Fostering creativity through gamification: a case study of the Information Technology industry

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Abstract

In an era of information explosion, cut-throat global competition and fast-paced innovation, small software companies have no alternative but to be more creative. This thesis aims to investigate the impact of using gamification as a creativity fostering mechanism on the proliferation of creative ideas in Banan Information Technologies, a small software development company in Sudan. Through quantitative and qualitative analysis, the thesis studies gamification's influence on the number and quality of ideas proposed within the gamification experience. To better quantify quality, certain software quality assessment metrics, inspired by the industry's best practices, were utilized and adhered to by a cohort of software experts. The case study presented in this thesis aimed to understand not only the direct impact of the utilization of gamification as a creativity catalyst, but also – through deep, hours-long interviews – strived to grasp the wider cultural and psychological ramifications of employing such mechanism. Gamification was found to have a strong impact on the number of ideas proposed over the tenure of the study, with the total number of ideas jumping almost fourfold in comparison to the number of ideas reported in an equally-long period prior to the introduction of gamification. The quality of proposed ideas deteriorated, however, averaging only half of the records reported over the said prior period. Through qualitative analysis, the researcher tried to investigate the reasons behind these figures. Interviews revealed myriad factors that may have affected the quantity and quality of ideas, ranging from peer pressure and internal campaigning within the company to fearing that one's high-quality idea will be lost in the midst of mediocre ideas.

Key-words

Gamification, Creativity, Fostering Creativity, Agile and Creativity, Creative Agile

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Stockholm, 2015
Ayman Idris

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1. Introduction

The aim of this thesis is to investigate whether gamification can be used as a catalyst to encourage creativity within a small software development company. This thesis will reflect on the introduction of a web-based gamified system designed to reward creativity with game-like elements (points and leaderboards) in Banan Information Technologies, a Sudan-based software development company.

Within the scope of the thesis, creativity refers to proposing novel and practical ideas that are intended to enhance the products (ideas for new features, creative solutions to challenging programming problems…etc.) as well as the processes (e.g. suggestions to further optimize the agile development process).

The thesis employed quantitative and qualitative data collection and analysis techniques to discern the relationship between the introduction of the gamification technique and the proliferation and quality of new and creative ideas. Viability and practicality, along with the perceived impact of said ideas on the products and processes, the timescale and degree of novelty are some of the factors used to judge the quality of proposed ideas.

1.1 Background

“Imagination is more important than knowledge. To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination”— Albert Einstein

“All great deeds and all great thoughts have a ridiculous beginning.” — Albert Camus

“Creativity is the process of bringing something new into being. Creativity requires passion and commitment. It brings to our awareness what was previously hidden and points to new life. The experience is one of heightened consciousness: ecstasy” (May, 1994, p. 120).

Creativity is one of those concepts that people viscerally understand but can’t aptly explain (Sternberg, 1995). This thesis intends to investigate the impact of using a novel methodology (namely, gamification) to incentivize creativity. It is therefore of paramount importance to first define what creativity is, and why is it important in this day and age for businesses (and software development companies in particular) to be creative.

Oldham & Cummings (1996, p. 612) define creativity as "products, ideas, or procedures that satisfy two condition: (l) they are novel or original and (2) they are potentially relevant for, or useful to an organization". This is - by no means - a unanimous definition, as researchers are still at odds over what exactly constitutes or characterizes a creative idea or person (Kaufman et al, 2009). Couger (2009) summarized more than 100 different definitions of creativity. Kaufmann (2003), for instance, suggested distinguishing between creativity used to tackle greater problem (Big C) and that used to tackle simpler, more workaday problems (little c). He hypothesized that each 'type' of creativity has its own metrics, motivators and characteristics.

For the purposes of this thesis the aforementioned Oldham & Cummings (1996) definition was used, because – despite their disagreement on which **other** factors need to be added in order to fully identify creativity – the majority of researchers regard **novelty** and **practicality** as the bedrock of creativity (Mueller et al, 2011).

The importance of creativity in the business world cannot be overstated (Sandle, 2004). A creative company – one is defined by Robinson & Stern (1997, p. 113) as "a company is creative when its employees do something new and potentially useful without being directly shown or taught." – has the chance not only to withstand the massive tide of globalization and the fast pace of technology development, but also to thrive and capitalize on it (Sandle, 2004). This corporate 'obsession' with creativity – according to Richard Florida (Florida, 2002) – is due to the current global context in which copious amounts of information are being passed across the globe. It is, therefore, vital to a company's competitiveness to know what to do with that stream of information. This shifts the focus back to the people, as it is the people who make sense and create value of this relentless torrent of data. Florida (2002) famously said "Access to talented and creative people is to modern business what access to coal and iron ore was to steelmaking."

The software industry is an example of such realm, in which a company has to either be creative or perish (Gu & Tong, 2004). According to Glass (1994), there are two main aspects of software development: creativity and discipline. Glass (1994) points out that software construction is – in essence – a rather complex problem-solving activity, one that needs creativity to be tackled.

Dybå (2000) argues that for small software companies in particular the environment is constantly changing and unpredictable, and therefore it's counterintuitive for software development activities in such companies to be confined within pre-established 'best practices'. Instead, Dybå suggests that small software companies need to be in an incessant pursuit of creativity. One way to do this, according to Dybå (2000), is by

focusing on the relationship between the two aspects of software development (namely, creativity and discipline).

Howland (2009) suggested creating a culture that embraces, encourages and rewards creative ideas as an essential first step towards fostering creativity in the workplace. Some of the techniques Howland (2009) suggested to achieve this included publicizing successful ideas pitched by employees (through company newsletters, internal websites…etc.), engaging upper management in welcoming and rewarding creative ideas and creating friendly creativity contests among the company's employees.

In this thesis, a case study was conducted in which gamification was used to employ some of the above-mentioned creativity-fostering techniques.

Gamification – commonly defined as the "use of game design elements in non-game context (Deterding et al, 2011, p. 17) - rose quickly in the past few years from its humble beginnings as a maverick technique to mainstream popularity. In 2011, Gartner, a world-leading IT research company, predicted that by 2015 "More than 50 percent of organizations that manage innovation processes will gamify those processes" (Gartner, 2011).

This surge of popularity is well reflected in the growing number of academic publications on the topic of gamification. A quick search on Google Scholar reveals that between the years 2000 and 2010, there were only 268 academic publications on gamification. Between 2010 and 2015, however, the number of publications on gamification was multiplied almost 40 times, totaling 10,300 academic papers to date.

Though popular, there are very few empirical studies about the impact of gamification on fostering creativity in general (Kalinauskas, 2014), and none about the impact of gamification on fostering creativity in the software development industry. In one of the few papers written on the topic of gamification's role in encouraging creativity, Kalinauskas (2014, p. 6) acknowledged that "although gamification is gaining more public attention, studies that would reveal its relations in fostering creativity are lacking". Kalinauskas (2014, p. 6) went on to say "by developing further research in the use of gamification while fostering creativity it is possible to determine, whether or not the "creative domains" should apply more measures of gamification in their activities". This perceived research gap motivated the researcher to conduct this research.

1.2 Research objective and research question

The objective of this research is to investigate the impact of applying gamification as a principal creativity motivator in a small software development company. Through a case study conducted in Banan Information Technologies and presented in this thesis, the

research will explore gamification's impact, manifested through two distinct features: the number of ideas proposed through the gamified system, and the average quality of those ideas. Therefore, the research question is:

What is the impact of using gamification as a creativity catalyst on the proliferation of creative ideas in a small software development company?

1.3 Delimitations

The theoretical and empirical delimitations of this study are briefly summarized as follows:

1.3.1 Theoretical (conceptual) delimitations

Following the inverted pyramid paradigm, the literature review chapter starts with a rather broad analysis of the concept of creativity and then narrows down to the contemporary perspective on creativity in the modern workplace. This is followed by a more narrow-scope, detailed analysis of the challenges faced by software development companies (particularly the small ones) and why is creativity absolutely essential to their survival.

Next, the concept of games will be discussed broadly in an attempt to theorize why games are so engrossing, then we'll delve into the topic of gamification and its wide range of applications. At the bottom of the theoretical framework pyramid there will be a discussion of the niche application of gamification as a creativity catalyst, along with a broad discussion of the ethical concerns regarding the implementation of gamification.

1.3.2 Empirical delimitations

The analysis of the gamified experience intends to understand the impact of gamification on creativity, expressed through the number and quality of new proposed ideas. The ideas employees can post are primarily related to the enhancement of products, programming-wise (algorithm optimization, tips to enhance code quality/readability, enhance code performance…etc.) as well as the agile process. Ideas related to the overall organizational context (how to provide a better customer service, how to better market the products…etc.) are not included within the scope of this thesis, as those require different metrics and frameworks for assessment and rating.

Another delimitation is that the targeted impact study focuses primarily on the number and quality of proposed ideas. It is acknowledged that the impact of gamification could be investigated through myriad parameters (culture permeating the company as a result of gamification, for instance), but the decision of focusing on those two specific

parameters was made (number and quality of ideas) because they are quantifiable, less subjective and easier to present and compare to historical data.

1.4 Limitations

Since it's based on a case study conducted in a company, the researcher cannot assume that the findings of this research can be generalized to other software companies without considering the cultural, methodological and technical factors associated with this particular case study.

Another limitation is that despite the established assessment guide for the panel of adjudicators to evaluate ideas and score them accordingly, rating is – in essence – inherently subjective.

Another limitation is related to the comparison of quality and quantity of ideas proposed before and within the gamification system. Even though the number of employees in both periods is roughly the same and that the number of active projects is also the same, gender representation is rather different. In the pre-gamification era, 34% of employees were females, compared to only 11% during the run of the gamified system. This thesis cannot conclude whether the higher female representation in the pre-gamification period played a role in the higher average quality of ideas proposed during that period. Further research in this area is needed in order to investigate whether there's a discernable gender-based difference in response to gamification incentives.

The company's bylaws prohibited me from publishing the ideas proposed through or before the gamification system, and also from publishing snapshots of the actual gamified system in the appendix section of this thesis. This may constitute a limitation particularly when the graphical elements employed in the gamified portal are described.

1.5 Disposition

This thesis comprises seven chapters, delineated as follows:

Chapter 1: Introduction – A general outline of the motivation, framework and setting of the thesis. Important concepts are defined, and the target research question and objectives are identified. This chapter also comprises an analysis of the delimitations and limitations associated with this research, along with a brief description of the thesis' structure and disposition

Chapter 2: Literature review –aims to present the reader with the existing theoretical work necessary to understand and analyze the impact of gamification on creativity fostering. This chapter comprises a literature-based analysis of concepts such as creativity, games, gamification and game-based incentives. The chapter also features an analysis of creativity's importance to business in general, and to software development companies in particular.

Chapter 3: Research methodology – A description of the research methodology used throughout the thesis. Different approaches to data collection and analysis are discussed, culminating in defining the approaches believed to be the best fit for purposes of the research, along with a general analysis of their credibility and limitations.

Chapter 4: Empirical findings – In this chapter, quantitative data from the gamification period (general information related to the context of the case study, detailed information about the ideas presented and collected from the gamified system as well as the scores the adjudicators gave to ideas), in addition to quantitative data from a period prior to the introduction of the gamification technique (number, averages and aggregates of ideas quality) as well as qualitative data (summary of the results of interviews conducted with employees in the company) are presented.

Chapter 5: Analysis – In this chapter, the collected data (both quantitative and qualitative) is analyzed in order to answer the research question. Throughout this chapter, the wider context of the 'non-quantifiable' aspects of applying gamification in this company (impact on company's culture, team members solidarity…etc.) is also analyzed.

Chapter 6: Conclusion – Sums up the discussion on the topic by summarizing and presenting the findings of the research leading up to the conclusion.

Chapter 7: Future research – There are myriad topics connected to gamification in general and the application of gamification on creativity fostering in particular that could further advance our understanding of the topic and elevate the application of gamification in the corporate world. This chapter discusses a wide range of gamification-themed research topics, from the role of culture and conformity on the relative success of gamification to the impact of the graphical design of a gamified portal on its popularity and appeal.

2. Literature Review

This chapter aims to present the reader with the existing theoretical body necessary to understand and analyze the impact of gamification on creativity fostering. This chapter comprises a literature-based analysis of concepts such as creativity, games, gamification and game-based incentives. The chapter also features an analysis of creativity's importance to business in general, and to software development companies in particular, along with a broad discussion of the ethical concerns regarding the implementation of gamification

2.1 Creativity

2.1.1 What is creativity?

J. P. Guilford's 1950 presidential address to the American Psychology Association, in which he initiated the call to define, measure and improve creative ability (Guilford, 1950), is heralded as a defining step in incentivizing academics to study the topic of creativity, a topic – back then – was still perceived to be elusive and nebulous (Guilford, 1950). Significant strides have been made since then in attempting to define creativity and in devising frameworks to measure it (Meusburger, 2009). Hennessey & Amabile (2010, p. 35) defined creativity as "the generation of products or ideas that are both novel and appropriate" thus, highlighting the importance of doing something **novel** (i.e., something that is unique, inventive or somehow out of the ordinary) as well as **appropriate** (in regard to practicality and perceived benefits) in order to be creative. This definition is primarily relied upon in traditional tests of creativity, such as the "unusual uses" test (Meusburger, 2009). The pillars of creativity according to Hennessey & Amabile (2010), namely novelty and practicality, are also echoed in more elaborate and widespread definitions of creativity, such as the one offered by Oldham & Cummings (1996, p. 612), In which creativity was defined as "products, ideas, or procedures that satisfy two condition: (l) they are novel or original and (2) they are potentially relevant for, or useful to an organization". This definition has become ubiquitous throughout academia and in textbooks that aim to explain the defining traits of creativity (Meusburger, 2009). It emphasizes the 'divergent' nature of a creative idea (being different from the norm, out of the ordinary), and points out that creativity combines both divergence and relevance (a slightly different take on the appropriateness trait discussed earlier, so that relevance to what's at hand – as well as the overall

practicality and benefit of the idea – are taken in consideration) (Meusburger, 2009). Meusburger points out that labeling an idea as 'divergent' or 'relevant' is highly subjective. An idea that is perceived to be groundbreaking by an individual or a company might be considered ordinary by another, and the same applies to relevance. Meusburger (2009) therefore argues that what is deemed to be 'creative' is highly culture and context-specific.

2.1.2 Creativity as a multi-layered concept

Woodman et al (1993) proposed a multi-layer construct of understanding creativity in which individual, team and organizational characteristics form an intricate system within a wider cultural and social context, in which creativity flourishes. Figure 1 describes the mapping and relationship between the different layers within this construct.

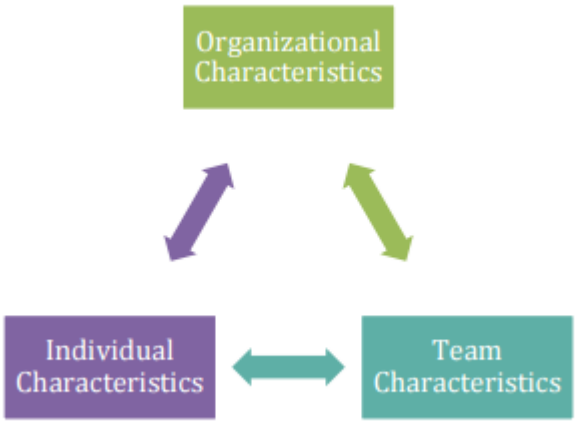

Figure 1: Creativity characteristics mapping and relationships (Woodman et al, 1993)

Mumford & Hunter (2009) highlight control, structure, advocacy and resources as critical factors for encouraging creative behavior on an organizational level. Mumford & Hunter (2009) also point out that less hierarchical organizations with less barriers between employees are considered to be more supportive of creative endeavors on individual, team and organizational levels.

An organization can also foster creativity on an organizational level by becoming a 'learning organization' – that is, an organization in which there are well-defined structures for codifying, sharing and institutionalizing knowledge (Drazin & Kazanjin, 2012). Such organizations, Drazin & Kazanjin argue, have a solid knowledge sharing and retrieval foundation upon which new knowledge can be formulated.

2.1.3 Individual and collaborative creativity

2.1.3.1 Individual creativity

Creativity has long been regarded as an individual trait (Shalley & Zhou, 2008). The importance of individual creativity transcends individual idea generation to providing a basis for a more collaborative idea generation process (Shalley & Zhou, 2008). To highlight the relationships between internal (individual) and external (collaborative) factors influencing creativity, Amabile & Mueller (2008) presented a conceptual model for a comprehensive, componential theory of creativity. The components and major influences of the model are presented in Figure 2.

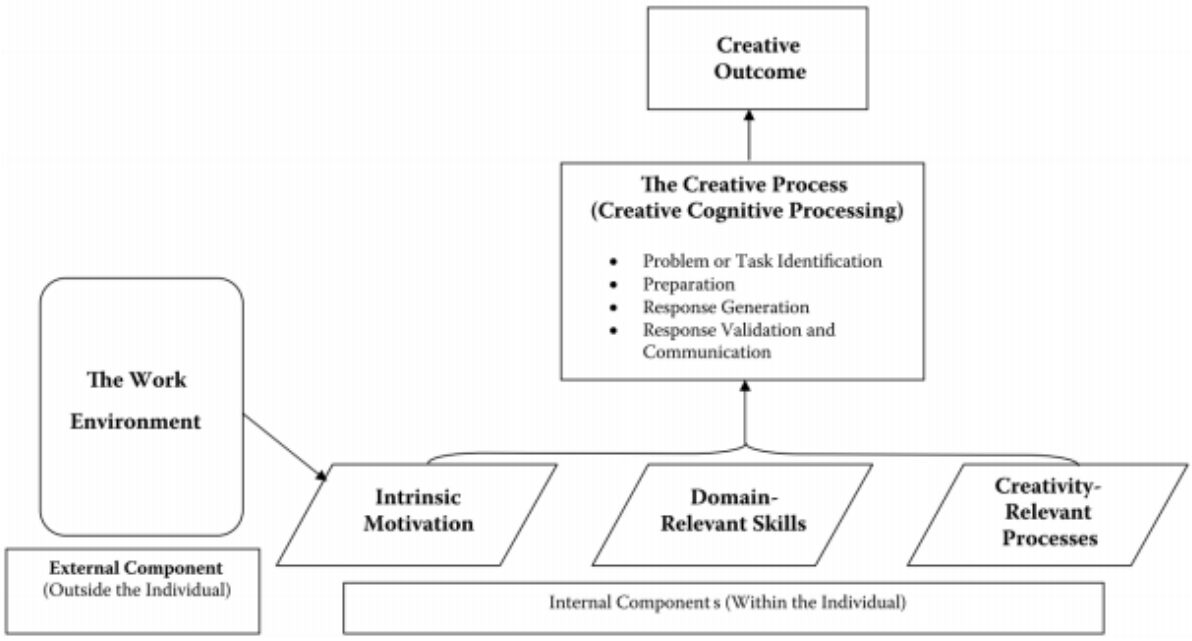

Figure 2: Amabile and Mueller's conceptual model of creativity (Amabile and Mueller, 2008)

The internal components of the model (skills and traits exhibited by the individual, such as intrinsic motivation, domain relevant skills and creativity-relevant processes) work together to facilitate the creative process. Amabile & Mueller (2008) pinpointed the importance of domain-specific skills in furthering creativity in said domain, as it would be impossible for one to make strides in a field without being adequately knowledgeable in it. Regarding creativity-relevant processes, Amabile & Mueller (2008) recount that "Creativity-relevant processes (originally called creativity-relevant skills) include a cognitive style and personality characteristics that are conducive to independence, risk-

taking, and taking new perspectives on problems, as well as a disciplined work style and skills in generating ideas." (Amabile & Mueller, 2008, p. 35).

The intrinsic motivation component is primarily concerned with the influence of factors such as one's interest in solving complex problems and the perceived level of challenge involved in attempting to offer creative solutions. (Amabile & Mueller, 2008).

2.1.3.2 Collaborative creativity

Hargadon et al (2006) hailed the rise of the collaboratively creative team as a new way of perceiving creativity, one that can complement or even supplant the individual-centric perception of creativity. In collaborative and creative teams, team members collaboratively utilize their knowledge, skill, unique backgrounds and motivations in order to formulate unified and creative solutions to tackle the challenges they face as a team (Hargadon et al, 2006).

Sonnenburg (2004) emphasized the importance of effective communication and facilitating knowledge sharing to the viability of collaborative creativity. Discussing the various factors influencing the effectiveness of collaborative creativity, Sonnenburg (2004, p. 84) stated "The phenomenon of communication is crystallized as the driving force for collaborative creativity".

Paulus et al (2011) proposed an extension to the woodman's multi-layer model (woodman et al, 1993) shown in figure 1, by delineating additional components that are primarily concerned with how knowledge is shared and the mechanisms facilitating ideas flow between individuals across the team. Figure 3 depicts the collaborative creativity model proposed by Paulus et al (2011).

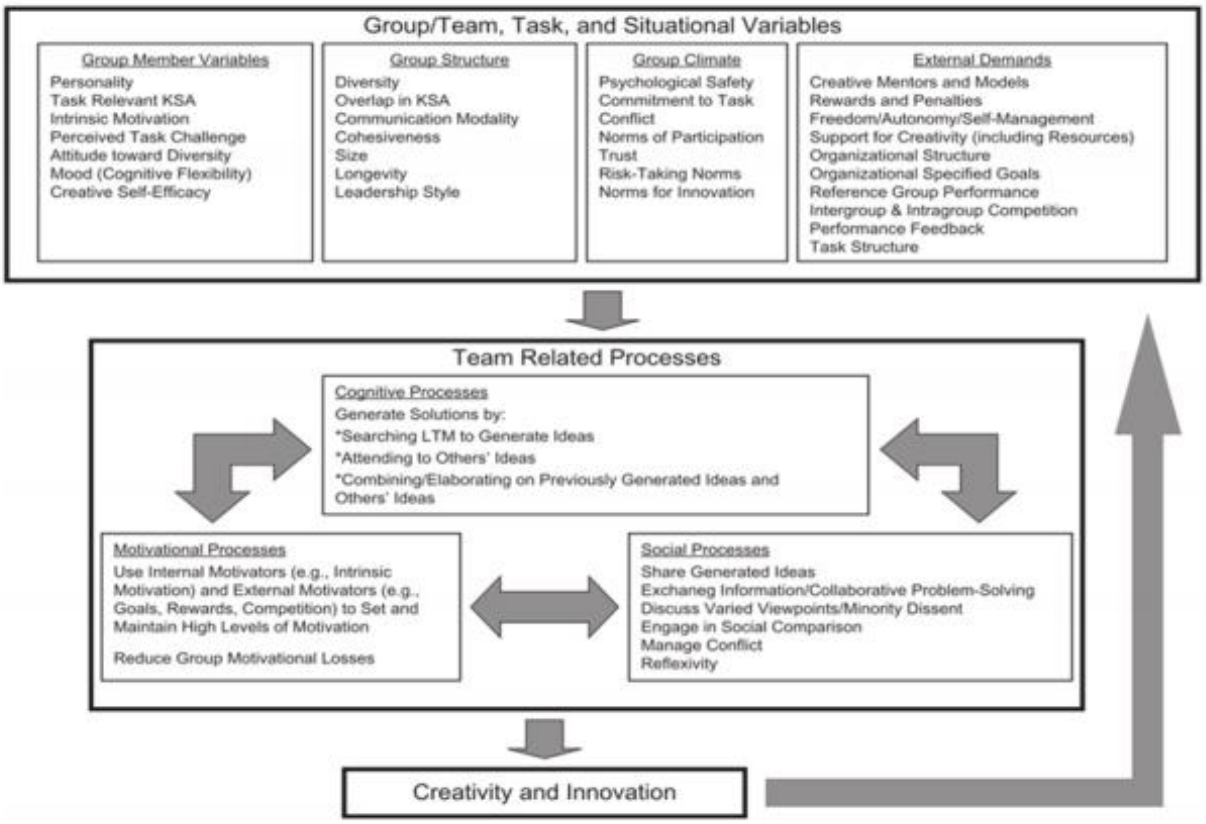

Figure 3: Input-process-output model of collaborative creativity (Paulus et al, 2011).

2.1.4 Creative climate

Ekvall (1996) coined the term "creative climate" and defined it as "an attribute of the organization, a conglomerate of attitudes, feelings, and behaviors which characterize the organizational life" (Ekvall, 1996, p. 110). Creative climate, according to Ekvall, is the offspring of the company's culture. Denison (1996) drew attention to the overlapping and sometimes confusing intersection of the constituent dimensions of organizational climate, organizational creativity, organizational culture and creative culture. To uniquely identify creative climate, Ekvall proposed ten defining features/dimensions: **Challenge**, **Freedom, Idea support**, **Trust/Openness**, **Dynamism/Liveliness**, **Playfulness/Humor**, **Debates**, **Conflicts**, **Risk taking**, and **Idea time** (Ekvall, 1996).
The research conducted by Lin & Liu (2012) proposed an alternative paradigm to fostering a creative climate within an organization, one that is creative achievement – and not country or culture – focused. Hunter et al (Hunter et al, 2007) showed that creative climate is every bit as important in non-profits and manufacturing plants as it is in research and development facilities, the traditional powerhouses for creativity and innovation.

2.1.5 Creative idea generation

The ability to generate ideas is the concrete manifestation of one's creativity (Garnham & Oakhill, 1994). The prevailing opinion about idea formation, one that is shared by Greek philosophers such as Aristotle and Plato and modern-day psychologists alike, is that idea formation can be explained as a chain of associations (Garnham & Oakhill, 1994). Gilhooly (1988) argued that imagination is absolutely vital in facilitating the thinking process, as it is the imagination that enables idea association. The development of thinking, according to Gilhooly (1988) is the ability to **accumulate** associations. Hence, an individual's capacity for solving problems can be attributed to their capability of formulating and accumulating associations (Gilhooly, 1998).

Stein (2014) suggested that associations occur when two stimuli occur **together** (contiguity), when two stimuli are **similar** to each other (similarity), or when two stimuli are **different** from one another (contrast). These stimuli can be environmental factors, previous associations, stimuli relayed through ideas related to other associations, or a combination of two or all of these factors (Stein, 2014).

According to the theory of Associationism (Shanks, 2007), when an individual comes up with an idea, this idea could have resulted from a powerful combination of ideas that were **already** in his or her tacit knowledge but haven't been connected before. This implies that our brains have the ability to create their own associations (Shanks, 2007). Mednick & Mednick (1964) discussed the relationship between association and idea formation. According to their model, association impact ideas generation in three ways: **Serendipity,** in which association of ideas seems to be taking place accidentally (Kellogg's invention of toasted corn flakes, for example), **Similarity,** in which ideas are associated because they share the same dimension (the kind of ideas a domain expert often gets to solve complex problems in his or her field) and **Mediation,** in which one idea can trigger the generation of a seemingly unrelated idea because of their shared associations.

2.2 Creativity in Business

2.2.1 Why should any company be creative?

Companies face challenging, new and different situations almost constantly (Rickards, 1991). It is often difficult to tackle these challenges in a conventional way, utilizing only the knowledge, skill and expertise the company has managed to amass over the years (Rickards, 1991). Majaro (1991) discussed the inherent limitation of relying solely on logical thinking to devise solutions to unconventional problems, as it is the very nature of logical thinking to progress in a series of steps, each depending on the one before,

resulting in the final solution being largely dependent on the very foundation of knowledge or expertise upon which this logical paradigm was established. This paradigm, Majaro (1991) argues, can offer little help in the face of unprecedented change in the company's surrounding environment.

In the past few decades creativity gained a lot of hype in the business world (Munir et al, 2010), which resulted in considerable research being conducted on the role of creativity in the modern company (Munir et al, 2010). The corporate world's interest in creativity intensified as the pace of change got faster, and the problems business faces in the era of hyper connectivity and globalization became ever-so-complex (Munir et al, 2010). According to Rickards (1991, p. 99), fast-pace change "…was causing 'Future shock' and social disorientation". Oldham & Cummings (1996, p. 620) noted that "numerous commentators have argued that enhancing the creative performance of employees is a necessary step if organizations are able to achieve competitive advantage".

To be able to aptly identify and tackle an ever-growing number of unique challenges that arise in business, it is imperative that the problem-solving capabilities of those in charge be challenged. This may include, in most case, a re-structuring and re-development of the process used to identify and approach problems, in order to produce new ideas and perspectives (Levitt & March, 1988).

Stiff competition in business may have also been one of the reasons that prompted companies to try to become more creative (Van Gundy, 1987). In an increasingly competitive world, a company's survival is directly dependent on its ability to stay ahead of its competitors by offering new products or services, and by constantly optimizing and refining its processes (Van Gundy, 1987).

2.2.2 Software development and creativity

Within the context of software development, creativity is referred to as an "intellectual and social activity which it is carried out by cognitive processing activities, and is influenced by factors such as emotions and mood" (Khan et al, 2011, p. 250). This definition emphasizes the 'psychological' aspect of creativity, by highlighting the non-quantifiable and non-intellectual influencers of creativity within software development (one's mood, for example).

Ever since its inception, software development has always been associated with creativity (Crawford et al, 2012). This could be attributed to the fact that despite the monumental advancements in developing easy-to-use programming languages that shifted most of the burden from developers to machines, the context in which software

development takes place (juggling customer requirements and business needs along with technical dimensions, within pre-specified cost, quality and time constraints and surrounded by ubiquitous unpredictability) – this necessitates creative, out-of-the-box thinking in order to maneuver seemingly contradictory circumstances (Dybå, 2000). Small software companies, in particular, have to be more creative because of their extreme susceptibility to changes within their environment (Dybå, 2000).

Crawford et al (2012) point out that most research conducted on creativity in software development focused on the impact of introducing creative techniques to further optimize requirements engineering (the process of eliciting requirements from the software product's intended users, a prelude to software construction), and neglected the core software development activities (software construction and coding).

Ciborra (2002) draws attention to the role **improvisation** plays in influencing software developers' creativity. Improvisation is a "process of making sense of incoming working events and developing ad-hoc solutions, where thinking and action seem to occur simultaneously" (Ciborra, 2002, p. 115). Even the most precise and least flexible procedures and methods for software development don't detail every single step necessary for implementation and construction, and therefore improvisation is an absolutely vital skill for a software developer (Ciborra, 2002). Improvisation is nourished by the developer's knowledge and experience and his or her understanding of the business domain to which the software product will be introduced, but it is also an innately creative act which is influenced by factors such as mood and emotions (Ciborra, 2002).

2.3 Games and gamification

2.3.1 The theory of games

Gamification may be a new concept, but games aren't. There's archeological evidence that cave men indulged themselves in games and game-like time-passing activities (Bunchball, 2010). Further research (Dignan, 2011) concluded that it's not only humans who find games engaging and rewarding. An investigation into the animal kingdom prompted the hypothesis that evolution tuned our brains in such a way that we find games engaging, intriguing and fun (Dignan, 2011). In other words, we are programmed to like games. Through millions of years of evolutions, our brains became adjusted to releasing enough endorphins to gratify us as a reward for engaging in self-preserving or skill-honing activities (Dignan, 2011).

The gaming industry is expected to total 111 billion USD in 2015 (Gartner, 2013). The sheer size of this industry prompted researchers to try to analyze and understand the

visceral drivers behind the allure of games and gaming (Dignan, 2011). In his emblematic article Alief and Belief, Gendler (2008) explains why we seem to be enthralled by winning points or unlocking new levels in a video game, even though we know full well that those winning will not yield any materialistic or physical gain.

Gendler (2008) argues that while engaging in games, the illogical, primitive part of our brains takes over, a mental state he calls "alief". Alief is, according to Gendler, "A mental state with associatively linked content that is representational, affective and behavioral, and that is activated—consciously or unconsciously—by features of the subject's internal or ambient environment. Aliefs may be either occurrent or dispositional." (Gendler, 2008, p. 640). Which, in short, means that non-physical stimuli may have the same effect on one's responses as real-life stimuli. An example will be feeling sad after watching a tragic movie, or feeling scared after watching a horror movie. The logical part of our brains knows that this is mere acting, but because those movies placed us in an "alief" state, our brains respond and form reactions akin to those of real situations (Gendler, 2008). Following the same concept, winning extra bonus points for slaying a video-game monster, or being placed in a hall-of-fame of a video game for scoring higher than your friends who also play the game will trick your brain into releasing the same kind of endorphins associated with achievement and fulfillment, typically elicited when one's accomplishments are being acknowledged by one's peers (Gendler, 2008).

The idea of using games as motivators in a business context might sound a bit outlandish to some. After all, we've been brought to believe that "work" is no fun and "games" are all fun (Dignan, 2011). The mere term "fun work" might be branded as an oxymoron (Dignan, 2011). Yet, a study (McGonigal, 2011) has found that, unlike popular belief, we're happiest when we're engaged in hard work that's bordering on our skill level. McGonigal argues that it's because most tasks in the normal work environment are mundane and don't even begin to scratch the surface of people's skill limits that we find them boring and unengaging (McGonigal, 2011). McGonigal observed a high level of commitment and corresponding fulfillment with players engaged in challenging video games. The reason, McGonigal argues, is that those video games push players to the very limits of their skill set, much like a hard yet attainable educational task within one's intellectual capability (McGonigal, 2011).

2.3.2 Gamification

2.3.2.1 Background

In a nutshell, Gamification refers to the application of game elements in non-game contexts (Gartner, 2011). Deterning et al (2011) elaborated on the various applications

of gamification in myriad industries, such as healthcare, education and manufacturing, and in different units or departments within an organization (human resources, sales and marketing…etc.). Flatlaa et al (2011) hypothesized that by identifying "game elements" i.e. game components that make games fun and engaging, we can systematically inject said elements in non-game contexts (such as in a business context) with the goal of achieving a similar level of engagement, motivation and commitment from targeted individuals (Flatlaa et al, 2011).

Within the context of gamification, there is a need for a more precise definition of what exactly is the kind of "game" we're referring to, since the word "game" is rather broad Dignan (2011). Dignan (2011) introduced the concept of "behavioral game" to further limit and precisely define what a "game" is as far as gamification is concerned. Simply put, a behavioral game – according to Dignan – is a game that makes seemingly humdrum daily activities more engaging, by utilizing a set of game elements that would envelop said activities and make them "fun" (Dignan, 2011).

Dignan (Dignan, 2011) introduced a framework for understanding, analyzing and building behavioral games. This framework, known as "the game frame", has ten constituent, interrelated components, namely: the **activity**, **objectives**, **player profile**, **outcomes**, **action**, **feedback**, **blackbox**, **skill**, **resistance** and **resources** components. The premise behind the game frame is that the integration of these ten modules will create an engaging behavioral game. Figure 4 denotes the constituent components of the game frame.

Figure 4: Dignan's game frame (Dignan, 2011)

The **activity component** refers to the particular "non-game" context that is sought to be enhanced or made more fun through gamification (Dignan, 2011). In this thesis, the activity component is idea generation and creativity.

The **objectives component** refers to the goal of playing the behavioral game, from the player's perspective. The long-term goal might be, for instance, winning the game. While a short-term goal might be securing enough points to level up in the behavioral game before any other player. Dignan specifies that the key to an engaging behavioral game is remembering what draws people to games in the first place: challenges within their skill level (Dignan, 2011).

The **player profile component** is the trail of actions or behavior of players along the behavioral game. Players often take pride in the choices they make along the game, and they regard their profile as a monument for their accomplishments (Dignan, 2011).

The **outcomes component** refers to the consequences of playing the game (gaining points, badges…etc. for good performance. Losing points, relegation for bad performance) (Dignan, 2011).

The **action component** refers to the moves the player can do within the game (Dignan, 2011). In this thesis, in which a behavioral game is intended to encourage employees to participate by pitching ideas, the actions undertaken by the players include posting a creative idea.

The **feedback component** represents the game's response to the player's actions. For instance, in the aforementioned creativity-fostering behavioral game, the game's feedback to the player participating with ideas is rewarding that player with points, badges…etc. (Dignan, 2011).

The **blackbox component** refers to the "game engine"; the repository for the game's logic, rules, and data. The blackbox is the entity (probably a computer program) that keeps track of the player's points, levels, badges…etc. It also enforces the game's rules, and it's the player's primary point of contact with the game (Dignan, 2011).

The **skills component** refers to the competencies developed and enhanced throughout the behavioral game (Dignan, 2011).

The **resistance component** refers to the opposition/adversity a player may face while playing the game. This could be represented as unexpected turns and twists along the game, or by introducing zero-sum competition (Dignan, 2011).

2.3.2.2 Pitfalls of gamification

Several studies have investigated the perceived shortcomings and pitfalls of gamification (Pihl, 2012). As it is often the case with trends and technologies that generate a lot of

hype, gamification was introduced to the world as a fit-for-all solution (Pihl, 2012). The fervor in adopting gamification resulted in massive disappointment because without properly and thoroughly understanding what gamification is and how to effectively use it, the performance of the majority of the introduced behavioral games in different contexts was poor. This lead to a retraction movement where objective analysis was necessary to evaluate gamification (Pihl, 2012).

Pihl (2012) and Robertson (2010) both pointed out that designers of behavioral games (also referred to as gamified systems) often mistake the true essence of games (i.e. what actually make games fun) and reduce it to points, badges and Leaderboards (collectively known as PBLs). Robertson (2010) referred to this approach as **pointsification**, rather than gamification.

An inherent challenge to applying gamification in a business context is the level of complexity of said context (Pihl, 2012). It is rather difficult to simplify an intricate system of inputs, procedures and relationships to a behavioral game with a fixed set of rules defined within the game's blackbox (Pihl, 2012).

Another challenge to applying gamification in a non-game context is the nature of reward (intrinsic vs. extrinsic) typically associated with gamification (Kapp, 2011). Kapp (2011) pointed out that the nature of gamification that emphasizes extrinsic rewards (points, badges…etc.) and pushes the player to strive to gain more of those extrinsic rewards (competition, leaderboards…etc.) can severely undermine intrinsic rewards (self-satisfaction resulting from skill mastery, for instance), which may be detrimental to the overall health of the business.

2.3.2.3 Gamification as a creativity catalyst

Since technology itself is the product of creativity, using technology to foster creativity is nothing new (Kalinauskas¸2014). Creativity, and the ability to conceive new and inventive ideas, is among the most-researched topics in psychology (Mumford, 2003).

Since gamification tries to get the user engaged with an activity, it might be necessary in this particular context to examine the relationship between "flow", the indescribable state of joy one feels when doing an appropriately challenging and engrossing task, and motivation (Kalinauskas¸2014). The "Flow theory" examines a state of satisfaction or euphoric happiness (Csikszentmihalyi, 2014). People in a state of "flow" are those, according to Csikszentmihalyi (2014, p. 34) who "feel they are engaged in a creative unfolding of something larger", whether it's a video game, sport competition, an intriguing logic puzzle or a challenging programming conundrum. The "flow" is directly related to the being engaged (Kalinauskas¸2014). "Flow", writes Csikszentmihalyi (2014,

p. 35) is a "line between boredom and anxiety, when a subject is challenged enough to be interested".

Groth (2012) attempted to utilize "flow" in gamification, by calling to modify gamified environments to induce a state of "flow" among the players. Macdonald, Byrne and Carlton (2006) conducted a study designed to investigate the relationship between flow and creativity in musical education. The authors note that "higher levels of flow are related in a number of important ways to higher levels of creativity and higher quality compositions" (Macdonald et al, 2006, p. 301). The authors also pointed out that gamification should be developed cautiously when the desired outcome is related to the creative output of the group, not the individual.

So, in short, gamification can be used to elicit and foster creativity by utilizing its game-like characteristics to send the player into a state of flow, which would release the player's inner-most creative tendencies.

2.3.3 The ethics of gamification

Several studies (Von Ahn, 2006; Von Ahn & Dabbish, 2008; Siorpaes & Hepp, 2008) show that they key motivation for people to participate in a gamified experience is to be entertained, not to solve problems. This implies that in order to develop a gamified experience that would ultimately lead to the solution of a real world problem, gamified system developers need to utilize potent persuasive techniques in order to get people to use the system regularly (Von Ahn, 2006). Some of these techniques, argues Albrechtslund (2007) and Llagostera (2012) are ethically questionable, including:

- Using persuasive technologies such as surveillance and conditioning to shape and reinforce human behavior and attitude
- Using technological reward and punishment to condition human behavior
- Performance monitoring and surveillance of the players' performance in the gamified experience could possibly compromise the participant's right to privacy

It is difficult to design an engaging and persuasive gamified system that doesn't compromise any of the aforementioned ethical concerns (Zichermann, 2012). Despite calls for establishing a gamification code of ethics, researchers have yet to reach a consensus on a set of foundational principles to establish the ethical framework for the application of gamification (Zichermann, 2012).

3. Methodology

This chapter presents the research methodology used throughout this thesis. Different research approaches to primary data collection were critically analyzed, reaching a decision on techniques for primary data collection/analysis that best fit the purposes of this research. Those approaches are highlighted along with a general discussion of their credibility and limitations.

3.1 The case study as a research method

3.1.1 Introduction

The research methodology used in this thesis is the case study. To examine the impact of a novel approach to foster creativity in an environment with myriad complex variables (cultural, organizational, technical…etc.), the research method has to have the ability to consider a complex research question within this contextually-rich environment (Schell, 1992). The case study approach is best suited to address the "**how**", "**why**" and "**what**" questions (Yin, 2013), by utilizing quantitative – as well as qualitative – data collection in order to produce sets of variables suitable for in-depth analysis (Schell, 1992).

Miles (1979, p. 595) defined the case study as "**an empirical enquiry which investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used**".

The definition above extends the usage of the case study as a method beyond providing a mere descriptive account of the case to achieving experimental isolation of one or more selected social factors within a real-life context, in an intellectually rigorous manner (Miles, 1979).

Contrary to the popular misconception, case studies are not limited to qualitative analysis (Collis & Hussey, 2013). Case studies can utilize quantitative – as well as qualitative - information (Collis & Hussey, 2013). The case study highlighted in this thesis employs a blend of quantitative and qualitative approaches to primary data collection and analysis.

3.1.2 The case study vs. other research strategies

The choice of an appropriate research strategy – one that is perceived to the best fit for the purposes of the research – is of paramount importance to the effectiveness of the proposed research (Schell, 1992). The decision of whether to use experimentation, survey methods, archival analysis, historical methods or case studies boils down to the researcher's assessment of three vital conditions (Yin, 2013): **the type of research question**, **the degree of investigator control possible** and **desired degree of focus on contemporary events.**

Table 1 (Yin, 2013) provides a comparative analysis of how each research strategy fares against each condition:

Strategy	**Type of research question**	**Requires control over behavioral events?**	**Focuses on contemporary events?**
Experiment	How, Why	Yes	Yes
Survey	Who, What, Where, How many, How much	No	Yes
Archival analysis	Who, What, Where, How many, How much	No	Yes/No
History	How, Why	No	No
Case study	How, Why, What	No	Yes

Table 1: Relevant situations for different research strategies (Yin, 2013)

As illustrated in the table above, defining the research question is a vital first step towards choosing a suitable research strategy (Yin, 2013). Following the definition of the research question, the level of control required and the degree of focus on contemporary events are the next most important variables (Yin, 2013). Case studies, Yin (Yin, 2013) argues, are best suited when faced with explanatory research questions, with no control required over behavioral events and with strong focus on contemporary events.

3.1.3 Different types of case studies

Case studies can be categorized into three main categories: exploratory, descriptive and explanatory (Mills, 2009). The **exploratory case study** investigates distinct phenomena that haven't been thoroughly investigated through preliminary research (Mills, 2009). It is typically used as a preliminary step towards understanding a relatively new research area where research questions haven't been fully formulated yet (Tellis, 1997).

The **descriptive case study** aims to collect information about a particular area of research without manipulating or changing the environment (hence descriptive) (Sandelowski, 2000). It is used to describe the current status of the phenomena so as to get a better understanding of the status quo regarding the conditions or variables in a situation (Sandelowski, 2000).

The **explanatory case study** uses both qualitative and quantitative research methods to delineate and describe phenomena and to discern relationships and formulate theories (Mills, 2009). An explanatory case study consists of: a) an accurate description of the facts of the case b) consideration for different and alternative interpretations of said facts c) conclusion based on the interpretation that seems most coherent (Yin, 1981).

3.2 Fostering creativity through gamification: a case study

3.2.1 Why Sudan, and Why Banan Information Technologies

The impact of introducing a gamified system on the proliferation and quality of new ideas was studied in the case of Banan Information Technologies, a small, agile-based software development company operating in central and east Africa.

The researcher's decision to conduct this research in Sudan was primarily influenced by the lack of studies on the impact of gamification in non-western countries (Steffen & Deterding, 2015). Sudan was an ideal environment for this research because, since it's the researcher's home country, the researcher expected to face minimal communication and logistical barriers hindering the progress of the research. Also, Sudan is currently witnessing an IT boom, manifested in the steadily-rising number of software development start-ups for the past ten years (Ibrahim, 2012). The researcher reckoned that the thriving IT landscape constitutes an ideal environment to test a mechanism intended to foster creativity in the IT industry.

The choice of Banan Information Technologies as the company in which the case study will be conducted was motivated by foundational, logistical and technical factors. By

foundational factors we refer to the company's vision that refers to creativity and innovation as the cornerstone of its ethos; the researcher reckoned that because of the underlying complexities associated with this research, it can go awry; therefore this research had to be conducted in a company where creativity is a much coveted trait. Logistical factors include having access to the company's CEO and upper management and having a good rapport with the company's employees. This was absolutely essential to the successful implementation of the gamified system, since it required the integration of an independent module into the company's running internal website, as well as being able to conduct thorough interviews with employees representing a wide spectrum of the company's workforce.

Technical factors refer to the company's records of creative ideas proposed since 2007. Having a historical reference was a necessary piece in order to be able to fully understand the impact of gamification.

3.2.2 The design of the case study

A web-based gamified system was developed and integrated within the company's local network and made accessible to all the branches of the company. The gamified system's constituent components (the rules and mechanics of the game, the game engine, the game portal and the game repository) were developed by the researcher, while the integration of the gamified system within the company's environment was carried out by the company's staff.

Employees can access the web portal of the gamified system and anonymously post ideas they deem worthy. A new idea post may contain a short description of the idea accompanied by an explanation of why the employee believes this idea is particularly creative.

Upon submission, the idea assessment workflow kicks in, automatically sending a synopsis of the idea to the adjudicators designated by the company. The panel of adjudicators for this case study comprised a software architect, a lead software test engineer, a business analyst, a product manager, a software developer and the researcher. Each adjudicator then rates the idea on a ten-point scale, based on assessment factors such as the viability and practicality of the idea, the perceived impact on the product or the process, the timescale and the degree of novelty. The scores awarded by the six adjudicators are then aggregated and the median is calculated to come up with a unified final score. This score will then be translated into an equivalent

number of 'game points', and the employee will level up in the game based on the number of game points he or she has managed to amass.

To answer the research question, this research had to have a reference for the sake of comparison in order to accurately estimate the impact of gamification on the number and quality of new ideas. Because the gamification case study was planned to run for 30 days, the comparison reference (the set of ideas proposed prior to introduction of the gamified system and was extracted from the company's archives) was also extracted from a 30-day period. The ideas proposed in the 30-day reference period (the ones from the archives) were also assessed and scored using the same factors used to assess the ideas proposed during the period the gamified system was up and running.

The case study concludes with a comparison of the number and median quality of ideas proposed through the gamified system to those of the comparison reference (archive) set (number and median quality of ideas proposed before the introduction of gamification). The goal was to see whether a) the total number of ideas proposed in the gamification era surpasses that of the pre-gamification era, and b) the median quality of ideas introduced in the gamification era is also superior to that of the pre-gamification era. Standard deviation was also used to investigate the variance in quality amongst the two sets of ideas: the ideas proposed through the gamified system and the ideas proposed prior to the gamified system, separately.

The thesis also investigates the atmosphere the gamified system has created within the company by interviewing employees (software developers, testers, system analysts and product managers). The thesis utilized qualitative analysis (in addition to the already-discussed quantitative analysis) to incorporate the human aspect of the experience gamification created (the feelings, attitudes and perceptions that governed people's behavior towards the newly introduced gamified system). Those aspects are vital (Patton, 1990) in deciding whether gamification can be relied-on as a primary technique for encouraging creativity and innovation in the long run.

3.3 Data collection

3.3.1 Quantitative data collection

3.3.1.1 Idea assessment metrics

As mentioned earlier, each judge gets to rate the proposed idea on a 10-point scale. The researcher relied on the work of Nasir et al (2011) on the success factors of software projects to come up with critical assessment factors and an estimation for their respected weights in order to be applied to proposed ideas.

A judge will typically rate how each idea fared against all six critical assessment factors independently, and then use the following table (Table 2) to come up with the overall final score:

Assessment Metric code	**weight**	**Critical assessment factors**	**Score** (1-10)	**Weighted score** (weight * score)
AM#1	1	Impact on code cleanliness/readability		
AM#2	1	Testability of the proposed code modification		
AM#3	2	Ease of development of the proposed idea		
AM#4	2	Resources utilization (human and otherwise) needed for the implementation of the proposed idea		
AM#5	3	Idea originality/ Innovativeness/novelty		
AM#6	3	Alignment with the company's goals/relevance		
Final score for the idea				(Weighted score/12)=

Table 2: Critical assessment factors

(The 12 in the idea assessment score denominator is the result of the addition of all weights 1+1+2+2+3+3)

3.3.1.2 Numerical data to be collected from the gamified system

- The total number of ideas proposed per day
- The total number of ideas proposed during the entire 30-day period
- The number of ideas proposed per department (software development, software testing…etc.) both per day and total
- The quality score of all ideas proposed during the entire 30-day period
- The median quality of ideas proposed per day

- The median quality of ideas proposed during the entire 30-day period
- The standard deviation of the quality amongst the entire set of ideas

3.3.1.3 Numerical data to be collected from ideas proposed prior to the gamified system

- The total number of ideas proposed during the entire 30-day period
- The number of ideas proposed per department (software development, software testing…etc.) both per day and total
- The quality score of all ideas proposed during the entire 30-day period
- The median quality of ideas proposed during the entire 30-day period
- The standard deviation of the quality amongst the entire set of ideas

3.3.1.4 Why the median and not the average (mean)?

Instead of using the average (mean), the researcher opted for using the median to generate a single figure that represents the collective quality of proposed ideas. Despite being easier to explain and communicate, the average as a statistical tool is susceptible to 'skewness', the case in which there are a few (or even one) extreme values in the data set. In this case, the average can be significantly influenced by those extreme value(s), causing it to be less representative of the majority of the values in the data set. The median, on the other hand, is impervious to skewness, because it represents the 'central tendency' of the data set (Altman et al, 1996).

3.3.2 Qualitative data collection

Berkling and Christoph (Berkling & Christoph, 2013) attributed the failure of gamification in many real-world applications to the gamified systems developers' tendency to underestimate the 'human factor'. Understanding what motivates people to take part in a real-world manifestation of a game and their attitudes and behavior towards gamification is essential to the success of a gamified system (Landers & Callan, 2011). The researcher acknowledged the need for a more personable, qualitative approach to data collection to complement and help understand the quantitative data collected through the game portal.

Among the different methods of qualitative data collection (surveys, focus groups, interviews, observation), interviews are best when detailed, in-depth information is needed from a limited group of experts (Driscoll, 2011; Collis & Hussey, 2013). The researcher anticipated a strong and mixed response to the gamified system, as it is often the case when people encounter gamification for the first time (Fitz-Walter et al, 2011),

and reckoned that detailed, in-depth information is pivotal in order to understand how people truly perceived the gamified experience. This notion prompted the researcher to use interviews to collect qualitative data.

The researcher conducted semi-structured interviews over the course of **7 days**, following the completion of the quantitative analysis of the data collected from the gamified portal. A total of **14 individuals** were interviewed, averaging 2 interviews per day. Interviews lasted between 47 and 65 minutes, with an average duration of **50 minutes** per interview.

The interviews aimed to provide context for the quantitative data collected earlier by asking the interviewees to explain or provide a personal account on aberrant or anomalous trends (surge of interest in the gamified system in a particular day followed by a sharp decline in the next two days, software testers in particular seemed to contribute the most ideas, employees from a certain branch contributed more than all other branches combined…etc.) as well as trying to use the interviews to understand the wider impact of the gamified system. The interviewees were encouraged to voice their opinions regarding what they liked and what they hated about the gamified experience, and whether factors other than the merits of the system were the reason for their attitude towards it (e.g. was the CEO's apparent support for the system a major influencer in your decision to use it?)

The interviewees were carefully selected to represent a wide spectrum of employees. Table 3 below denotes the various categories taken in consideration while selecting interviewees.

Areas	**Categories**
Age group	20-25, 25-30, 30+
Educational background	IT majors, Engineering majors, others
Years of experience	0-5, 5-10, 10+
Area of expertise	Coding, testing, business analysis, scrum management
Branch	Sudan, South Sudan, Senegal, KSA, UAE

Table 3: categories taken in consideration when making interviewing decisions

3.4 Credibility of research findings

3.4.1 Reliability

Research reliability refers to "the extent to which your data collection techniques or analysis procedures will yield consistent findings" (Saunders et al., 2007, p. 149). In this research, reliability was ensured through:

- Using qualitative data collection and analysis to complement and provide context to the collected quantitative data. By analyzing not only "what happened" but also "why it happened", the researcher aimed to provide context to understand the motivations behind people's attitude and behavior, thus explaining the results.
- The diversity of the interviewees to ensure a more thorough and reliable representation of the gamified system's users group. Also, the interviews were conducted in the interviewees' native language (Arabic) to minimize misunderstanding.

3.4.2 Validity

Research validity refers to the degree to which the collected data measures and reflects the phenomenon under investigation (Saunders et al, 2007). According to Yin (2013), there are three tests to ensure the validity of an empirical social case study, which are construct validity, internal validity and external validity tests. All three tests were utilized in this research, as detailed below:

- *Construct validity* refers to the correct identification of operation measures for the phenomenon under investigation (Yin, 2013). In this research, construct validity was ensured through the utilization of two data collection techniques (qualitative and quantitative), using 6 idea-quality metrics to encompass different aspects of software development and designating 6 adjudicators to assess the quality of the proposed ideas through said metrics
- *Internal validity* refers to the establishment of a causal relationship between different conditions, by delineating the relationship between the theoretical framework and the research findings (Yin, 2013). In this research, internal validity was ensured through the thoroughness of the established theoretical foundation (in respect to creativity, gamification and software quality assessment) upon which the gamified system was constructed. When analyzing and discussing the findings, the researcher made references to the respective theoretical justification of said findings
- *External validity* refers to the establishment of a context in which the findings of the research can be generalized (Yin, 2013). The case study presented in this

thesis was conducted within a specific cultural, technical and organizational context, which makes the findings pertinent to that particular context. However, other researchers can draw upon the conclusions of this thesis and conduct similar case studies in different contexts and analyze the differences in findings to formulate hypotheses regarding the role of culture, sector, gender…etc. in responding to gamification as a creativity motivator.

3.5 Limitations

3.5.1 Limitations of case studies

Case study analysis is limited in the context of methodological rigor, research subjectivity and external validity (Ben, 2014). Ben (2014) pointed out that case study analysis absolves the researcher from traditional methodological constraints, which consequently undermines the replicability, reliability and subjectivity of the research. A major limitation that has been traditionally linked to case studies is external validity and generalizability (Ben, 2014), which can be described as an inherent limitation in which a case study conducted under certain conditions and within a certain context cannot be generalized to other contexts with different variables and under different conditions.

3.5.2 Limitations of qualitative research

Qualitative research is dependent to a great extent on the personal traits and eccentricities of the researcher/interviewer (Anderson, 2010). Asking the same question in different ways, or emphasizing certain words in a way that reveals or hints the researcher's biases may yield different responses (Anderson, 2010). It is also difficult to elicit, analyze, interpret and visualize results from qualitative research (Berg, 2004). Also, issues related to protecting the interviewees' confidentiality may pose ethical challenges to the research (Berg, 2004).

3.5.3 Limitations of quantitative research

In many situations, it might be inherently difficult to obtain quantitative information describing a particular phenomenon (Konradson, 2015). Also, In Quantitative research understanding the context of the phenomenon might prove challenging. Another limitation to quantitative research is that data may not be robust enough to explain complex social issues (Konradson, 2015).

Another challenge to quantitative research is that it might be cumbersome and time consuming to conduct. In this thesis, for example, the quantitative part of the research was the most demanding and error-prone, one that required the collected efforts of the researcher and an entire department to get the gamified portal up and ready, and the time and effort of the judging panel to rate ideas.

3.5.4 Other limitations

The level of objectivity of the adjudicators is a sizable limitation; despite the established assessment guide for the panel of adjudicators to evaluate ideas and score them accordingly, rating is – in essence – inherently subjective. The judges' own preferences may have influenced their scoring.

The tenure of the case study was limited to only one month to allow time for data analysis and qualitative research. The case study was concluded while the gamified system was still in the 'hype' phase, where people was still rather intrigued by it. This poses a limitation because for the thesis to reflect a correct and durable image of the usage of gamification on the longer run, people's response to gamification need to be investigated after the initial hype is over.

4. Empirical findings

In this chapter, quantitative data from the gamification period (general information related to the context of the case study, detailed information about the ideas presented and collected from the gamified system as well as the scores the adjudicators gave to ideas), in addition to quantitative data from a period prior to the introduction of the gamification technique (number, medians and aggregates of ideas quality) as well as qualitative data (summary of the results of interviews conducted with employees in the company) are presented.

4.1 Background

4.1.1 The case study set-up

Banan Information Technologies is a software development company headquartered in Sudan, with subsidiaries in South Sudan, Senegal, Saudia Arabia and the United Arab Emirates. Founded in 2000, the company specializes in developing software products for the telecommunication industry.

Fostering innovation is the cornerstone of the company's ethos. The company has long been experimenting with different techniques to incentivize innovation and unleash the creative spirit of its employees. Starting 2007, the company started keeping record of all creative ideas proposed by the staff to enhance the quality of its products.

The case study for this thesis – studying the impact of implementing gamification on creativity in Banan Information Technologies – ran from March, 12th to May, 5th 2015, and was conducted on phases. Phase 1 (March 12th – March 25th) comprised general preparations, coding, integration and release of the gamification portal website. In Phase 2 (March 26th – April 25th), the gamified system was up and running, and employees used it to post ideas and get rewarded with game points. Phase 3 (April 26th – April 28th) comprised the rating process of selected ideas proposed before for introduction of gamification for the sake of comparison. The fourth and final phase comprised conducting 14 interviews to help interpret the collected quantitative data, and was concluded on May, 5th.

4.1.2 The gamified portal

The gamified portal is a website which is linked to the company's internal website and is accessible only within the company's intranet. The researcher used Microsoft's SharePoint platform to develop the gamified portal.

Browsing to the portal's URL, the portal automatically reads the user's credentials through their network account, so there's no need to sign-in or sign-up. Through the portal, the user can either a) browse their 'home' page: ideas they posted earlier and the scores they got for them, post new ideas…etc. or b) browse the 'public access' page: where they can see the leaderboard, the pictures and announcements of last-week's top-performers, as well as short synopses of the ideas proposed so far (anonymously- the names of those who pitched the ideas does not show).

The leaderboard contains the names and total scores of all employees (those who haven't pitched any ideas through the system will have a total score of zero) ranked by score from highest to lowest. "Total score" means the player's cumulative score so far: the summation of all the game points said player has managed to win. The more ideas you post and the more points you win, the higher you level up in the leaderboard.

As a reward, each Sunday (first day of the week in the HQ branch) the picture of the previous week's top-scorer is featured on the game's portal, as well as the company's internal portal, along with a short text drafted by the CEO praising that employee's creativity. To be a week top-scorer, only the points you managed to get during that week will be taken in consideration, not your cumulative score.

4.2 Quantitative results

4.2.1 Results from the gamified portal

4.2.1.1 Final score per idea

Idea code	Date of Proposal	Department	Branch	Final Score
ID0001	March, 28	Testing	SD	4
ID0002	March, 28	Testing	SD	4
ID0003	March, 30	Testing	SD	5
ID0004	March, 31	Development	SD	5
ID0005	April, 1	Testing	SS	4
ID0006	April, 2	Testing	SD	4
ID0007	April, 2	Testing	SD	3
ID0008	April, 2	Testing	SS	4
ID0009	April, 2	Testing	SD	4

ID0010	April, 7	Testing	SD	4
ID0011	April, 11	Development	SD	4
ID0012	April, 11	Development	SD	5
ID0013	April, 12	BA	SS	3
ID0014	April, 14	PMO	SS	4
ID0015	April, 14	BA	SD	4
ID0016	April, 15	Development	SD	5
ID0017	April, 19	Testing	SD	4
ID0018	April, 19	Testing	SD	5
ID0019	April, 19	Testing	SD	5
ID0020	April, 19	Testing	SD	4
ID0021	April, 19	Testing	SD	3
ID0022	April, 19	Development	SD	4
ID0023	April, 19	Development	SD	4
ID0024	April, 22	Development	SD	4
ID0025	April, 22	Development	SD	4
ID0026	April, 23	BA	UAE	5
ID0027	April, 23	BA	SD	3
ID0028	April, 23	Testing	UAE	4
ID0029	April, 23	Testing	SD	5
ID0030	April, 24	Testing	SD	4
ID0031	April, 24	Development	SD	4
ID0032	April, 24	Testing	SD	5
ID0033	April, 25	Testing	UAE	5
ID0034	April, 25	Testing	SD	5
ID0035	April, 25	Testing	SS	4
ID0036	April, 25	Testing	SD	3
ID0037	April, 25	Testing	SD	3

Table 4: Final score per idea in gamification era

- SD refers to Sudan, SS refers to South Sudan, and UAE refers to the United Arab Emirates
- BA refers to the Business Analysis department, PMO refers to Product Managers

4.2.1.2 Individual judge scores

Idea code	Judge #1 Score	Judge #2 Score	Judge #3 Score	Judge #4 Score	Judge #5 Score	Judge #6 Score
ID0001	3	3	4	4	5	5
ID0002	4	3	4	4	3	5
ID0003	5	5	4	5	4	4
ID0004	5	3	5	5	4	5
ID0005	3	3	5	4	4	3
ID0006	3	5	3	3	4	4
ID0007	3	3	3	4	4	3
ID0008	3	4	5	4	4	3

ID0009	3	3	4	4	5	3
ID0010	4	4	3	5	4	3
ID0011	4	4	3	4	3	4
ID0012	3	3	5	5	5	5
ID0013	3	3	3	3	4	3
ID0014	4	3	4	3	3	4
ID0015	3	5	3	5	4	4
ID0016	5	5	5	4	3	4
ID0017	4	5	3	4	4	3
ID0018	4	5	4	5	4	5
ID0019	4	5	5	3	4	5
ID0020	5	4	3	3	4	4
ID0021	5	3	3	4	3	3
ID0022	5	5	3	4	4	4
ID0023	3	6	6	4	3	3
ID0024	3	4	4	5	5	4
ID0025	3	4	5	4	5	3
ID0026	5	5	5	3	3	4
ID0027	4	5	3	3	3	3
ID0028	5	4	5	3	4	3
ID0029	5	5	5	5	4	4
ID0030	4	4	3	4	5	5
ID0031	5	4	3	4	4	5
ID0032	5	5	5	4	3	5
ID0033	5	5	3	4	5	5
ID0034	3	5	5	5	4	3
ID0035	4	4	5	4	3	3
ID0036	3	3	4	4	3	3
ID0037	2	2	5	3	3	3

Table 5: Individual judge score for ideas in gamification era

4.2.1.3 Number and median quality of ideas per day

Day	**Number of ideas**	**median score of ideas**
28-Mar	2	4
29-Mar	0	0
30-Mar	1	5
31-Mar	1	5
1-Apr	1	3.75
2-Apr	4	4
3-Apr	0	0
4-Apr	0	0
5-Apr	0	0
6-Apr	0	0
7-Apr	1	4

8-Apr	0	0
9-Apr	0	0
10-Apr	0	0
11-Apr	2	4
12-Apr	1	3
13-Apr	0	4
14-Apr	2	4
15-Apr	1	4
16-Apr	0	0
17-Apr	0	0
18-Apr	0	0
19-Apr	6	4.25
20-Apr	0	0
21-Apr	0	0
22-Apr	2	4
23-Apr	4	4.25
24-Apr	3	4.33
25-Apr	5	3.8

Table 6: number and median of scores per day in gamification era

4.2.1.4 Number and median quality of ideas per department

Department	**Number of ideas**	**Contribution (%)**	**median score of ideas**
Testing	23	62.16%	4.09
Development	9	24.32%	4.11
BA	4	10.81%	3.75
PMO	1	2.71%	4

Table 7: number and median of scores per department in gamification era

4.2.1.5 Summary

Total number of days	**29**
Total number of ideas posted	**37**
median quality of ideas	**4**
Standard deviation of quality	**0.53**
Total number of employees in the company	**97**
Number of employees participated	**17**
Percentage of employees who participated	**17.53%**

Average number of ideas per participating employee	**1.76**
Average number of ideas per company employee	**0.38**
Average number of ideas per day	**1.28**
Number of active projects at the company	**7**

Table 8: Summary of gamification era

4.2.2 Results from ideas proposed before introducing the gamified system

In order to estimate the impact the gamified system had on the number and quality of new ideas, there had to be a reference or a benchmark. The company keeps record of all creative ideas proposed through different communication channels (email, posted on the company's internal website, raised in staff meetings…etc.) since 2007. The gamified system ran for 29 days, and therefore the researcher needed to specify a 29-day-period from 2007 until the day before release of the gamified system to serve as a comparison reference.

Two important factors influenced the decision of which 29-day-period to use as a comparison reference: First, **the number of company employees had to be similar or close to that of the gamification era**. Second, **the number of active projects in said period had to be similar or close to that of the gamification era**. These two factors ensure that the purported difference in quantity or quality of proposed new ideas can be solely attributed to the introduction of gamification and not because there were more employees in one period than the other or that they were rather busy in one period and therefore didn't have the time to come up with new ideas.

Based on the factors mentioned above, the researcher chose the period between **June, 1** and **June 29, 2014** as a reference period. The number of employees in the company in that period was 94, and the number of active projects was 7.

Upon deciding which pre-gamification period to choose, the judges went on and rated the ideas proposed in that period in the same fashion they did the ones proposed through the gamified portal.

4.2.2.1 Final score per idea

Idea code	Date of Proposal	Department	Branch	Final Score
IDB001	June,5	Developent	SD	7
IDB002	June, 7	Developent	SD	8
IDB003	June, 8	Testing	SD	7
IDB004	June, 10	Testing	SD	9
IDB005	June, 16	Developent	SD	8
IDB006	June, 22	Testing	SD	4
IDB007	June, 24	Developent	SD	7
IDB008	June, 26	Developent	SD	8
IDB009	June, 29	Developent	SD	9

Table 9: Final score per idea in pre-gamification era

4.2.2.2 Individual judges score

Idea code	Judge #1 Score	Judge #2 Score	Judge #3 Score	Judge #4 Score	Judge #5 Score	Judge #6 Score
IDB001	7	7	7	6	8	8
IDB002	7	8	7	8	9	8
IDB003	8	7	7	6	7	7
IDB004	9	8	9	9	6	8
IDB005	8	8	7	7	6	9
IDB006	4	5	3	3	5	4
IDB007	7	7	8	7	7	7
IDB008	6	8	8	8	7	8
IDB009	9	9	8	8	8	9

Table 10: Individual judge score for ideas in pre-gamification era

4.2.2.3 Number and median quality of ideas per department

Department	Number of ideas	Contribution (%)	median score of ideas
Testing	3	33.33%	6.33
Development	6	66.67%	7.83
BA	0	0%	3.75
PMO	0	0%	4

Table 11: number and median of scores per department in gamification era

4.2.2.4 Summary

Total number of days	**29**
Total number of ideas posted	**9**

median quality of ideas	**8**
Standard deviation of quality	**1.33**
Total number of employees in the company	**94**
Number of employees who contributed ideas	**8**
Percentage of employees who contributed ideas	**8.51%**
Average number of ideas per participating employee	**1.125**
Average number of ideas per company employee	**0.10**
Average number of ideas per day	**0.31**
Number of active projects at the company	**7**

Table 12: Summary of pre-gamification era

4.3 Qualitative results

4.3.1 Interviews context

The researcher conducted **14** semi-structured interviews over the course of **7 days,** from April 29th to May 5th**,** averaging 2 interviews per day. Interviews lasted between 47 and 65 minutes, with an average duration of around **50 minutes** per interview. All the interviews were conducted through Skype. All the interviews were conducted in Arabic. The interviews aimed to provide context for the quantitative data collected earlier by asking the interviewees to explain or provide a personal account on aberrant or anomalous trends, as well as helping understand the wider impact of the gamified system by voicing their opinions regarding what they liked and hated the most about it, and whether factors other than the merits of the system were behind their attitude towards it.

The interviewees' details can be found in **Appendix I.**

4.3.2 Interviewees' responses

4.3.2.1 Understanding motivations

Question #1: "**Was opting to participate in this experiment the result of peer pressure? Did the apparent support of the CEO and upper management for the gamified system play a role in motivating you to try it out?**"

An overwhelming majority of interviewees (11 out of 14) responded that they used the gamified system because they thought it would please their superiors and/or co-workers. Among whom, 7 attributed their interest in the new system to the e-mail the CEO sent on the eve of the gamified system kick-off urging employees to participate (while assuring anonymity), and 4 said they were reluctant to try it at first, but after their colleagues started talking about it they felt left out and consequently decided to join.

Question #2: "**When you were first introduced to the gamified system, what was your impression on the game-like environment and the idea of using game points and leaderboards to convey progress?**"

9 out of 14 interviewees said they liked the idea of using game-like components in a real-world context (3 were already familiar with the concept of gamification). 5 interviewees said they were dubious. Among those 5, two said they thought "this is never going to work", and one interviewee distinctly remember calling the idea "juvenile".

A follow-up question was "**Would you describe yourself as a serious gamer?**" And the responses reflected a split between interviewees that was almost identical to that of question #2. 10 interviewees answered yes (among whom were the 9 who reported a positive initial impression about the idea of using gamification in a business context).

4.3.2.2 Game structure and aesthetics

Question #3: "**In this gamified system we used a single-level game structure, which means there's only one level on which people accumulate points (unlike most video games for instance where accumulating a certain number of points elevates the player to the next level). Do you think adding multiple levels would have made the game more intriguing/competitive?**"

8 out of 14 interviewees thought adding more levels would've made the game more interesting and competitive, because when multiple levels are available people with the same skill level (expressed through the points they accumulated so far) directly compete against each other, unlike when there's only one level containing all players. 6 interviewees thought adding more levels would have made the game unnecessarily complicated, and therefore they approve of our choice of a single-level game.

Question #4: "**What do you think of the gamified portal's design? Were you persuaded or dissuaded to contribute to the game because of the way the game portal looked?"**

5 interviewees expressed their satisfaction with the design of the game portal; they described it as "simple", "uncluttered" and "aesthetically pleasing". 2 of whom said they wouldn't have used the system if it was cluttered with "unnecessary bells and whistles". 6 interviewees thought the portal was "lacking" in design and graphics, and that they contributed despite – not because of – the "poorly designed" game portal. One interviewee was involved in a gamification project before, and she expressed her concern that on the longer run people tend to lose interest in gamification systems if they don't feel "visually gratified" by the aesthetics and the graphics.

Question #5: "**The reward the gamified system offered a week top-scorer is that he or she will have his or her picture on the company's webpage for a week with a short text praising their creativity. Did this promised reward encourage you to participate? Do you think excelling in the game should be rewarded with real-world benefits?"**

Almost all (13 out of 14) interviewees said they initially didn't think much of the promised rewards, and thought that it would be better if game points could be exchanged for real-world benefits (added days to their annual vacation, for instance).

4 interviewees went on to become week top-scorers (once, each). They said despite their initial misgivings they felt "fulfilled" by the rewards when they actually won. The interviewees who were never week top-scorers maintained their stance against non-materialistic rewards and reiterated that gamification rewards can only motivate people if it was possible to exchange them for real world benefits.

Question #6: "**Would you have contributed to the game knowing that your name will be mentioned next to your idea's description and the score it eventually got?"**

All (14 out of 14) interviewees said they would have thought at least twice before posting anything if it was possible for others to link the ideas they proposed back to them. One interviewee said it would be "humiliating" if people knew he posted an idea that eventually got a poor score. All interviewees said they preferred the current setting where the only thing public about an employee is his or her cumulative score, not a series of individual scores on each idea he or she has posted.

4.3.2.3 Participants' behavior

Question #7: "**Did the game motivate you to think of something new, or just dish out something you already had in mind?**"

10 out of 14 interviewees said at least their first idea was something they've been thinking about for quite some time but were never motivated enough to communicate to management or pursue on their own. Only 4 interviewees said they started actively thinking about ideas to post only after the gamified system was introduced.

Question #8: "**Can you make an estimate of the time (in hours) you spent thinking about an idea you eventually posted?**"

With the exception of only one interviewee who indicated that it took her 4 hours to formulate her idea in a way that she deemed worthy of posting, all interviewees said it took them between 1 to 2 hours to investigate an idea, study it from different perspectives and eventually put it in writing and post it to the gamified portal.

Question #9: "**Would you, or did you, post an idea even though you felt it wasn't particularly good?**"

7 interviewees answered "yes". Among those the prevailing opinion was that posting ideas through the gamified system was a "number's game". The more ideas you post, the higher cumulative score you get, and ultimately the higher you level up on the leaderboard. One interviewee summarized it by acknowledging that it would be very difficult and cumbersome to come up with an idea that would deserve a 9 or 10 score, for instance, but it's relatively easy to come up with two or three mediocre ideas (median score of, say, 4 each), totaling 8 in cumulative score. This notion lead people not to hold back, and barrage the game portal with whatever ideas they came up with even if they felt those ideas weren't particularly splendid. The guaranteed anonymity meant that they won't suffer peer mocking if their ideas were poorly received by the judges.

Question #10: "**How would you describe the atmosphere the gamified system created across the company?**"

The unanimous answer was that the gamified system created an amusing atmosphere of "friendly banter", particularly in the first two weeks. People would tune up every morning to check the game portal and see who topped the leaderboard. Losing one's lead, an interviewee recounted, would typically lead one's team mates to "humorously berate him/her". An unexpected – and an unintended – outcome was that the gamified system helped entrench the sense of solidarity among people from the same department. Software testers, for instance, would go around the company or send emails urging

other testers to participate so that when the experiment is concluded and the researcher of this thesis analyzes the results, testers would come on top as the most creative.

Question #11: "**Before the gamified system was introduced, did you consider emailing management an idea you came up with?**"

10 interviewees said they did have ideas about how to enhance products (before the gamified system was even introduced), but only one of them communicated his idea to management. The reasons behind their reluctance to share their ideas with their colleagues and/or superiors varied from an innate dread of being judged/ridiculed (even if not to one's face) to exaggerated self-criticism that establishes almost-impossible-to-be-met validation criteria for one's ideas before they were deemed "good enough to be shared".

5. Analysis

The results show a staggering variance in gamification's impact on the quantity and quality of proposed new ideas.

Comparing the quantitative results extracted from the 29-day run of the gamified system to the results of quantitatively analyzing the ideas proposed before the gamified system was introduced reveals that gamification lead to a massive increase (fourfold) in the number of ideas proposed: from an average of 0.31 ideas/day pre-gamification to 2.8 ideas/day through the gamification system.

The number of ideas per employee witnesses a tremendous surge as well (almost fourfold), from 0.10 ideas/employee in the pre-gamification era to 0.38 after the gamification system was introduced, which means that gamification had such an impact in incentivizing employees to pitch ideas that almost one in every three employees felt motivated to post at least one idea.

The findings also reveal that there's a high probability (76%) for employees who posted an idea through the gamified system to post at least one more idea. This percentage plummets to only (11%) in the pre-gamification era results.

The findings mentioned above are strong indicators that gamification worked horizontally (by convincing more and more employees to propose ideas) as well as vertically (by convincing those who already proposed ideas to pitch more) across the company in encouraging employees to come up with ideas.

Gamification was not nearly as effective in elevating the median quality of ideas, though. While the ideas proposed in the era prior to the introduction of gamification had a median quality score of 8 (with more than half of them enjoying a score of 8 or 9), The median quality score of ideas proposed under gamification could barely exceed 4, with 5 being the highest recorded idea quality score in the entire 30-day period.

It was also evident from the results that ideas proposed in the gamification period enjoy a lower standard deviation, which means that they tend have quality values close to each other. This corroborates the earlier stated finding that this particular usage of gamification did not incentivize 'mavericks' or people with radical ideas. Rather, it worked best among those who have ideas with average quality. This was further corroborated by considering the highest quality idea in both periods.

This stark disparity between gamification's overwhelmingly positive impact on the proliferation of ideas proposed and the elevation of employees' engagement on the one

hand and the disappointing median quality score figures on the other was perceived by the researcher as an interesting phenomenon that requires further investigation through qualitative data collection (namely, interviewing key individuals who were involved with the gamified system).

The interviews revealed that participating in the gamified experience was not an entirely personal choice to most interviewees. Be it indirect (letters sent by upper management urging employees to participate) or direct intervention (employees from certain departments campaigning to get their colleagues to propose more ideas so that their department will be considered the most creative), most interviewees on some level felt that they 'had' to participate. This is not to say that employees were coerced to participate. Rather, the researcher believes that the atmosphere and buzz around the gamified system may have influenced employees subconsciously, causing them to feel innately obligated to take part. This, coupled with the assured anonymity (which implies that none of one's co-workers or team mates will be able to link the idea back to one) could be one of the reasons to explain the fourfold increase in the number of ideas, as well as the extended horizontal engagement reach (more employees proposing ideas). It could also explain why the median quality of ideas suffered an almost 50% drop compared to its pre-gamification levels; if people subconsciously felt that they 'had' to participate, their utmost priority would be to post ideas, any ideas. And since coming up with high-quality ideas is as one interviewee put it "cumbersome", the median quality of ideas will understandably be mediocre.

The very structure of the game could also be one the reasons why the number of ideas skyrocketed while quality suffered. The game, as one interviewee put it, was a "numbers game". An employee can top the leaderboard by posting a series of relatively mediocre ideas, because the scores add up. If an employee posted one superb idea (with a quality score of, say, 10), he or she will trail behind another employee with three ideas each with a four point quality score (totaling 12). This may have motivated employees to focus more on quantity than quality, and dissuaded those who have a relatively fewer number of ideas (albeit with higher quality) because they realized even with their higher-than-average quality ideas, they will not atop the leaderboard. This has been a concern of the researcher and the company's ideas' assessment committee before the launch of the gamification system, but it was feared that erecting more checks and balances will only discourage employees from taking part, particularly due of the novelty of the gamification approach. The researcher and the committee collectively opted not to establish a minimum threshold (idea score won't be added up to one's cumulative score if it was less than a certain threshold) in order to emphasize the "no limits" ethos of the gamified system, which – we reckoned – will encourage more employees to participate.

The topic of whether to use external rewards in gamification (rewards beside the traditional points and badges typically featured in a gamified system, such as rewarding top-achievers with real-life perks) has long been hotly-contested (Nicholson, 2012). The researcher opted for non-financial external rewards (namely, posting top scorers' pictures on the company's internal website and the game's portal as well), because a) they boost players' interest in the game by providing 'tangible' rewards, and b) they help building a more competitive atmosphere within the game's environment (O'Donovan, 2012). When establishing an external rewarding mechanism one should also keep in mind that if the reward was deemed too worthy (a financial reward, for instance) the gamification system seizes to be a manifestation of a game. The first rule of gamification, according to Zichermann & Cunningham (2011) is that gamification 'needs to be fun'. Introducing sizable financial rewards to the equation can create a negative environment for the system; employees will perceive their scores too negatively and they will probably be rarely satisfied with the scores they got; this will create a hostile environment where those who're lower in the leaderboard may resent those on top, which can be detrimental not only to the gamified system but to the company as a whole. Therefore, the researcher opted for posting the week's top-scorer picture on the website to encourage employees to participate and to help create a positively competitive environment supporting the gamified system.

The interviews have also shown a strong relationship between one's initial acceptance of the very concept of gamification (using game elements in a real-life context) and one's status as a fan of video-games. This corroborates the findings of Liu et al (Liu et al, 2011) that gamification generally appeals to a younger demographic which practically grew around video games.

The interviewees overwhelming preference of posting ideas anonymously can be attributed to culture-specific factors. Eggleton and Moldavan (2001) point out that while students in most western countries are encouraged and taught to embrace mistakes, eastern cultures often show less tolerance towards less-than-perfect performance. This could be one of the reasons why employees in the case study presented in this thesis dreaded the mere thought of others being able to see the ideas they posted and the scores they got.

The case study presented in this thesis was conducted within a specific cultural, technical and organizational context, which makes the findings pertinent to that particular context. Also, the various factors that influenced the employees' decision to participate in the gamified experience can downplay the quantitative findings regarding

the impact of the introduction of gamification as a creativity fostering technique. However, other researchers can draw upon the conclusions of this thesis and conduct similar case studies in different contexts and analyze the differences in findings to formulate hypotheses regarding the role of culture, sector, gender…etc. in responding to gamification as a creativity motivator.

6. Conclusion

In this thesis, it was evident that there's a strong relationship between the introduction of gamification as a creativity catalyst and the increased number of ideas proposed. Compared to its pre-gamification levels, the number of ideas proposed through the gamified system increased fourfold, with a wider, more diversified reach across the different branches and departments of the company.

However, the median quality of ideas proposed through the gamified system – rated by a panel of experts using a pre-specified set of weighted metrics – suffered a sizable drop, from 8 to 4. The highest recorded idea quality in the gamification period was almost 50% lower than the highest recorded idea quality in pre-gamification levels.

The utilization of gamification as a creativity fostering technique can therefore be succinctly summarized as to have a positive impact on the proliferation of ideas (manifested through the sizable increase in the number of idea pitches through the system) which goes in tandem with a negative impact on the overall median and maximum quality of ideas proposed through the gamified system.

This disparity between gamification's impact on both quantity and quality can be attributed to myriad factors, including subtle coercion factors that subconsciously mandated employees to pitch ideas, regardless to whether they believe their ideas were top-notch or not, along with the perception that for one to top the leaderboard and enjoy the reward of being a top achiever in the eyes of management and one's co-workers, one has to pitch as many ideas as possible so as to accumulate scores.

Upper management's overwhelming support of the gamified system and its campaigning efforts to motivate employees in different branches to use it may have hinted that management regard this issue with the utmost seriousness, hence employees may have perceived the issue as an assignment or a chore they need to put up with, which may have consequently caused them to put little thought into what they post, as long as they post something.

Despite initial dubiousness, non-financial rewards coupled with the points and leaderboard advantage of progressing in the game was reported to be compelling and engrossing by the majority of the interviewees. The nature of rewards associated with gamification implementations has long been a contentious area between different schools of thought, this case study proved that within its stated context and scope, meticulously-curated non-financial rewards can work in tandem with the rewards offered through the gamified system to provide stronger incentives for employees to take part in the gamified experience.

7. Future research

This chapter discusses a wide range of potential gamification-related research topics, ranging from the role of culture and conformity on the relative success of gamification to the impact of the graphical design of a gamified portal on its popularity and appeal.

7.1 Management support and intervention

The impact of management's support of a newly-introduced gamification system on its overall success can be an interesting area of further research. Even though conventional wisdom dictates that management's support of a novel technology or technique is absolutely vital to its success and that you can never have 'too much' of it (Sharma et al, 2003), this thesis reveals that management should reckon that they're walking a fine line and that they shouldn't insinuate or hint that employees are **obligated** to use the gamification system. It's a long held belief in gamification circles that one should not be or feel coerced (be it directly, indirectly or subconsciously) into participating in a gamified experience (Werbach & Hunter, 2012). This begs the question: how much is too much when it comes to managerial support and intervention?

7.2 Cultural aspects

Steffen and Deterding (2015) point out that most gamification research is primarily conducted in western countries. One of the reasons the researcher opted for conducting this research in Sudan is because there has been virtually no studies on the applications of gamification in any context or domain outside the United States, Europe and (recently) Japan (Steffen & Deterding, 2015). Some of the findings of this thesis, such as people's overwhelming preference of posting ideas anonymously, can be attributed to culture-specific factors. Eggleton and Moldavan (2001) point out that while students in most western countries are encouraged and taught to embrace mistakes, eastern cultures often show less tolerance towards less-than-perfect performance. This could be one of the reasons why employees in the case study presented in this thesis dreaded the mere thought of others being able to see the ideas they posted and the scores they got. Further research on this topic, conducted in different countries with different cultural backgrounds, can corroborate or refute this hypothesis.

7.3 Checks and Balances

Richard Branson (2015) said “there is no such thing as a bad idea. Any idea can be a great idea, if you think differently, dream big, and commit to seeing it realized”. In the context of this thesis, where the number of ideas was multiplied several times as a result of using gamification, this purpose seems to be served. However, others might beg to differ. Some company executives complained that the gamified system resulted in ‘so many average ideas’ but not a single ‘astounding one’. They contemplated establishing certain checks and balances to ensure that people think twice before posting ordinary, slightly mundane ideas. Doing this, however, might jeopardize the entire system as people’s internal idea screening process might be too harsh, resulting in very few ideas being proposed. Because the impact of implementing certain checks and conditions on the frequency of idea posting and the average quality of said ideas hasn’t been studied yet, this remains an untested hypothesis.

7.4 Impact of portal’s graphical design

The gamified system in this thesis employed basic graphical elements, with no sophisticated 3D elements or special audio or visual effects. further studies on the impact of using certain graphical elements on the level of employee engagement and whether or not there’s a ‘point of diminishing returns’ in which adding more graphical elements to the game portal only leads to less employee engagement can discern the relationship between the game portal’s design and the overall impact of the gamification experience on the company.

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Appendix I – Detailed interviews information

Interviewee	Age	Gender	Years of experience	Branch	Title	Interview duration (minutes)
#1	23	M	<1	Sudan	Software Developer	48
#2	24	M	<1	Sudan	Software Developer	51
#3	30	M	6	Sudan	Software Tester	55
#4	25	M	3	Sudan	Software Developer	46
#5	25	M	2	South Sudan	Software Developer	50
#6	27	M	4	South Sudan	Software Tester	62
#7	31	F	7	South Sudan	Software Tester	47
#8	33	M	8	UAE	Business Analyst	50
#9	27	M	4	Sudan	Software Tester	55
#10	29	F	5	Sudan	Software Developer	46
#11	32	F	8	Sudan	Business Analyst	53
#12	38	M	14	Sudan	Product Manager	50
#13	34	M	3	Sudan	Product Manager	52
#14	24	M	2	Sudan	Business Analyst	48

Appendix II – Interview guide

Understanding motivations

Question #1: "Was opting to participate in this experiment the result of peer pressure? Did the apparent support of the CEO and upper management for the gamified system play a role in motivating you to try it out?"

Question #2: "When you were first introduced to the gamified system, what was your impression on the game-like environment and the idea of using game points and leaderboards to convey progress?" and a follow-up question was "Would you describe yourself as a serious gamer?"

Game structure and aesthetics

Question #3: "In this gamified system we used a single-level game structure, which means there's only one level on which people accumulate points (unlike most video games for instance where accumulating a certain number of points elevates the player to the next level). Do you think adding multiple levels would have made the game more intriguing/competitive?"

Question #4: "What do you think of the gamified portal's design? Were you persuaded or dissuaded to contribute to the game because of the way the game portal looked?"

Question #5: "The reward the gamified system offered a week top-scorer is that he or she will have his or her picture on the company's webpage for a week with a short text praising their creativity. Did these promised rewards encourage you to participate? Do you think excelling in the game should be rewarded with real-world benefits?"

Question #6: "Would you have contributed to the game knowing that your name will be mentioned next to your idea's description and the score it eventually got?"

Participants' behavior

Question #7: "Did the game motivate you to think of something new, or just dish out something you already had in mind?"

Question #8: "Can you make an estimate of the time (in hours) you spent thinking about an idea you eventually posted?"

Question #9: "Would you, or did you, post an idea even though you felt it wasn't particularly good?"

Question #10: "How would you describe the atmosphere the gamified system created across the company?"

Question #11: “Before the gamified system was introduced, did you consider emailing management an idea you came up with?”