Gameful design for skills development of youths in marginalised urban communities

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Abstract. Unemployment is high among youths living in marginalised communities in South Africa. One of the reasons is that many young people are either un- or low-skilled to gain employment in a digital economy requiring high-skilled individuals. The fourth industrial revolution (4IR) also exacerbates the future of work for these youths if they remain unskilled. Training with digital technologies is becoming the norm (especially with COVID–19) but engaging and motivating youth to learn skills is challenging. Gameful design, when effectively used, can create engagement and motivation. This study investigated what gameful elements can engage and motivate youths in marginalised communities to learn employable skills and how these elements can be incorporated into a system. We conducted a series of co-participatory workshops, including self-reflection tasks with some youths from a marginalised urban community in the Western Cape, South Africa. The study finds twenty-three system-based gameful design elements and three non-system-based elements to engage and motivate youths. The results provide insights for gameful designers, development centres, and policymakers involved with youth skills development.

Keywords: Youth unemployment, Gameful design, Youth skills development, Design anthropology, Community informatics

1   Introduction

Gameful design and gamification have been studied and applied to create more engagement, participation and motivation for users to complete a set of activities or goal(s). Gameful design or gamification could be considered a buzzword, especially in business [1, 2], fitness [3, 4] and education [5, 6]. However, there are few studies on how gameful design can train youths for skills in a non-formal education context in marginalised communities, especially in developing countries. In addition, using digital technologies to train for highly technical skills can be challenging, especially if youths find the purpose of the activities unclear and non-engaging [6].

This study tries to fill this under-researched area to understand what gameful design elements designers can use to engage and motivate youths in marginalised

communities to learn skills. We were particularly interested in understanding these insights from youth groups' perspectives and their lived experiences. As Nacke and Deterding [7] noted, studies should address how gameful design can be applied in various areas. Schöbel and colleagues [8] further assert that designers should not force game elements on systems but allow them to unfold from a given context being studied.

We conducted this study in an urban marginalised community in South Africa. The South African government and education system has struggled with upskilling its youth for current employment opportunities and the future of work that emerges with the digital era [6, 9].

We focus on these communities based on trends showing that unemployment increased after apartheid (1990-) among those living in marginalised communities who are uneducated and -skilled [10–13]. A broad-based skills shortage was in part caused by the South African economy's shift towards a technology-led and high-productivity growth path between the late 1990s and the early 2000s that "was intended to stimulate investment in skills development and higher wages…" and occurred at the "same time as an increase in the still largely unskilled labour force and a shift away from labour-intensive agriculture" [14]. This result led to the decline of the need to hire unskilled labour and fewer youths living in marginalised communities gaining employment [14, 15].

We begin by discussing the unemployment crisis youths face in urban marginalised communities regarding skills development. Next, we discuss gameful design, its frameworks, and its application in learning. We describe the research methodology, including the context of the community studied. We follow this with our findings, discussion, and conclusion.

In this paper, we contribute theoretically and practically to gameful design in skills development for youths in marginalised communities. We established the elements and user types to consider when designing for such a context. Finally, we provide insights on incorporating these identified elements into a system using a user flow framework.

2   Background and literature

2.1 The Unemployment Crisis in Urban Marginalised Communities

The unemployment rate in South Africa was 34.9% in the third quarter of 2021 [16]. Statistics South Africa (the South African national statistics service) states that the rate increases to 46.6% if the expanded definition of the unemployed is considered. This extended definition includes discouraged work-seekers (people without employment who did not take active steps to find work during the last four weeks). One of the many reasons for unemployment is an individual's skills and educational level [9, 15–17]. Many unemployed individuals are young people living in marginalised communities who find it difficult to gain employment since they are primarily unskilled or low-skilled [11, 14, 18].

Although some of these marginalised communities are in rural areas, many are in urban cities and are called townships or locations [11, 12]. These communities have seen consistent population growth due to migration from rural to urban areas, thus increasing the number of unemployed people in cities [11, 13]. Many opportunities in urban regions require high-skilled individuals, whereas migrants are typically unskilled and cannot fill the labour demand [14, 17, 19–21]. Most of those who migrate to cities in search of opportunities are young people (between the ages of 15-34) [22]. Of this age group, up to 46% of individuals are currently not in employment, have an incomplete high school education or have no high skills training [14, 16, 17]. The National Youth Policy (NYP) for 2020-2030 states that this situation has "reached crisis proportions in South Africa" and is a significant challenge facing the country [17].

There is a correlation between education, skills, and employment in South Africa [16, 17]. Many South African young people do not have the financial capacity to get educated. Consequently, they become impoverished [12]. Graham and Mlatsheni [14] argue that skills development interventions can enhance youth groups' employability – skills and characteristics that make individuals more marketable in the industry. We also subscribe to Graham and Mlatsheni's [14] suggestion that the focus of research should be on unskilled youths with less than a matric (high school) qualification, as they contribute to a higher unemployment rate when compared to the absorption rate of employment among post-secondary qualifications. The suggestion echoes the National Planning Commission's [23] recommendations to find ways to improve skills acquisition and development, especially for young adults in poor communities.

While it is established that South Africa needs to focus more on developing highly skilled youths for its economy, engaging and motivating these youths can be challenging [6], especially if they find the activities' purpose unclear. According to Glover, learning is an active process requiring engagement to start, remain motivated and be engaged to complete the learning process [6]. Gameful design was introduced to increase interaction with digital interfaces, improve user experience, create engagement and motivation, and increase user satisfaction with a service or product [2, 24]. We propose that gameful design can motivate and engage youths and bring about a significant change in behaviour toward learning skills, as seen in other environments [24, 25].

2.2 Defining Gameful Design

We first needed to understand what it means to design something in a 'gameful' manner. However, the meanings and definitions of gameful design and gamification differ. For instance, Tondello [26] argued that the difference between their meaning 'lies in the designer's intention'. Tondello, referring to Deterding, Dixon, Khaled and Nacke's [1] work, describes gamification as when designers' focus is on using game elements as a strategy to solve a problem, while gameful design is when designers' focus is on creating a gameful experience. Tondello concludes that the difference does not matter if users accomplish their desired goals on a designed product. Velasquez argues in the comment section [26] that the ambiguities of the terms stem from the use of words "like 'game elements' or 'game thinking'", which are semantically

broad and rather obscure". Velasquez adds, "[g]amification places emphasis on game feedback systems and game interface components. At the same time, gameful design emphasizes game mechanics and rules (which includes the above)" [26].

Bell [27] agrees that the terms are distinct but subtle: "gamification equates to making a game of an activity". In contrast, gameful design "looks at the various aspects and intrinsic motivators embedded in successful games (and other nongame events) and asks whether those elements can be replicated". The term 'gamification', derived from the digital media industry, has been heavily contested and created discontent among game studies and industry experts [1, 26]. The oversimplification, multiple interpretations (as seen above), and the various ways of implementation gradually led to different uses and definitions [2].

To understand these terms (gameful design and gamification) and their use, we can examine the work of Deterding and colleagues [1] terms. They defined *gamification* as the "use of game design elements in non-game contexts". To arrive at this definition, they first differentiated between 'gamefulness' and 'playfulness' using Caillois' interpretation of the concepts of Paidia and Ludus [28]. While Paidia, on one end, signifies uncontrolled, uncertain, unrestricted, and light-hearted activities, Ludus, on the other end, signifies subordination to rules, calculation, skill, and patience. Ludus thus denotes the qualities of gamefulness – goal-oriented with rules.

Deterding and colleagues [1] thus assert that designing a product for gamefulness using game elements is the goal of gameful design and that gamification is the design strategy of using game design elements. In order words, these terms are not different based on "designers' intention". Instead, they are based on "intentional properties" – the design strategy (gamification) and the design goal of gamefulness using game elements (gameful design). Gameful design is often implemented using the method of gamification [29].

These terms could be used based on what is being referred to – the design strategy ('gamification) or the design goal (gameful design). However, Deterding and colleagues [1] suggest that gameful design should be the preferred term for academic discourse. They argue that "[g]iven the industry origins, charged connotations and debates about the practice and design of 'gamification', 'gameful design' currently provides a new term with less baggage".

In support of Deterding and colleagues' view, we use the term gameful design in this study. We define it as using game design elements to achieve a goal-oriented psychological state (gameful experience) to increase user engagement, motivation, and participation in a non-game context. This description encompasses all the aspects of a gameful design definition:

1. The use of game elements
2. A psychological state that is goal-oriented (gameful experience)
3. To increase user engagement, motivation, and participation (user behaviour created by the psychological state)
4. In a non-game context.

In summary, using either term (gameful design or gamification) is context-dependent. Using these terms does not affect the user if the end product helps them accomplish their desired goals. It is also important to note the 'part' game elements in non-game contexts, as sometimes games such as serious games are confused with

gameful design. Serious games comprise 'whole' game elements but in non-entertainment contexts primarily for educational and learning purposes [1].

2.3 Gameful Design Elements and Frameworks for Learning

While the definition of gameful design is essential, the elements that create increased engagement and motivation for users to achieve a specific goal are equally significant. Most studies on gameful design in learning focus on formal education, institutions of learning or teachers within formal education [5, 24, 30–32]. There is still a knowledge gap in understanding what gameful design elements can be used to engage learning for skills in a non-educational environment for marginalised youths. Despite this, we considered what elements have been used in formal education and deduced that much of these could apply to skills development in other environments.

Being in an era that sees societies moving toward post-material values of experience, self-identification, self-expression, and self-realisation [33], interest in designing for motivation, engagement and enjoyment has grown in human-computer interaction (HCI) [29]. Hence, organisations and designers look for ways to continue motivating users regularly. These include education and skills development methods to keep young people engaged, inspired and enjoying the learning process.

In education, gameful design refers to game mechanics and dynamics applied to teaching and learning [24]. Lee and Hammer [32] argue that using game-like features in education and schools has been there over time but not channelled properly to create engagement. Such features include the points given to students for assignments and tests correctly completed and translating these points to "badges" known as grades. Each academic year, using the reward system, if the students perform well, they "level up", moving to an advanced class. They claim that "students would not describe classroom-based activities in school as playful experiences" and that "the existence of game-like elements does not translate directly to engagement" [31:2].

Applying gameful design in formal education is still a developing trend, even for economically advanced countries [31, 34]. It is still viewed as one of the most challenging aspects to apply gameful design compared to other areas such as business, fitness and marketing [35]. Dicheva and colleagues [34] reviewed 34 case studies and identified seven game mechanics for use in education – avatars, points, virtual currencies, badges, progress bars, levels, and leaderboards. Points are used to quantify user performance. The user is ranked on a leaderboard based on the points and badges received. Virtual currencies are used for in-game purchasing, and levels show users' expertise.

In the South African education context, a project conducted in rural schools of the Eastern Cape by Botha, Herselman and Ford [24] introduced gameful design to encourage the use of tablets for teachers at rural schools for formal teaching and learning. In another study, Adukaite, van Zyl, Er, and Cantoni [5] examined factors influencing tourism teachers' acceptance of gamified systems. These studies on gameful design for education or learning in South Africa are rare but emerging. From existing studies, the primary aim is to create an engaging user experience when designing for gamefulness [24]. Huotari and Hamari also stressed the case for

engagement and user experience as the core of gameful design [25], though their work centred on using gameful design service marketing.

Regarding frameworks, the MDA (mechanics, dynamics, aesthetics) framework [36] is well known for designing game and gameful systems. The framework divides game consumption into three components: 'rules', 'system', and 'fun'. By using these components, Hunicke and colleagues derived the design element equivalents for game design as 'Mechanics', 'Dynamics', and 'Aesthetics' (MDA). They argue that breaking game elements into these components helps redefine the concept of gamified systems as systems that build behaviour through interaction.

Game mechanics are the designer's functional elements afforded to a user [36–38]. These mechanics permit the designer to control the 'levers' of the game to guide users' actions [8, 38]. The system's designer sets the rules and goals for the user. Examples of mechanics include leaderboards, challenges/quests, levels, badges, points, onboarding, missions, feedback and social engagement loops [38].

The user's interactions with game mechanics are considered *game dynamics* [38], and they create aesthetic experiences [36]. In order words, they include user interactions such as time pressure to complete a goal, opponent play [36], information sharing among users, the rate of consumption, and all that can be modified for effects [38]. *Game aesthetics*, on the other hand, evoke emotional responses from users [36]. Hunicke and colleagues [36] stress that in describing the aesthetics of game design, words that have a more directed vocabulary should be used instead of words like "fun" and "gameplay".

Furthermore, the HEXAD user-type model has gained traction in gameful design. The lack of gameful design frameworks or models that can be applied to gameful systems led to the creation of the HEXAD model by Marczewski [39]. This model is built on player types and motivation drivers from literature. Marczewski first summarised these motivation drivers as RAMP (Relatedness, Autonomy, Mastery, and Purpose) [40]. Marczewski derived RAMP from two known motivation studies – self-determination theory (SDT) from [41] and the intrinsic motivation drive from [42]. SDT identifies three aspects as intrinsic motivators – autonomy, competence and relatedness. Similarly, *drive* recognises three aspects as intrinsic motivators – Autonomy, Mastery, and Purpose.


Fig. 1. The HEXAD framework [39].

The HEXAD framework classifies gamification into six user types with the motivation of the type they represent. In summary, the six user types are Socialisers (motivated by Relatedness), Philanthropists (motivated by Purpose and Meaning), Free Spirits (motivated by Autonomy), Achievers (motivated by Mastery), Disruptors (motivated by Change), and Players (motivated by Rewards) [39].

The framework was further used and analysed to understand what game design elements were preferable for demographic clusters [43]. This analysis resulted in eight gameful design elements – Socialisation, Assistance, Immersion, Risk/Reward, Customisation, Progression, Altruism, and Incentive.

3   Context and Reflection on Research Settings

We conducted the research at Mfuleni – a marginalised suburb (often called township) located in the City of Cape Town Municipality, Western Cape Province, South Africa. Other similar townships in areas known as the Cape Flats surround it. Stats SA puts the estimated population at about 53 000, of which the working age (15-64) makes up 65 per cent of the total population. Of the estimated population, an average of 33.2 per cent have either a Matric (29.3%) or higher education (3.9%). The sample age group for this study (18-29) is about 33 per cent of the total population[1].
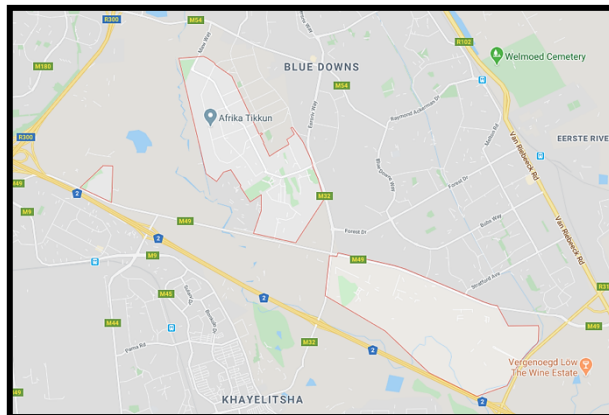

Fig. 1. Aerial view and location of Mfuleni (image courtesy of Google Maps).

Afrika Tikkun served as our gatekeeper to the township community. Afrika Tikkun runs a career development programme (CDP) targeted at youths aged 19-29. This programme helps mitigate the effects of the challenges youths face by providing "career guidance, job readiness training, job placement and bursaries for further learning". We first sent the summary and purpose of the research via email to the

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[1] See https://bit.ly/2H2oAwe for further information.

acting CDP Manager for consent and approval. Ten youths who had attended the programme and volunteered as CDP alumni committee members were selected. This number fulfils the number of participants needed for an effective, non-crowded, focus group activity [44, 45].

Mfuleni, like the rest of the Cape Flats communities, is secluded from other parts of the high-income areas of Cape Town. Travelling from the CBD to Mfuleni, one moves from suburbs with affluent residents or gentrified districts towards informal settlements of houses made of zinc (called shacks).
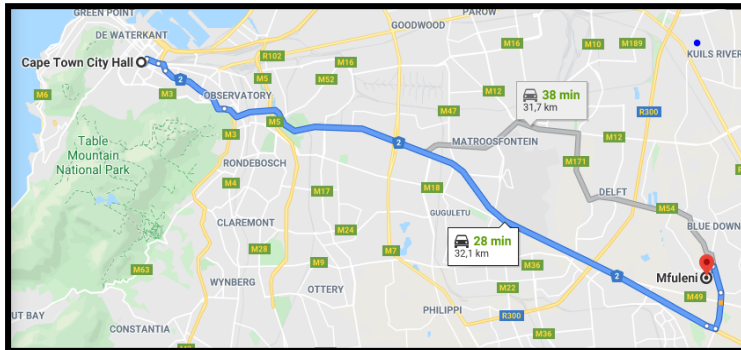
Fig. 2. Distance from Cape Town CBD to Mfuleni Township (image courtesy of Google Maps)

One of the first things a visitor will notice when they arrive in Mfuleni is the number of community members involved in the *shisa nyama* (local name for barbeque) business. It is a primary source of income, while other economic entities include a shopping mall. The Afrika Tikkun development, training and resource centre resides in the Mfuleni Township. Its facilities are open to community members and include a computer lab. The township only has one known internet hotspot close to a local library, with a daily cap of 50 MB per user.

Fig. 3. Afrika Tikkun at the centre of the community

The sparse access to computer and internet resources threatens the move towards the 4IR, which focuses on digitised technologies, and widens the proficiency gap between skilled and unskilled urban youths.

4 Methodology

Using *design anthropology* (DA) as the primary methodological approach, we explored what gameful design elements could engage and motivate youth in urban marginalised communities and how these elements could be incorporated into a gameful system. *Design anthropology* is a collaborative and iterative methodology that combines research practices, methods and techniques from design and anthropology, aiming toward innovation and transformation [46–49]. It serves as a mediator between the designer and the user for social design [49]. The use of DA facilitates highlighting the shared daily routines of the individuals within an environment or a community that can bring about transformation and innovation [48].

Using DA as a methodology involves six steps: Placing oneself in context (using anthropological methods and tools for data collection), analysing the data, clearly defining the problem, ideating, designing and prototyping, and lastly, testing the design and prototype. As described earlier, adequate steps were taken to select the participants needed for the research, comprising low-skilled, unemployed youths between 18 and 29 years old.

4.1 The Process and Analysis

Our first step was to organise a session explaining the research goal and (possible) outcome to the participants and setting up dates for further workshops. They acknowledged what was presented and signed an individual consent form to be part of the research. The form assured the participants of their rights, confidentiality and anonymity using pseudonyms. It is necessary to state here that the researchers only played a facilitator's role in allowing the findings to unfold from the youths. Every analysis was done with the youths or validated with the youths if any further analyses were carried out. These validations were done during the start of each workshop before any other tasks were given if any. In addition, as this research was conducted using focus groups, the participants agreed upon the findings as a group. The idea was to develop shared meanings as a community.

We gave the youths a reflective and self-awareness task to complete in three weeks. They were each given a notepad and a pen for the task. The participants were to keep track of their activities, taking note of the places they go to and at what time, and consider businesses or companies around them if any. The intention was for the youths to identify what opportunities could be available around them. In addition, they were to take note of the types of game(s) they play and for how long, what keeps them engaged in the game(s), what appeals to them in the game(s), and what situation made (motivates) them to go back to the game(s). If they did not play games, we informed them to note their use of social media apps, such as Facebook, Instagram,

and YouTube. Most social media apps have successfully implemented gameful designs to keep individuals intrinsically engaged and motivated [54]. The principle of this task is that the youths have a clearer understanding of their personal experiences and will be in the best position to note and describe why they carry out these actions.

After the three weeks had elapsed, we met for group workshop activities and discussed the given task's findings. While they reported on their findings, we asked follow-up probing questions to ensure we understood what they said. We noted these while probing (see figure 5 below for samples of the personal notes).

In addition to the task, we enquired about their experience and journey at Afrika Tikkun. We asked three (3Ws) questions:

1. What made them start the skills development at Afrika Tikkun
2. What motivated them to continue
3. What were some of the challenges they faced

They noted their responses with their pseudonyms and handed them over. These questions were intended to:

1. Determine what features could be added for on-boarding the youths to the gameful system
2. Find out what motivated them to continue at Afrika Tikkun that could translate into gameful design features that would intrinsically motivate the youths to learn skills.
3. Suggest solutions on how to mitigate their challenges

After this session, we collected the notes and responses for further analysis.
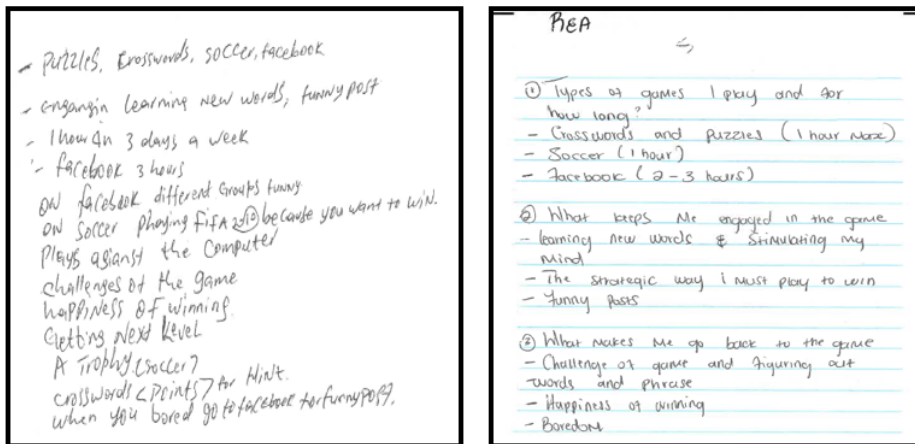

Fig. 4. Sample of youths' notes.

After this phase was complete, we conducted workshops for defining and ideating. During these workshops, we presented our interpreted findings to the youths, who validated them. These findings combined the reflective and self-awareness task given and the enquired experience and journey at Afrika Tikkun.

Once validated, all participants mapped out the findings using the empathy and needs mapping tool [50, 51]. At this point, it is necessary to state that analysis and

testing followed a continuous process, creating more meanings from prior findings. An iterative process ensured we tested and validated each idea with the participants.

We only considered the pains (problems/challenges) and gains (goals) and, to a lesser extent, the tasks (activities) that they would like to perform if they had a system to learn skills. These considerations mapped a persona for the design of a gameful system.
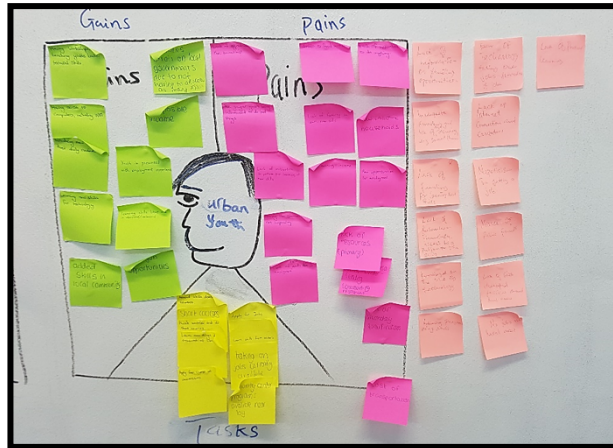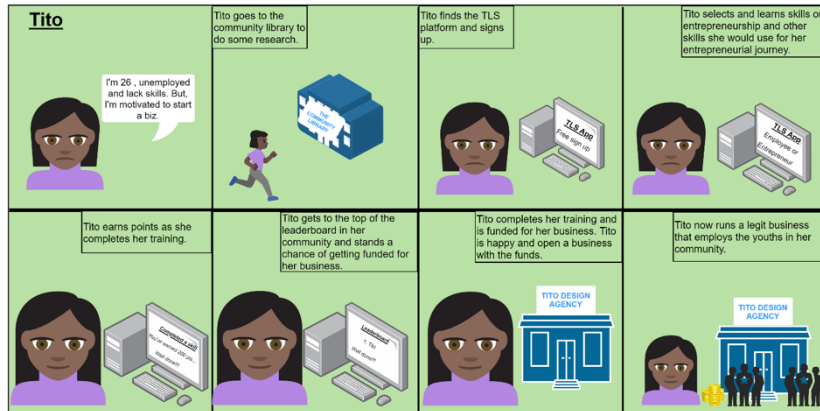

Fig. 5. Empathy and needs mapping

Drawing insights from the mapping exercise, storyboards were created for the two personas identified by the group – a youth seeking to learn skills for employment (employment stream) and, secondly, a youth desiring to learn skills to start their own business (entrepreneurship stream). The insights from the mapping exercise allowed for the creation of storyboards for the two personas identified – Thando and Tito. Thando is an entrepreneur, and Tito is a youth looking for employment opportunities.
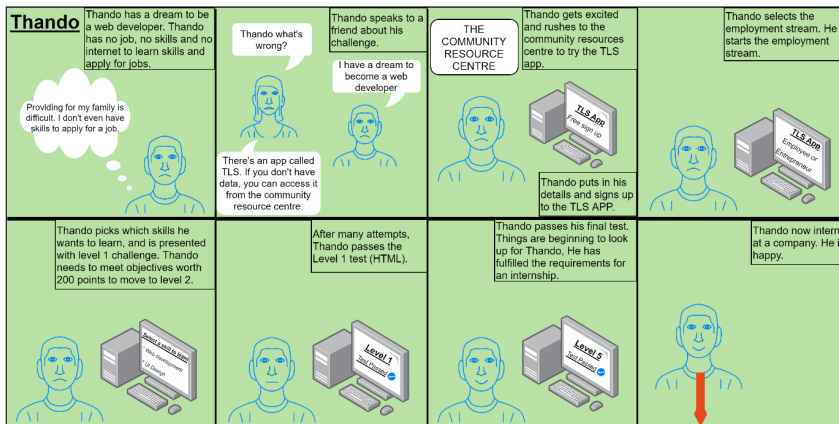
Fig. 6. Thando's Empathy and needs mapping.

Fig. 7. Tito's Empathy and needs mapping.

We then framed the point of view (POV) [51] from the above empathy map and storyboard to capture the design vision for the ideation phase. Below are the POVs:

POV 1: Youths without skills need to have places and opportunities available to them to develop the necessary skills to gain employment to help alleviate poverty in their lives.

POV 2: Unskilled youths need to learn skills to provide for their families. They cannot learn skills due to the lack of resources in their communities.

POV 3: Unskilled youths need to find work to earn money; however, they cannot learn employable skills due to their lack of resources and opportunities.

To help spark the ideation process, we used the 'how might we' (HMW) questions. Using HMW paved the thought process of mitigating the known challenges (pains) the youths face to achieve their intended goals (gains). This process led to a brainstorming session of ideas, including features on how gameful system techniques could influence engagement and motivation.

The entire process involved active participation and collaboration with the youths. This collaborative approach enabled the researchers to reflect critically on our interpretations (and potential biases) and ensure we validated our findings.

5 Findings and Discussion

From the findings, the participants played multiple games and used social media platforms for an average of 5 hours per day. These findings indicate that a well-designed, gameful skills development system could fuel their interest. Some of the listed games played are sports games like football (soccer), puzzles (Candy Crush and Crosswords), role-play games (RPG), and simulation games (farming and driving). All listed Facebook or Instagram as the social media platforms they use.

Participants noted several examples of engaging and motivating elements in the games they play and the social media they use. These include achieving a trophy, gaining points, accumulating virtual currencies, getting to the next level, and the happiness of winning. Others are game challenges, the strategy needed to win, stimulation of the mind, the feeling of games being natural, and communication with fellow users. They also noted the following: clear missions, funny posts, ability to learn, personalisation (use of avatars, changing colours, and background music), followership and engagements with people on social media.

The participants shared experiences of their journey at Afrika Tikkun with the 3W questions, which give further insight into features to consider:

1) What made them start the skills development at Afrika Tikkun? One of the main reasons was that they knew the programme's outcome before they started. They knew what training courses were being offered and could anticipate the potential effect of each skill. To stimulate initial interest, the onboarding of programmes should have a clear goal (or mission) from the onset on what skills they could learn on the application and what they could achieve with the skills learnt. For instance, knowing he will "learn computer skills, driving skills towards a learner's / driver's license, and having job readiness training" made Amos start the training at Afrika Tikkun. Luckitz, Rea, and Luzu also echoed this sentiment.

Luckitz noted that the opportunity to improve his self-confidence and presentation skills made him begin the programme. Luzu's goal-driven orientation was ignited because of the "promises they (Afrika Tikkun) made" and a chance to get a driver's license through the programme. Rea, needing something to keep her busy during her gap year and her interest in computer training, led her – with the help of her aunt – to train for computer skills at Afrika Tikkun.

In addition to what stimulated their interest, we observed that youths were bored or frustrated before getting opportunities at Afrika Tikkun. They stated they were "sick of staying at home" and having "nothing to do at home". When prospects arose as they did at Afrika Tikkun, they "grabbed the opportunity with both hands". This finding shows that some youths are willing to want to develop and grow despite the circumstances surrounding them.

2) What motivated them to continue? From the feedback, the youths claimed that their engagements and relationships with each other are some of the key reasons they continued and completed their training. They were able to share their experiences and learn from each other. Examples of statements used were "Engaging with fellow youths at Afrika Tikkun" and "I Love working with people". In other words, a well-designed application that creates this form of engagement could generate better user engagement and an enhanced learning experience. Luckitz's statement summarises the general sentiment:

> *"The relationship I had with my fellow learners. It was amazing how people shared their personal [experiences] and situations that occurred in their lives at the time and how they trusted me with that information. Also learning from other people that were there." Luckitz*

The quality of the content or resources for training is also a factor that can increase or decrease interest. Amos noted that the training in soft skills, such as presentation

skills, developed his confidence. Emphasising that the progress towards learning a skill should not appear too easy and tedious, Rea and Amos noted that the challenging web development training piqued their interest more than the computer literacy training. Learning a skill should be scaffolded in levels of difficulty that become more challenging as users build confidence in their ability to complete a skill. In other words, creating challenges that would show progress and increased difficulty would give the youths the perception and belief that they are mastering a skill. In addition, Amos stated that completing the skills training should not end there but should open new opportunities for youths to learn new skills if they want to.

Another influential factor was a perceived sense of achievement from earning badges or reaching the top of leaderboards. Rea cheerfully added that her web development training was challenging but that "…I pushed myself to be good at it… and I came first in class". This feeling of being first in the class created a sense of accomplishment. Other factors that motivated them to complete the skills training included free internet and transport fares. Luckitz and Luzu stated that the transportation fare (ZAR 400) and the internet use at Afrika Tikkun made it easier to travel to the developmental centre for training.

3) What were some of the challenges they faced? Two main obstacles surfaced regarding completing the programme at Afrika Tikkun – financial constraints and travel distance. For instance, the stipend paid to the youths was only enough for transportation to the development centre and not for living expenses. Luckitz said he thought to himself if he should continue the training even though he "was not getting [paid] much" and had to travel a long way to be in time for the sessions.

Table 1. Gameful elements are identified below using the MDA framework.

Mechanics (to control levers)	Dynamics (interactions to create experiences)	Aesthetics (feelings derived)
Mission	Onboarding	Competition
Challenges	Feedback loops	Fellowship
Levels	Social engagements loop	Discovery (the feeling of learning)
Badges	Time pressure	Expression (includes Happiness of winning)
Points/virtual currencies	Allies/Opponents play	Amusement (Funny post)
Leaderboards	Personalisation	
	Communication (and information sharing) among users	
	Sharing achievements on social media	
	Winning strategy	
	Content quality	
	Realness	
	Opportunities (includes internship, job, funding)	

From the above, we can categorise the identified gameful elements using the MDA framework into three components (see Table 1). The gameful elements are discussed further in the following subsection. The MDA framework is preferred in this study as it streamlines and allows for the categorisation of the found elements compared to the grouping of gameful elements by Tondello and colleagues [43]. Although the grouping from Tendello and colleagues is based on demographic clusters, it caters for mechanics and, to a lesser extent, dynamics. It does not consider the elements concerning feelings and emotions [36]. The findings indicate that aesthetic elements are integral to a successfully designed gameful system.

In addition to the above, free internet, physical resources (including digital technologies) and financial assistance were other external factors that motivated participants.

5.1 Game elements identified

Mechanics (to control levers): Game mechanics are the functional components that set the rules afforded to a user by the designer [36–38]. These components allow the designer to control the 'levers' of the game to guide users' actions. Six elements were identified from the findings as the fundamental game mechanics to consider and are discussed below.

1. *Mission:* From the onset, users should know the goal of each skill course on the system – what they will achieve (a skill they will learn). The outcome of the gamified system and that of each skills course must be stated clearly. This mechanic helps develop users' interest in engaging with the gameful system. This finding aligns with the motivating factors youths described in joining Afrika Tikkun.

2. *Challenges:* Each mission (i.e., each skill) should be broken into smaller achievable tasks (sections) as challenges that build towards achieving the main goal (completing the stated mission). These challenges are sections of each course.

3. *Levels:* Level mechanics could be used to indicate users' progress towards completing each challenge (task) (see Fig. 11). Challenges and levels (1-7) should be progressive. For instance, from beginner to professional (or expert level). Each skill will be broken into increasing difficulty levels that progressively show mastery of the new skill. These levels must be carefully designed to achieve a flow that does not appear too easy, too complicated, or tedious. The level (or rank) obtained can encourage the user to receive a certificate on the NQF (national qualification framework) scale through the QCTO (Quality Council for Trades and Occupations). Obtaining a certificate would mean that their skills development training could lead to a recognised degree, thereby addressing existing low qualification levels. Additionally, those who have gained skills at the top level could mentor others.

4. *Badges:* Users should earn badges as they complete challenges (i.e., sections of a skills course) to get a sense of accomplishment and to keep them motivated. These badges should be linked to their progress (levelling up).

5. *Points and virtual currencies:* Each section can be grouped into chapters. Users earn points and virtual currencies by completing these chapters or assessments of these chapters/sections. Youths can 'spend' points earned for hints while assessing the skill learnt. Tips while doing assessments should give clues but not a clear answer.

The virtual currency earned can be used to purchase time to book mentoring with a subject matter expert (possibly a volunteer).

6.   *Leaderboards:* Leaderboards can rank users according to specific skills to create more engagement and show how a user compares to others in terms of progress. This ranking will be time-based (see more on time pressure below) and based on point accumulation. This element should be optional, as not all participants mentioned this as an element that engages them. For instance, users may receive occasional prompts to opt in to see how they fare compared to others.

Dynamics (interactions to create experiences): Game dynamics are users' interactions with game mechanics to complete actions, including time pressure, opponent play [36], and sharing information [38]. From the findings, the following are added to the dynamic elements of the MDA framework: onboarding, feedback loops, social engagement loops, personalisation, winning strategy, content quality, authenticity, and role-based play (i.e., allies or opponents).

1.   *Onboarding:* Onboarding helps users acclimate to the gameful designed application and influences how they would interact with the game mechanics and the output of such interactions. Onboarding can be done to understand the user journey and application mechanics, using general soft skills training – for instance, basic digital skills, communication and presentation skills.

2.   *Feedback loops:* Feedback on how the users progress toward obtaining a skill is crucial for engagement. The gameful system reacts to how well the users perform by applying the feedback loop mechanic. Users are presented with rewards (points, virtual currencies, and free assessment hints) based on the outcome of their actions. The positive or negative feedback loop can be applied to keep them more engaged to see the results of their efforts and dedication to learning a skill. For instance, users earn more rewards for completing more tasks quickly and frequently.

3.   *Social engagements loop:* In addition to the feedback loop, the social engagement loop mechanic can also influence users to re-engage with the gameful application. For instance, the gameful application can remind users to continue their training and provide information on the opportunities available should they complete their training. In addition, users can make friends and chat with other users around a specific location or distance to create connections. Users can send messages or mention their friends' names on the application; the receiver will be notified even when not online. This notification can be in the form of an app notification, email, or SMS.

4.   *Time pressure:* Time pressure can be introduced to secure engagement, encouraging users to complete training (the mission) in time. The duration will depend on how long it will take to learn a skill – subject matter experts will determine the period. For time pressure to be adequate, some form of incentive must be in place. For instance, users could qualify for internship opportunities should they complete the training by a predetermined deadline. As seen in the case of the youths at Afrika Tikkun, the possibility of getting opportunities for internships and jobs motivated them to complete their skills training.

5.   *Ally/opponent play:* Users can choose and interact with others depending on their perceived roles (ally or opponent). They should be able to compete with opponents or have allies when completing the same skills training. This role-based

play could create more engagement and motivation to complete training sessions. The findings from the participants reveal that some are competitive, and others are not. This option allows the users to own their experience and determine how they want to interact with others.

6. *Communication (and information sharing) among users:* Users should be able to communicate and share information through chats or forums. Users in the same vicinity could meet physically (for example, at development centres) for more engagement.

7. *Sharing achievements on social media:* Users should also be able to share their achievements (badges and skill completion) with friends on the application or other social media platforms.

8. *Personalisation:* Users should be able to personalise their experience, though personalisation goes beyond basic customisation. Users should be able to personalise their avatar, change the colour background and toggle light/dark mode, play background music, and determine the skills they want to learn, among other things. Personalisation would give them a sense of ownership and autonomy in their journey.

9. *Winning strategy:* Winning strategies can be shaped as user support to assist users in performing complex tasks. Users may need to explore what they require to accomplish the task. They may, for example, consult guidelines, tips and other users to determine their winning strategy.

10. *Content quality:* The content quality of the training matters and should be relevant. The participants continued with the programme because of the high standard of training they received at Africa Tikkun. Content can be structured according to scaffolding outcomes.

11. *Realness:* Users were engaged and motivated if they realised the real-world applicability of the training. The system should ensure that the training applies and is practical to the real world and workplace experience.

12. *Opportunities:* The system should allow users to obtain information about potential opportunities, including internships, jobs, and funding.

Aesthetics: Game aesthetics are the emotional responses (or experiences) evoked in users through their interaction with game dynamics. The gameful application design should ensure it evokes the following game aesthetics:

1. *Competition:* The feeling and experience of competing with other youths in completing missions.

2. *Fellowship:* The feeling and experience of knowing they are not alone in this journey by socialising with other youths.

3. *Discovery:* The feeling and experience of discovering and learning new skills.

4. *Expression:* The feeling and experience of going through a journey of self-discovery and accomplishment. This would include the "happiness of winning".

5. *Amusement:* The participants mentioned being amused as an essential emotion.

While the 23 elements discussed are system-based, other non-system-based elements are worth noting. These are free internet, resources (including digital technologies), and stipends.

5.2 Incorporating the identified elements in a gameful designed system

The ideation process led to ideas on the features of the gameful designed system. The participants rated and validated these ideas. Below we describe these ideas and how the gameful design elements are incorporated.

We start by describing the user flow of the system, then explain how the levels work and how that could lead to mastery and purpose. The conceptual user flow (Fig. 10) for the gameful designed system depicts the path and journey of a user's experience on the system. The user flow chart uses the following conventions in identifying the elements used.
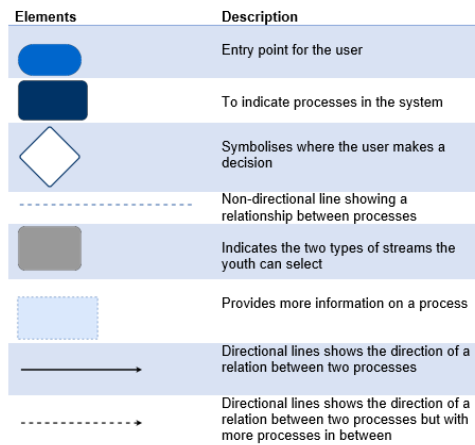
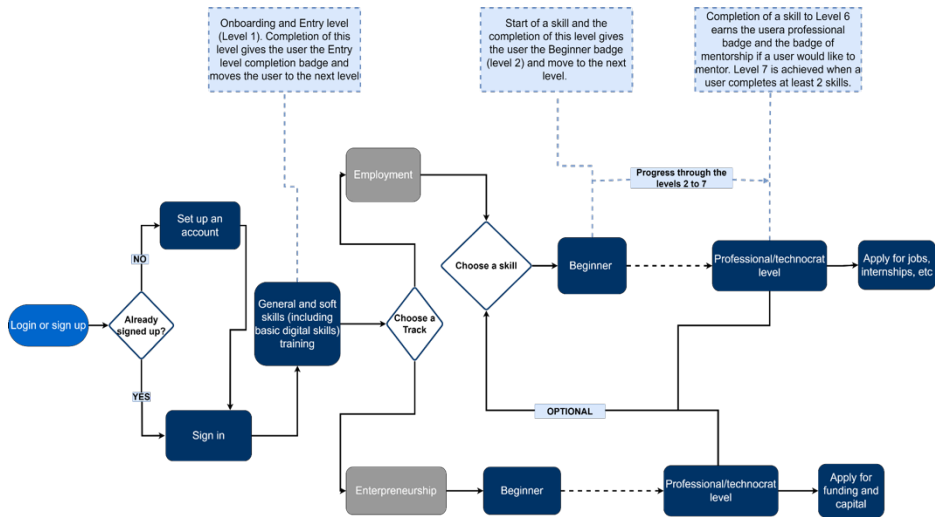**Fig. 8.** User flow elements and description.

Fig. 9. User flow framework for incorporating the gameful design elements.

The user starts by creating an account on the platform, and if they have created an account, they sign in. They can personalise their account at this point or do it later. The user then undergoes the onboarding process to understand how the system works. The process would be to explain the mission first – including the outcome of being able to apply for opportunities. Onboarding will assist users in learning soft skills and experiencing all the gameful elements identified and discussed above. The general and soft skills will include basic skills in using digital technology, their applications and the search functions of these technologies. Completing this training gives the user an entry-level completion badge, and they can advance to the next level. The process of levelling up is discussed further below. Once the user completes the onboarding process, they are prompted to choose a skill-learning track – entrepreneurship or employment.

Users interested in skilling towards entrepreneurship will work through the contents across different levels (levels 2 to 6). Once completed, they are prompted to apply for funding for their business. This process means they do not need to go searching for funding opportunities. Furthermore, this process assures potential funders that they will be funding the businesses of those who are skilled to be entrepreneurs. They also have the option to learn other hands-on skills from the employment track that will aid them in their business.

The same experience is expected of those in the employment stream, but they select a skill they want to learn towards a career. Once a skill is completed (at level 6), users are prompted with opportunities within the skill category. These opportunities may include internships and jobs. Like the entrepreneurship stream, they do not need to search for opportunities from various sources. It also gives future employers the security that the youth have the requisite skills.

Regarding the levels, the learning of a skill is broken down into levels that build up in difficulty. The levels are divided into three sub-levels: lower-level, mid-level, and top-level. The lower level has three levels – Entry, Beginner, and Novice. At this sub-level, the user should be able to have soft skills and the foundational knowledge of the skill being learnt. The mid-level has two – Knowledgeable and Proficient. At level 5, the user should be proficient in applying knowledge to real-life projects. The top level has two – Professional and Technocrat. At the top level, the youth should have advanced knowledge of the skill and be able to apply these skills to real-life projects. They are, at this stage, eligible to mentor others. The seven levels are shown in the figure below.

Fig. 10. Levels for the gameful system.

Each skill users learn starts from the Entry level to the Professional level. After achieving the professional level, the youth earns the right to become a mentor for the completed skill and can opt in. Level seven (Technocrat) is reserved for those who complete at least two skills. In other words, those who can complete at least two skills are recognised, which should motivate and engage users to learn more skills. For instance, a user can start a skill to become a Web developer after completing level 6 and subsequently earn the right to mentor others in learning web development. This user then decides to learn mobile development, completes it, and moves to level 7 for being able to complete at least two skills.

Furthermore, understanding the user types is also essential. The HEXAD 'user types' framework for gameful design from Marczewski [39] has been validated to measure user preference [52]. Concerning the user types using the HEXAD framework, participants exhibited *achievers*, *socialisers*, *players*, *free spirits* and *philanthropists*, and to a lesser extent, *disruptors*. These were noted from observation of the findings and are yet to be validated. For instance, Rea exhibited *achievers* by stating that what motivated her to continue was the perceived sense of achievement and summarised that "I pushed myself to be good at it… and I came first in class". They also exhibited socialisers. For instance, "Engaging with fellow youths at Afrika Tikkun" and "I Love working with people" were used. We are here reminded of Luckitz's statement in section 5 (*What motivated them to continue?*), summarising the participants' thoughts. For *philanthropists* and *players*, Amos stated, "learning computer skills, driving skills towards a learner's / driver's license, and having job readiness training" made him start the training at Afrika Tikkun. Luckitz, Rea, and Luzu also echoed this sentiment.

This finding supports the conclusions from Şenocak and colleagues [53] in their study on open and distance learning (ODL). Although their work focussed on ODL systems in education, the personalities of gamefully designed systems for learning seem to be the same regardless of the learners' backgrounds.

6   Conclusion

Prioritising the training of marginalised youths for high skills is one solution for dealing with unemployment. Nevertheless, engaging youths to learn these skills can be challenging. In this vein, we explored and presented gameful elements that can be used to engage and motivate youths from marginalised communities. In addition, we showed how these elements could be incorporated into a gameful system. This paper extends the work on gameful elements in learning within a particular context [8], using lived experiences.

The paper also provides a localised framework (and user flow) on how to incorporate game elements within the context of unemployed youths in marginalised settings (like informal urban areas in South Africa). Designers and stakeholders can duplicate the conceptualised gameful design and test for engagement and motivation among other youth groups.

While the study followed a meticulous process, we focused on an in-depth understanding and not on generalising findings across all youth groups. The limitation

of only collecting data from an urban marginalised community is noted, and further research may be required across similar communities and rural areas across South Africa. Finance, time, and COVID-19 lockdown regulations also affected taking this concept into development and further testing the system.

Considering the above limitations, expanded research with youths from other urban marginalised communities and rural areas would be advisable. Through the identified gameful elements and user flow framework, future research could test if these resonate with different groups and if they can stimulate engagement and motivation. Finally, the user types could be verified using the HEXAD framework.

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