning by repetition to help students master conceptual and technical skills of which they have insufficient knowledge [14].

In some gaming contexts, replay has a negative social connotation. For example, in violent video games, aggressive actions are incentivised – i.e., players who defeat their enemies are rewarded with praise by other players or with badges by the game designers. Moreover, game designers often do not make visible in video games the consequences of aggressive behaviour [23]. Similarly, we seek to highlight the implicit and often hidden negative social implications of replay in an IS learning context.

3 The alienated gamified social system

In this section, we focus on the role of gamified technical systems in alienating the social system. Technical systems can potentially alienate social systems as its end-users are not able to change the software's source code. Software vendors establish control by employing copyright restrictions on the executable code and treating it as a trade secret. Hall and Pesenti [24] highlight a lack of access to data in AI development; top AI organisations keep data confined to their own design initiatives. These measures are taken to safeguard profit imperatives and serve as technical barriers to competing software vendors [25]. Glass [25] argues that such capitalist commitments misrepresent users' interests and needs. Consequently, the social system is deprived of opportunities to change the source code for its emerging and diverse needs. Likewise, Sonnenburg et al. [26] observe that "few machine learning researchers currently publish the software and/or source code."

Berry [27] argues that software design is entrenched in neoliberal principles. Neoliberalism is part of the broader capitalist system and linked to Western ideas of wealth accrual. Therefore, digital technology is used as a capitalist tool through which a certain type of dominant knowledge can be sustained. A further consequence is that endeavours to develop indigenous knowledge with the aid of digital technology are stifled. In similar vein, Hagerty and Rubinov observe that people from low-income countries are "underrepresented in the datasets central to developing AI systems" [28].

The free and open-source software (FOSS) and decolonisation movements counteracts the social exclusion that stems from proprietary software. As opposed to proprietary software, FOSS permits users to examine the code that they use, to change it if they prefer, and to communicate the changes to the inventor for implementation in future versions of the software. The outcome is that autonomy is sustained among software users [29]. Sonnenburg et al. [26], however, point out that open source software (or 'open science' in the context of scientific research) is never truly free or open. Although small in number, open data sets including Caltech 101, the Delph repository, and the UCT Machine Learning Repository have made significant contributions to progress in ML [26].

Geyser [30] calls for decolonising and diversifying game design courses and uses an example of a first-year game design course she offers at a South African university. She distinguishes between two types of students in the game design course: experienced players and novices. In contrast to novices, skilled players have extensive gameplay experience, attended wealthier schools, and were taught in the subjects Information Technology and Visual Arts. Conversely, novices are mostly black students from resource-poor backgrounds, and with little or no technical knowledge or access to computer infrastructure. Novices tend to be second-language English speakers, which disadvantages them, as a good command of English is a central requirement for the course.

The challenge these second-language users face is their unfamiliarity with gaming registers [30]. Registers are defined by Gee [31] as a vernacular used for a specific purpose, e.g., the language of video game players. Therefore, the Western tradition of thought and action, entrenched in digital games, is not (always) easily understood by students who are not prolific game players. Geyser recommends that curriculum developers draw from students' local social and cultural backgrounds (e.g., language) and metaphors to decolonise game design curricula. Geyser further recommends that practitioners and curriculum developers draw from a rich tradition of precolonial games to decolonise game courses. Indeed, Nxumalo and Mncube advocate the play of indigenous games in schools to decolonise curricula [32].

4 The knowledge system: Social Cognitive Theory

We use Bandura's [33] Social Cognitive Theory (SCT) as a theoretical framework to understand social inclusion and exclusion in gamification. The SCT concept – collective efficacy [34] – will frame our discussion about group cohesion. Collective efficacy refers to the shared belief of a group to achieve a desired result. To analyse the concept of oppressive, intelligent gamified technical systems that alienate the social system, we use SCT's triadic causation model (TCM) [33]. TCM is based on reciprocal determinism, which is the idea that human agency and learning function within an interactive social environment. TCM includes *personal (p)*, *environmental (e),* and *behavioural (b)* determinants exerting influence on each other – see Fig. 1[1].

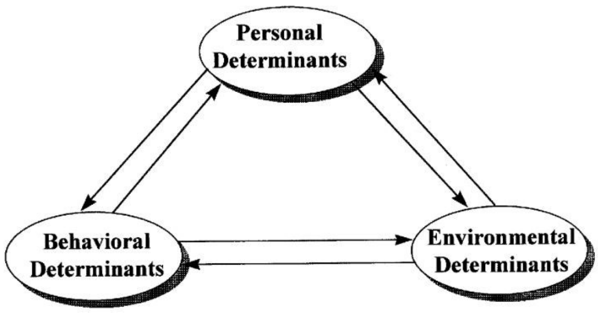

Fig. 1. The triadic causation model of Social Cognitive Theory [20].

Bandura describes the three components and the relationship between them as follows [33]:

Behavioural determinants ⇔ environmental determinants. A person's behaviour exerts influence on environmental conditions. Likewise, a person's behaviour is partially influenced by environmental conditions. In the context of this study, unless students engage with gamification imparted with some form of AI, they do not praise or question its effectiveness.

Personal determinants ⇔ behavioural determinants. A person's expectations affect the behaviour and the motives behind their actions. In turn, a person's actions affect

[1] From "Social cognitive theory of mass communication" by A. Bandura, 2001, *Media Psychology, 3,* p. 266. Copyright [2001] by Taylor & Francis Ltd (http://www.tandfonline.com). Reprinted with permission.

their personal perceptions of phenomena. In the context this study, the extent to which a student is receptive to AI-based gamification depends on whether it meets with their personal learning experience.

Environmental determinants ⬄ personal determinants. Observable personal traits affect how people perceive different social environments. In the context of this study, ICT and AI present different meanings to different individuals.

5 Method

The empirical data presented in this paper was collected as part of a larger gamification study that was conducted by the first author. The research sample was first-year IS students at a South African University of Technology. SCT was deployed as a theoretical framework and Action Research (AR) as a research strategy. Data was gathered via semi-structured interviews, focus groups and participant observation across two Action Research cycles. The established Action Research model by Lewin [35] – the founder of Action Research – guided data collection. Lewin's Action Research model diagnoses a problem, plans actions, implements planned actions, and assesses those actions to resolve problems [35].

In the first AR cycle, teams were selected randomly. The first author observed that there was a lack of interaction between group members during the gamification sessions. He attributed this to the participants not knowing each other, despite being grouped in the same lessons and roster. To address this issue, the first author asked students to choose their own teammates for the second AR cycle. The rationale that underpins this team formation strategy is the notion that group interaction will improve if students engage in gameplay with friends, whom they trust.

The first finding – social alienation – that emanated from team formation was captured in response to the following interview question: In cycle one, 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 and why? The second finding – language – stems from participant observation (discussed in more depth in the next section).

6 Findings

Aligned with the aim of illuminating the oppressive qualities of 'intelligent' technical systems, the results focus on Quizlet's 'progress-reset' function (discussed in Section 2.2). In the present study, students who disliked progress reset were observed to be withdrawn or had a poor grasp of the English language. In addition, these students were observed to contribute little to group interaction or struggled to form relationships with the prospect of effective group work.

6.1 Social alienation

Withdrawn students struggled to establish strong social bonds; therefore, choosing team members to play Quizlet Live was difficult. The result was a lack of cooperation between members, causing many progress-resets. This reflects in students' remarks about team formation and communication: "some people ... they do know some of the people that were in class, which doesn't bode well for others who don't know people that they trust… It wasn't really fair for people who did not have information about their classmates" [Student 7]; "[t]he 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" [Student 11]; "[w]e had a third person, I don't remember him, he was there" [Student 15].

We link the issue of withdrawn students to Quizlet Live being available only in team play mode at the time the empirical research was conducted. Shortly after the research concluded, Quizlet added single-player mode to the technical system. As we mentioned earlier, individual play should not be dismissed. Student 11 states, "I play with other people like friends, but I'm not really a player of group"; Student 3 states, "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 … you gonna exactly see the level you are on. You only see the level your group is on". Bandura [34] states that a group's united effort towards the desired success is greatly affected by the performance of its individual members.

Since this paper is part of a wider research effort, practitioners might argue that social alienation could be accounted for in the use of a gamification framework, e.g., Octalysis [36]. However, Octalysis' fifth core drive – which would have informed discussion about 'social alienation' – is not a game element, but a persuasive learning element [see 37]. This core drive relates to group quests and companionship in gamification, and deploys methods such as mentorship and social prods, among others, to strengthen social interaction in a group [36].

Landers and colleagues argue that "if identical psychological effects can be created without a game, whether regarding persuasion, learning, or any other practical outcome, then the creation of a game is a waste of resources. If gameful design is functionally identical to existing interventions used to change behavior, there is no reason to study gameful design either" [38]. To this end, Webber et al.'s [12] notion of AI intervention (highlighted in Section 2.1) to optimise team formation can be valuable as a pre-implementation strategy to improve team collaboration in gamification.

6.2 Language

The language issue was raised when a lecturer participant drew the first author's attention to Student 11 and his teammates who encountered many progress-resets. Student 11 seemed unnerved and contributed little to the deliberations about the correct potential answer to quiz questions. The lecturer said that he struggles with English as his mother tongue is French; she explained that he reads slowly to understand the proper context of what he reads. In his individual interview, Student 11 gave the following answer to a question about the most difficult challenge that he faced in the IS course, "it's my language, because I used to speak French…you know changing the language, changing all of the stuff".

However, unless students speak the same language, changing Quizlet's [10] language setting – for example, to French – is impractical. Besides, the primary medium of instruction of this IS course is English. Moreover, non-fluent English-speaking students generally embrace English as an instruction medium [39]. This is linked to the perception that English proficiency (and computing registers embedded in English) is essential to perform in a hyperconnected, globalised information and communication society [27]. Also, there is a paucity of indigenous languages in the computing field, which compromises attempts to Africanise computing curricula. Therefore, it is not easy to translate computing registers to meaningful, relatable indigenous terms. In English, for example, the meaning of a graphical user interface 'menu' and 'list' is different; in isiXhosa, the term 'uludwe' refers to both a menu and list [40].

The following responses reflect the statements above: "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 ... and if you translate it, it doesn't make sense" [Student 6]; "Me personally, I prefer learning in English because that is what most of the subjects are in. For the person[2] 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]; programming is more easy if you are English speaker when you do programming because there is no other term, you cannot translate it to French. … 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 learn English and to do Programming" [Student 11].

Beliefs of English as the *de facto* language should not instil the notion that it is not necessary to develop IS content in other languages. Gamification can offer solutions; an example is Von Holy et al. [41] who created a web-based digital repository – called BantuWeb – as an instrument to motivate users to add 'resource scarce languages'. An instance of gamified features includes users earning points for contributing content on the website. The points are listed on a leaderboard with the aim of promoting competition between users to add content and compete for a higher rank.

This finding illustrates the 'narrowness' of progress-reset as an ANI. That is, it cannot account for all social factors – in this instance, language – in the process of managing progress. This relationship between ANI and gamification remains valuable in the narrow context of language acquisition. For example, to assist students in learning the vocabulary of a new language, Lungu [42] presents an AI ecosystem which monitors reader applications to track learners' reading activities. The AI constructs a model of learners' developing knowledge to recommend tailored reading sessions to them. The service interface includes a *Motivator* agent that deploys gamification strategies as a feedback mechanism to keep learners motivated.

[2] Student 10 (a non-Xhosa speaking student) is referring to a Xhosa speaking student.

7 Discussion and potential solutions

In Section 3, we argue that neoliberal elements in the design of intelligent technical systems could be oppressive. Consequently, users' choices in the direction of their technological experience could be prohibited. A major assumption we highlighted is that the designers of technical systems/AI presuppose the social requirements of their users or their own social background. This bias is further compounded by technical systems designed according to Western standards, given that digital technology and AI are predominantly produced and consumed in the West [43]. Subsequently, context-bound experiences of users in non-Western settings are mostly ignored. Consistent with SCT, personal (p) determinants – i.e., weak sociality and insufficient English skills – negatively affect student behaviour (b) and the information systems environment (e) when engaging gamified technical systems:

Personal determinants ⇔ behavioural determinants. Introverted and second-language English speaking students struggle to perform in gamified information systems. We anticipate that introverted students will perform better in both individual gameplay and group gameplay following exposure to individual play. We anticipate that second-language English speaking students will perform better if they partake in translating computing registers to relatable local languages, by participating in Africanisation research projects.

Personal determinants ⇔ environmental determinants. For introverted students, little knowledge acquisition occurs through gamified information systems because of a strong emphasis on group work. Little knowledge acquisition also occurs for second-language English speaking students because gamified information systems are (typically) embedded in Western epistemology, which in turn, is communicated in English. But we expect students with personal goals to improve their English or to take part in attempts to Africanise game design courses/research projects that will enable them to cope in a gamified information systems environment. And individual efficacy, which we expect to increase through individual gameplay, is valuable in IS environments focused on group work.

Behavioural determinants ⇔ environmental determinants. If introverted students' performance improves through individual gameplay, we expect them to improve in group gameplay environments. We anticipate that second-language English speaking students will perform better as gamification information systems gradually become decolonised. We also expect that second-language English speaking students' performance will gradually improve in English-dominated gamified information systems environments as a direct implication of improved English abilities achieved via personal goals.

To Africanise the design process in a gamified technical system, we advance the deployment of a player-centred Design Science research strategy. Our ideation of design science research involves more than students evaluating 'smart' gamified technical systems in the post-implementation phase; students should be able to collaborate with game programmers and AI designers to plan, study, implement and change the source code [26]. Indeed, Yordanova [44] highlights the lack of skills for designing AI and recommends that more institutions introduce Bachelors, Master, and PhD programmes in AI design. From a programmer's point of view, we recognise that student participation in the design of AI infused gamified applications may not offer significant value to system design and maintenance. This is because students or gamers might not possess advanced programming skills. Yet, at the very least, IS departments and game designers should facilitate a process where students integrate cultural and indigenous knowledge and constructs into game design.

8 Concluding remarks

This paper discusses how 'intelligent' gamified information systems exclude students based on their background. We highlighted how the technical system often oppresses the social system, whereby it does not fulfil the requirements of the social system. Oppressive qualities in technical systems are a manifestation of the interests of its designers, embodied in source code not accessible to be viewed or changed by users. The result is that the complexities of the social system – e.g., non-English language and social alienation – are not considered. To democratise gamified information systems, we call on software designers, vendors, and academic institutions to collaborate with students when designing systems. Such endeavours could make significant contributions to the indigenisation and specifically the Africanisation of the IS discipline.

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