PERSUASIVE TECHNOLOGY AND GAMIFICATION AT THE WORKPLACE:
ENGAGING EMPLOYEES IN EFFECTIVE DOCUMENTATION OF ANALYSIS AND EVALUATIONS

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ABSTRACT

The availability of rich and high-quality data gives organizations the opportunity to make strategic decisions and a competitive edge over their competitors. However, documentation has been known to be a repetitive and tedious task and employees who perform this task may not be inherently motivated and suffer from fatigue, which reflects poorly on the quantity and quality of documentation. This thesis addresses this problem and proposes to use Persuasive Technology and Gamification to engage employees in documentation. Persuasive technology aims to change behaviours and attitudes through the art of persuasion without the use of coercion. Gamification is a type of Persuasive Technology that leverages the persuasive power of games to cause behaviour change in people. A lot of existing research and practice have focused on using Persuasive Technology and Gamification to achieve workplace engagement, motivation and productivity. However, there is little research on the use of Persuasive Technology and Gamification to engage employees in effective documentation of analysis and evaluations. This research aims to fill this gap and explore the feasibility of leveraging Persuasive Technology to encourage employees in documentation of analysis and evaluations.

A Requirement-Focused Design Science Research approach was adopted to define requirements for the implementation of a persuasive gamified system to encourage employees in documentation of analysis and evaluations. Two studies were conducted to investigate employee motivation and the susceptibility of employees to various persuasive strategies. The first study was conducted among 20 Applied Behaviour Analysis front-line staff. ABA is data driven, however, front-line staff do not provide sufficiently rich data which is a critical part of the success of ABA. The second study was carried among 55 Graduate Assistants (markers) from the University of Saskatchewan. Providing feedback on assignments is a quintessential part of the learning cycle of students and the availability of feedback that students can understand and execute is required. However, students find feedbacks provided to them often vague, insufficient, or difficult to comprehend. Especially, in the second study, the results depicted a workforce whose engagement in tasks was not self-determined and a description of a perceived low satisfaction of Basic Psychological Needs; Competence, Relatedness and Autonomy. This presents a workforce that will engage in the minimum amount of work required of them without an extra effort in performance. The results of our studies showed that both ABA front-line staff and Graduate Assistants are most susceptible to two persuasive strategies - Commitment and Reciprocity, followed by Authority and least susceptible to Consensus and Scarcity among Cialdini's persuasive principles. Among the social influence persuasive strategies, employees from both studies were most susceptible to Trustworthiness. Whilst there was no statistically significant difference between the other social influence persuasive strategies (Reward, Competition, Social Comparison, Social Learning) among ABA employees, Graduate Assistants were more susceptible to Reward and Competition and least susceptible to Social Comparison and Social Learning. However, gender and continent of origin influenced the susceptibility of Graduate Assistants to Trustworthiness and Social Learning. North American Males are not influenced by Social Learning in contrast to African Males who influenced by it. Although North American females are least susceptible to Social Learning, they are still influenced by it.

These results imply the investment in a persuasive gamified system that will facilitate the satisfaction of the Basic Psychological Needs of employees to increase their intrinsic motivation in effective documentation of analysis and evaluations. Persuasive and game elements that support Rewards, Competition, Trustworthiness, Commitment, Reciprocity and Authority could be used to achieve this. To make these results actionable, requirement guidelines have been recommended for both workplaces based on the insights gathered from the user studies. However, these requirements have not been evaluated. Therefore, future work will involve the design, development and evaluation of a persuasive gamified system based on the requirements specifications. Also, to draw definite conclusions on tailoring persuasive strategies to individuals and groups, future research should consider the impact of other workplace diversity factors that may impact susceptibility to these persuasive strategies.

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This thesis is dedicated to my husband and best friend, Prince Selassie.

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CHAPTER 1: INTRODUCTION

There has been a proliferation in the use of Persuasive Technology and Gamification aiming to cause behaviour change in people in diverse contexts such as health, sustainability and education. This phenomenon is also gaining grounds in the workplace because of its ability to tap into the intrinsic motivation of people and its ability to ameliorate the achievement of goals and objectives that are essential to an organization. Werbach and Hunter [1] distinguished between two categories of Gamification: Organizational and Personal Gamification. They further discussed a differentiation between two types of Organizational Gamification: Internal and External Gamification [1]. *External Gamification* is used by organizations to attract and sustain customers and clients. It is usually integrated into the marketing concepts and plans of organizations to create and maintain strong and lasting relationships with customers and clients. The goal of External Gamification is to continuously attract and maintain a customer base that is loyal to the organization implementing it. An example of external Gamification is the loyalty reward programs implemented by airlines where frequent flyers get discounts on flight fares. Another example is the accumulation of shopping points which can be exchanged for an equivalent monetary value of products at a customer's convenience. On the other hand of the organizational implementation of Gamification is *Internal Gamification*. Internal Gamification is applied in in-house to increase productivity, create an engaging work environment, promote healthy relationships among employees, foster a trusted relationship between employees and management and to ultimately meet the organization's objectives and missions. Researchers have reported encouraging results in the implementation of Gamification and Persuasive Technology in promoting many activities and behaviours in in-house enterprises [2–6]. Chapter two explicates some of these implementations (Sales and Marketing, Sustainability, Customer Service, Human Resource Recruitment).

A significant area that has received less to no attention in the implementation of Persuasive Technology and Gamification in the workplace is the documentation of analysis and evaluations. For example, even though Makanawal et al. [4] gamified the business process of a Customer Service Center (involving lot of data entry), the focus of Gamification was on providing training and increasing the efficiency with which tickets were resolved. The importance of data to some organizations or business units cannot be overemphasized, because the availability of quality data aids in their strategic decision making processes [7, 8]. Also, one of the contributing factors to the failure of most information systems is the lack of documentation (data and data quality) [9]. However, documentation, whether to provide feedback,

answer a questionnaire or record data, has been known to be a repetitive and tedious task [4]. Workplaces characterized by tedious and boring tasks have been reported to have high turnover rates because employees are not inherently motivated to be engaged with these tasks and responsibilities [10]. Some of the major contributors to monotony and boredom at workplaces is repetitive work, lack of challenge, and less power and control over responsibilities. Cleary et al. [10] described these contributors as a characteristic of a workplace that provides employees less options and limits their creativity. As expected, employees whose jobs are mostly characterized by documentation of observations and evaluations (for example ABA front-line staff and markers) experience a high level of monotony and boredom [4]. This leads to what is sometimes referred to as "questionnaire fatigue" [11, 12] and leads to employees who are not engaged with their tasks and responsibilities at the workplace. Individuals suffering from "questionnaire fatigue" are hardly motivated to provide documentation in the dimensions of quantity and quality [11, 12]. Considering the success recorded in using persuasive technologies and Gamification to cause behaviour change in people (this is extensively discussed in chapter two), this research was conducted to explore the feasibility of using Persuasive Technology and Gamification to encourage employees in the effective documentation of observations, analysis and evaluations. The main research question that this research sets out to answer is:

How can Persuasive Technology and Gamification be leveraged to engage employees in effective documentation of analysis and evaluations?

To aid in finding an answer to the research question, theories and principles from the fields of Social Psychology, Persuasive Technologies, Gamification and Workplace Motivation were used. Theories from Social Psychology that are relevant to this research are the Self-Determination Theory, Social Comparison Theory and the Reinforcement theory. These theories are discussed in detail in chapter two. The Self-Determination Theory provides the bases for understanding the motivation experienced by individuals and its impact on their behaviours or functional responsibilities. This theory postulates that when the three Basic Psychological Needs of Competence, Autonomy and Relatedness/Belongingness are satisfied, a person becomes intrinsically motivated and performs at their best [13]. The Self-Determination Theory also distinguishes between acts that are inherently motivated (intrinsic motivation) and those that are motivated by external factors (extrinsic motivation) [14]. Exploring employee motivation to understand how motivated employees are and which basic psychological needs are lacking has been shown by

previous research to be a good entry point into keeping employees motivated at the workplace [13, 15, 16]. BJ Fogg [17], also stated that the cause of the failure of most implementations of Persuasive Technology implementations is a result of failing to study target users and what motivates them. In addition to studying human motivation, an exploration of which persuasive principles and strategies employees are most susceptible to aids in the selection of appropriate game elements that will effectively motivate employees to willingly and inherently engage in documentation of analysis and evaluations. This approach gave rise to the following sub research questions:

1. *What are the satisfaction levels of the Basic Psychological Needs (competence, autonomy and relatedness) of employees involved in documentation of analysis and evaluations?*
2. *What is the motivation (work Self-Determination index) experienced by employees involved in documentation of analysis and evaluations?*
3. *What is the susceptibility of these employees to persuasive strategies and principles?*
4. *What are the risks of implementing Persuasive Technology and Gamification to engage employees in effective documentation of analysis and evaluations?*

A Requirements-Focused Design Science Research [18, 19] approach was adopted to undertake this research. Design Science Research (DSR) approach provides a scientific basis for providing pragmatic solutions (artefact) to real-world problems. A Requirement-Focused DSR concentrates on defining requirements for a project. It involves investigations into already existing problems and the collection of requirements through literature review and data collection from relevant stakeholders [19]. For a Requirements-Focused DSR, the requirements for a solution are not evaluated [19]. An adapted framework of the DSR by Peffers et al. [18] was used in this research. This framework is comprised of six activities: problem Identification and motivation, objectives of the solution, design and development of artefact (solution), demonstration, evaluation and communication. However, not all these activities will be used for this research. The focus will be on problem identification and motivation, objectives of the solution, and communication of requirements.

1.1 Problem Statement and Relevance

The ubiquity and power of technology has provided various advantages of digitalizing documentation. This had led many business, organizations and institutions to opt for this way of acquiring, storing, processing and using documented data. Digitalizing documentation can be achieved through data entry.

Data entry involves the inputting of data in a computer. This can be done using technological features like forms embedded into applications, word processors, and spreadsheets. Data entry produces data that is electronically stored and sees a reduction in the cost involved in acquiring, storing, searching processing, and analyzing data compared to the traditional way of recording and storing data on paper [20] [21]. Documentation is conceivably a significant factor in the success of many organizations. For example, ABA organizations thrive on the availability of documentations from therapy sessions to develop ABA programs that work for patients by mapping behavioural interventions to the occurrence or non-occurrence of target behaviours [22]. Information retrieved from data is also the pillar of some organizations' strategic decision-making process. Due to this, presence of sufficient and quality documentations mostly helps in prediction of useful trends that can give an organization a competitive edge [21].

Previous literature has paid much attention to the significance of Data Quality in information systems and the development of metrics to measure Data Quality [8, 23, 24]. Data Quality has, however, been viewed to be a multifaceted concept, consequently, resulting in two types of Data Quality Metrics: subjective and objective assessments [23]. Whilst subjective data quality assessments review the requirements and experience of different stakeholders, objective data assessments review data quality with or without any context. A typical dimension reviewed during data quality assessment is "Free-of-Error" [25]. This represents the degree to which the documentation provided are reliable and correct. Employees creating a documentation usually strive to avoid the major types of errors that happen in the process: transcription error and transposition error. Transcription errors are typically characterized by typing errors such as typographical errors and multiple entry of the same data. Transposition errors occur when the positions of digits in a number are entered in the wrong order (for example 345 and 354) [26].

Amidst paying attention to detail and trying not to commit errors, the documenting task can become overwhelming and cause employees to suffer from what is sometimes referred to as "questionnaire/respondent fatigue". Questionnaire/Respondent fatigue happens when people get tired of entering data along the way [11, 12]. This occurrence mostly ends with individuals giving up the act of providing data. Therefore, in cases where data are entered out of necessity, less attention is paid to the quality of data being entered (for example, data does not communicate the intended message).

There are enterprises that depend on the availability of sufficient amount of high- quality documentation. Examples are the Applied Behavioural Analysis (ABA) care units and educational institutions.

ABA is a method developed to promote behaviour change among individuals suffering from Autism Spectrum Disorder (ASD) [27]. The goal of ABA is to teach ASD patients meaningful skills of learning and doing things on their own to increase their quality of life and decrease their dependence on other people. A successful ABA program uses behavior change techniques that are observable and measurable [22]. This means that during an ABA session, there is always an ABA staff, observing how the ASD patients react or pick up lessons from the program, measures the success of skill acquisition, and then finally records all observations and measurements. ABA is data driven since the objective measurement of behaviour change is dependent on documentations from ABA sessions. Subsequent programs and sessions are drawn and scheduled based on reports generated from previous data gathered. It is therefore, important to prove beyond reasonable doubt that behaviour change in patients is because of ABA programs that have been administered. The occurrence of behaviour change must not be left to the discretion of ABA personnel but must be proven using data collected during ABA sessions [22]. Despite the significance of the collection of high-quality data, front-line employees and many ABA care units suffer from "questionnaire fatigue" due to constantly switching between behaviour observations among multiple patients and recording high volumes of data [28]. Their jobs can become overwhelming, as such, causing them to lack the motivation to provide proper documentation required to make confident decisions regarding patients' health.

In the educational context, feedback is a quintessential part of the learning cycle of students. One of the ways students receive feedback is through the assessment of assignments, quizzes, and exams. These feedbacks aid students in attaining achievable learning outcomes. According to Chickering and Gamson [29], giving feedback to students is one of the seven principles for good practices in undergraduate education. They argue that a vivid distinction between what students know and do not know allows them to establish a focused learning process. Feedbacks are also a way to suggest areas of improvement for students. In summary, assessments give students the opportunity to reflect on what they have been taught whilst feedbacks inform them on what they still need to learn or improve on. However, a considerable amount of time is required to ensure that grading is fair, detailed and constructive. Grading also turns out to be a monotonous and repetitive task as a marker has to grade the same assignment/test over and over again for all students[30]. Repetitive and monotonous tasks are not inherently enjoyable and lead to a disengaged workforce [10]. The quality of feedback is also of utmost importance for it to achieve its intended purpose, improve the learning of students. Researchers have pointed out that, most

of the time, students do not pay attention to feedbacks because they do not understand them [31]. This results in feedback not accomplishing its intended purpose as a guidance to help students improve. There have been reports of students finding feedback provided to be less useful than perceived by the ones (tutors and markers) who provided them [31]. Some of these feedbacks are perceived by students as puzzling, providing less instructions on how to improve, or back-breaking to materialize[31] [30].

The problems discussed above present non-arguable reasons why employees in the line of works discussed above, who appear not to enjoy the task of documenting analysis and evaluations must be motivated to do so with focus on both quantity and quality documentation. The discussed problems also highlight the importance of research into effective strategies and design principles to encourage employees to recognize, sustain and if possible increase their knowledge in the value of their responsibilities.

1.2 Thesis Overview

Chapter two of this document discusses the background and related work on motivation and behaviour change, workplace motivation, Persuasive Technology and Gamification at the workplace. Chapter three discusses the research approach adopted for this research: Data collection methods and instruments, Participants, and data analysis. Chapters four (ABA employees) and five (Graduate Assistants) presents the results, discussion and design requirements obtained from the two user studies carried out for the purpose of this research

CHAPTER 2: BACKGROUND AND RELATED WORK

2.1 Motivation and Behavior Change (Intrinsic and Extrinsic Motivation)

From a motivational approach, people's engagement in an activity will be sustained as long as this activity continues to meet some or all of their Psychological Needs [13]. This ideology has been used by researchers to cause and sustain behaviour change in people. The motivational approach of behavior change makes use of any of several theories of motivation including but not limited to the Maslow's theory of needs [32], Self-Determination Theory (SDT) [33], Social Comparison Theory [34], and Reinforcement theory [35].

The Social Comparison Theory [34] explicates that people will evaluate themselves based on how they measure up to others. There are two types of social comparison; Upward and Downward Social Comparison. Upward social comparison sees that people compare themselves to those who are better than them to improve themselves. However, with downward social comparison, people compare themselves to those they are better than to boost their ego and elevate their self-worth.

The Reinforcement Theory [35] postulates that the decision to continue performing a particular behaviour is dependent on whether the aftermath of the behaviour yields a positive or negative reinforcement. Positive reinforcements which cause a continuation in the performance of a target behaviour may take the form of rewards like awarding points and badges. Negative reinforcement however, might cause a cessation in the execution of target behaviours [35].

Maslow's theory of needs mentions that people's motivation is influenced by certain needs, although some of these needs take precedence over others. According to Maslow, Physical survival is the most basic need for survival on the hierarchy of needs. Once this need is satisfied, people will be motivated by the next need on the hierarchy [36]. For example, a person who has no place to sleep (lowest on hierarchy of needs) will not be worried about self-actualization (highest on hierarchy of needs). The hierarchy of needs are (starting from the lowest to highest): Biological and Physiological, Safety, Love and belongingness, esteem and self-actualization needs.

Over the last four decades, Ryan, Deci and Pink and other researchers have done much research on the use of the Self-Determination Theory at the workplace and found that when employees are inherently motivated at the workplace, they perform their tasks effectively and efficiently [16, 37–39]. This has made

SDT suitable for studying and improving workplace motivation. Per SDT, there are three basic psychological needs: the need for competence, relatedness, and autonomy [40]. These needs have been said to direct and shape an individual's complex behavior and well-being. Previous research on Self-Determination Theory (SDT) has also identified the basic types of motivations: intrinsic and extrinsic motivation [40]. These types of motivation from the SDT are an important principle in the areas of Persuasive Technology and Gamification [41]. Intrinsic motivation stems from the enjoyment of a task because of the inherent will to do so. It is what drives the engagement in an activity just because of the enjoyment it brings. This type of motivation yields a much higher quality experience of enjoying the performance of an activity. Extrinsic motivation, however, drives the engagement in an action for gaining an external reward (positive outcome) or avoiding punishment (negative outcome). There is no consideration for the enjoyment of an activity when external motivation is the driving factor. External motivation has therefore been considered to undermine the positive effects of intrinsic motivation [13].

Despite the view that extrinsic motivation is driven by the expectation of a separable outcome and therefore is completely non autonomous, there have been other works that postulate a rather opposing view [40, 42, 43]. For example, SDT points out that extrinsic motivation varies greatly in the degree of autonomy it exhibits [40]. The taxonomy of human motivation (Organismic Integration Theory) [33], a sub theory of the Self-Determination theory explains the different levels of autonomy that exist in extrinsic motivation. Ryan and Deci [33] used SDT to explicate how basic psychological needs can facilitate or undermine internalization and integration of values and regulations. In this taxonomy, for a person to move from being completely demotivated to being intrinsically motivated, they pass through the internalization continuum as shown in the Organismic Integration Theory diagram (Figure 1). At the lowest end of the continuum is *Amotivation*. Amotivation describes the situation where an individual has no form of motivation to perform a target behaviour. In cases where the target behaviours are performed, there is a passive attitude towered the execution of such behaviours.

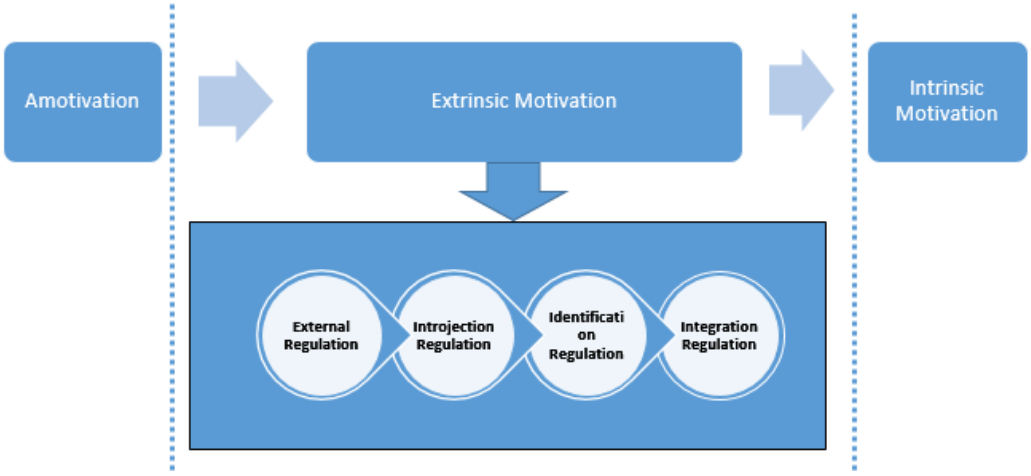

Figure 1. Adaptation of the Organismic Integration Theory [40]

The next stop on the internalization continuum is external regulation which is in turn broken down into four types depending on the degree of autonomy involved; External, Introjection, Identification, and Integration Regulation. *External Regulation* involves engagement in an activity only for the purpose of a separable outcome (positive or negative). This is the type of motivation described in Skinners' Operant Theory [35] which posits that the consequence (reinforcement or punishment) of a behaviour is a major determinant in the continuation of that behaviour. *Introjected Regulation* revolves around an individual's ego and sense of pride. It is when individuals engage in an activity to receive approval from others or attain self-esteem. Sometimes, introjected regulation happens because people try to avoid the guilt of not engaging in a behaviour. Introjected regulation produces the lowest level of autonomy. *Identified Regulation* occurs when an individual realizes the importance of a behaviour and decides to engage in the behaviour. *Integrated regulation* produces the highest level of autonomy in extrinsic motivation. At this stage, a target behavior becomes a part of an individual and they engage in it without being told to do so. On the far end of the Internalization continuum is *Intrinsic Motivation* where an individual engages in a behaviour because of the inherent will to do so. At this stage, individuals exhibit a complete sense of autonomy. The greater the internalization, the better the personal experience, behavioral and performance outcomes.

2.2 Workplace Motivation and Engagement

In the beginning of the 20th century, Frederick Taylor [44] developed the Scientific Management Approach to organizational behaviour as a way to increase workplace productivity. His approach thought the biggest motivation of employees is money. He was therefore, an advocate for the workplace system "A fair day's

pay for a fair day's work" [45] and as such advised that monetary incentives should be used to motivate employees. In this system, employees were paid per their efficiency or how much work they did. Although, widely used by all initially, it later faced criticism from both employers and employees at large. Taylor's work was perceived to have focused solely on tasks and responsibilities ignoring employee wellbeing and happiness [45]. In other terms employees were treated like machines to achieve increased productivity as well as maximized profit. In parallel to the development of the Scientific Management Approach to organizational behaviour were the Bureaucratic Approach [46] and Henri Fayol's [46] 14 principles of organizational behaviour. These works including Taylor's faced criticisms as they were considered to have ignored employees' humanity although they presented logical and efficient ways of increasing productivity at the workplace [47].

It wasn't until 1924 that the importance of employee motivation was established after the Hawthorne Studies [48] which challenged Taylor's theory that employees are more motivated by money which is a type of extrinsic motivation. The results of these studies challenged prior notions that money was the most important motivator of employees and put much emphasis on the significance of employee behaviour on their work attitudes as well as role of management or supervisors in producing a motivating and productive workplace. One of the outstanding findings of the Hawthorne studies was the impact of group/teamwork on organizational survival. The Hawthorne studies brought light to the various diversity in employee behaviour and interaction at the workplace which needed to be researched.

Work motivation has been defined as "*a set of energetic forces that originate both within as well as beyond an individual's being, to initiate work-related behaviour, and to determine its form, direction, intensity, and duration*" [49]. Employee motivation is indispensable to any organization that wishes to thrive and achieve its organizational goals and objectives. A workplace that has motivated employees is characterized by a productive and engaged workforce. The main reason for motivating employees at workplaces is to ensure the survival of these organizations [50]. According to Gallup [51], there are three levels of employee engagement; engaged, not engaged and actively disengaged. An intrinsically motivated workplace produces employees who are engaged. Engaged employees do their jobs as it is expected of them with passion and are also committed to the organization as well as putting in effort to improve themselves. A workplace that is not motivated produces employees that are "not engaged" who may become actively disengaged along the way if no measures are put in place to motivate them. Employees who are not engaged, execute their responsibilities as employees but without any form of passion or

commitment to the organization. Actively disengaged employees are not happy with their jobs and as such put in minimal effort to do them. To attain the highest level of employee engagement possible at the workplace, it is of utmost importance to managements of organizations to identify these levels of engagement and sustain the positive ones whilst working on ways of improving the negative ones like "not engaged" and actively disengaged. To increase and sustain the level of motivation at workplaces, managements of such organizations must understand what motivates their employees, a task that has proven to be an intricate one. This is due to the changing needs of humans influenced by both internal and external factors. For example, Kovach [52] found out that money (extrinsic motivation) doesn't work effectively as a form of motivator for people as their salaries increase and also the older employees get, the more motivated they are at tasks and responsibilities that are interesting and challenging to them (intrinsic motivation) [50, 52].

Previous research has shown that one of the most significant factors that increases workplace motivation is interesting work [50]. However, the nature of some jobs has been proven to be tiresome, monotonous, less creative, and quite boring, therefore, inherently providing little to no motivation to employees most of the time. For example, customer service center jobs have been identified by previous literature to be repetitive and boring [4, 53]. One of the proven ways of making such jobs interesting to employees is the introduction of Persuasive Technologies and Gamification to keep the work place fun and enjoyable [4]. This decreases the degree of boredom and makes the workplace a desirable place to be.

The rest of this chapter discusses what Persuasive Technologies and Gamification are and how they have been used at workplaces to increase employee motivation and engagement.

2.3 Persuasive Technologies

The art of persuasion has been a part of human existence from the beginning by playing significant roles in the political, social and religious lives of people. It is what influences and motivates people to make a choice when faced with multiple alternatives. Do I buy product A or B? Should I vote for Donald Trump or Hillary Clinton? Should I go to the gym or watch television while eating? In each of the questions posed, persuasion no matter what form it takes, influences the decision made. For example, Harry might choose to go to the gym because he wants to fit in when he meets his friends who appear to be physically fit. Jones might choose to watch television while eating because he perceives he will derive more pleasure from that than visiting the gym.

Robert Cialdini [54], a well-known researcher in the field of social influence, identified six persuasive principles that influence's people's decision making. These principles were tested and discovered to influence people's thought process in making decisions [55]. They have been widely implemented in internet marketing/ecommerce, specifically in the business of conversion rates. For example, how do you cause a visitor to your website to look around and eventually buy something? The six principles of persuasion identified by Cialdini[54] are:

Commitment: It is innate for individuals to perform a target behavior if they have committed to it. This principle been shown by previous research to be the most influential principle. This is because society admires people who are committed and consistent and as such people do not go back on their words or promise after committing.

Reciprocity*:* Reciprocity causes people to pay back a favor owed. It creates a sense of commitment and nurtures social relationships that last and exhibit loyalty. With reciprocity, you do someone a favour and expect them to be there when you need them.

Authority: People are likely to perform a target behaviour if it is asked by someone in authority. This could be a person who is an expert in a certain field or has some form of entitlement. Society also makes people to believe that obeying authority is a morally upright and admired practice.

Liking*:* People perform a target behaviour when it is suggested by someone they like and it usually influenced by factors like praise, similarity, increased familiarity and attractiveness.

Consensus*:* To fit into a social group, individuals are likely to perform target behaviours. This is characterized by imitation learning where people change their behaviour due to a group pressure. Deviating from what a social group is engaged in, might cause an individual to risk rejection which is undesirable to them.

Scarcity: People will be influenced by something if it is rare and especially when its scarcity is recent. Also, scarcity is most influential when there is a competition to acquire a scare product or resource. For examples, airline companies use this strategy to acquire sales (only two seats left).

The art of persuasion is not new; however, technology has created an avenue for the existence of a ubiquitous and sometimes an invisible form of persuasion called Persuasive Technology. Before information technology came into the picture, persuasion had been achieved using various means

including but not limited to print media and advertisement (Television, Radio). Although this traditional way of achieving persuasion has been effective, there are some advantages of using information technology over the traditional media to persuade. For example, information technology is ubiquitous and scalable [56]: people increasingly spend more and more of their time interacting with and through information technology devices, as well as perceiving the world through such devices. The "father" of Persuasive Technologies, BJ Fogg [56], defined persuasion as *"An attempt to change attitudes or behaviors or both (without using coercion or deception)"* and Persuasive Technology (PT) as *"Any interactive computing system designed to change people's attitudes and behaviors".*

PT has been used to change behaviour and attitudes in several domains such as education, marketing, health and workplace. Persuasive Technology can be found in many applications that are aimed at changing people's behaviour and attitudes. For example, Amazon, an ecommerce website, has leveraged persuasive technologies to encourage people to buy more products by suggesting related items or make shopping easy by using the "Buy Now with 1-click" feature. Social media sites like Facebook, Twitter, LinkedIn have made and continue to make extensive use of Persuasive Technologies to increase and retain subscribers to their websites. They have achieved these using suggestion of friends to new comers to the site, customization and filtering of newsfeed to users. To equip users to maximize their experience on these social media sites, LinkedIn for example, persuades its users to complete their profile information by assigning them a level (e.g. All-Star) based on their profile strength. There has also a been a growth of applications that influence people to pick up healthy life styles such as adequate physical activity, healthy eating, and quitting smoking. A persuasive system is a system that aims to encourage its users to perform specific actions or adopt a specific position toward a given subject (or behavior and attitudes, per a classic sociocognitive approach) [2].

According to BJ Fogg's functional triad [57], computing technology can be used in three main ways; computers as tools, computers as social actors and computers as media. Each of these ways of using a computing technology consists of techniques or strategies that are best suited to them. However, for this document, computers as a tool will be discussed. There are seven ways computers can be used as a technological tool in interactive software. The strategies that enables the function of computers as a tool which have also been identified as the seven most common persuasive strategies [57] are discussed below in Table 1.

Table 1. Most Common Persuasive Strategies

Strategy	***Explanation***	***Example(s)***
Conditioning	This persuasive strategy uses the Operant Conditioning to keep people sustained or engaged in an activity	Points and Badges
Suggestion	Provision of interactive cues to motivate people to perform a target behaviour. Suggestion is not just about providing cues but also providing these cues at the right time.	Those who bought this item also bought the following items.
Customization and Tailoring	People's behaviour change as they use an interactive system. They leave all forms of footprints in their use of a system which can be leveraged to provide content based on the changing behaviours. This makes sure the user is not exposed to information that is not important or pertinent to them at any time.	Facebook filters it's users' newsfeed and presents them information that is important to them based on their system behaviour.
Surveillance	This involves monitoring a user's behaviour by a third party. People change their attitudes when they know they are being watched especially when there is a reward or punishment that comes along with surveillance.	*You have gained 5lb in the past five days*
Reduction	Complex tasks can be simpler to cut the physical or cognitive effort to perform the target behaviour. In reduction, some sequence of steps involved in performing a target behaviour are omitted.	Amazon "One Click" feature which provides the avenue for a shopper to buy a product with just one click.
Self-Monitoring	Give the target audience the autonomy to track their progress and make changes as they deem fit. This causes them to feel trusted, get more involved and track their progress effectively	
Tunneling	Also, known as guided persuasion, interactively provides steps on how to achieve a target behaviour. This makes it easier and clears the confusion of doing tasks that involves a lot of actions	Software installation wizard

On the other hand, research has also identified social influence as one of the most effective ways to achieve behaviour change in people [58]. The most commonly used social influence persuasive strategies used are Rewards, Competition, Trustworthiness, Social Comparison and Social Learning. These social influence persuasive strategies aid to promote and sustain social relationships while causing desirable behaviour change in a target audience. These strategies are discussed below:

Rewards: This strategy is rooted in the Incentive Motivation Theory which postulates that people are drawn to behaviours that offer positive incentives and drawn away from negative incentive behaviours [59]. Also, the Operant Conditioning Theory has it that people will continue to perform a target behaviour depending on the consequence that follows the behaviour (negative or positive reinforcement). This type of motivating people to pick up behaviours has been has been aligned with extrinsic motivation. However, rewards at the workplace do not necessarily foster only extrinsic motivation. For example, Westover and Taylor posit that rewards can foster intrinsic motivation when they take the form of interesting work or job autonomy [60]. Also, a workplaces that implements intrinsic task rewards together with extrinsic tasks rewards produce a workforce that exhibit job satisfaction which is one of the major determinants of workplace engagement [61].

Competition: The desire of individuals to win against opponents can be leveraged to motivate people adopt target behaviours. It is sometimes a way for people to exhibit their competence to others in their social group as a way of validation. According to Kukkonen and Harjumaa [62], competition leverages the innate desire of people to compete.

Trustworthiness: Trust is an important part of social groups because it strengthens the ties that hold a social group together. This value is extended further when persuasive systems are involved. Getting a target audience to trust the system being implemented can motivate them. The persuasive system should be unbiased, relate the appropriate information or features that are best suited to an individual. For example, individuals should trust an implementation of a leaderboard is not rigged at the backend and rewards are given out to those whom they are due.

Social Comparison: A persuasive system should provide the avenue to people to compare their performance to others. Social Comparison can take the form of an upward comparison or downward comparison according to the Theory of Social Comparison [34]. Upward comparison allows individuals to compare their performance to those who are better than them. This allows them to imitate behaviour to

be achieve a better performance too. Downward comparison allows an individual to compare their performance to those who they performed better than. Downward comparison can give some people a sense of self-esteem or ego. However, whilst upward comparison can make people frustrated especially when they can't match up with a model performance, downward comparison can make individuals to stop trying to be better at what they do. This implies that in implementing social comparison, there is a need to know which type works for individuals.

Social Learning: Social Learning as a persuasive strategy provides the platform for people to change their behaviour to what everyone in their social group is doing. It is most often the aftermath of Upward Social Comparison. People may also be persuadable by social learning just so they can fit into a social group. It is analogous to one of Cialdini's persuasive principles, Consensus [63].

2.4 Gamification as a Persuasive Technology

Video games have been discussed to have the potential to impact people's behaviour in a positive way if the right game elements are used. These impacts can promote long-term social change which are significant and noticeable [64]. The Entertainment Software Association [65] published in April 2015 that 42 percent of Americans play video games regularly which is more than 3 hours daily and each U.S. household has at least two gamers on average. This has led researchers to leverage the use of game elements to cause behavior change in people. Gamification has been a highly debated term that sprung from a rich foundation of terms and concepts in HCI and game researches which gave rise to the formation of many parallel and contesting terms (exploitationware, playful design, behavior games) [66]. A more scholarly definition of Gamification was proposed by Deterding who defined Gamification as "*the use of game design elements characteristic for games in non-game contexts*" [66].

Gamification has been classified as a type of Persuasive Technology by previous literature as a result of its use to expedite persuasion in order to cause behaviour change in people [67]. From a motivational standpoint, Gamification works using some game elements like badges and points to reaffirm players of their competence. It provides them the feeling of belonging to a social group using game elements like leaderboards which also doubles as a tool for social comparison [68] . Gamification has also been proven by previous literature to be a type of Persuasive Technology because of the overlapping of four Persuasive Technology strategies in Gamification: Tunneling, Self-monitoring, Surveillance and Conditioning [68].

These strategies have been explained in previous sessions. Tunneling in Gamification is not possible without the use of Reduction which is also a Persuasive Technology strategy. Reduction in Gamification causes complex and huge goals to be broken down into simpler and manageable goals. This then provides the avenue to guide users through the achievement of these goals. An example is the progression of players from one stage/level of a gamified application to another. When using Conditioning, players are motivated to sustain engagement in an activity using positive reinforcements or reward which may take the form of points, badges and virtual currencies. Self-monitoring and surveillance in the context of Gamification are sometimes inter-twined. Players' performance whilst using a gamified application is usually recorded to or tracked and displayed to players. This helps them have an idea of their performance and sometimes feedback helps them to improve their performance.

Many gamified systems have been designed and built using the basic theoretical game-design MDA-framework [69][70]. This framework has been developed to serve as a formal approach to bridge the gap between game design and development. It addresses three concepts in game design: Mechanics, Dynamics and Aesthetics. Mechanics focus on the rules and components of the game and defining the boundaries of players' actions. Dynamics are related to the run-time interactions between the player and the game. Aesthetics defines the emotions that are triggered in the player whilst engaging with the game. With the MDA framework, there is a one-way direction from the designer to the player. The designer creates features and functions (Mechanics) that the player interacts with (Dynamics) to create feelings and emotions (Aesthetics). Modifications have been made to the MDA framework to suit the context of gamification. One of such modifications resulted in the MDE framework [71] which is referred to as Emotions (as such MDE instead of MDA). The authors of this framework argued that the concept of Aesthetics was more suited to the context of games because it refers to just the emotional trigger of engaging with the game. However, Emotions better describe and relate to the outcome of the emotional engagement players experience when interacting with a gamified system [71].

There are various game elements used when designing and implementing gamification. Some of the common game elements used for gamification, their purpose and examples are shown in Table 2.

Table 2. Examples of common Game Elements

Game Element	Purpose	Example
Points	These are awarded based on a player's participation in certain actions or performing desirable behaviours. They could highlight an achievement or status.	Inviting a friend to join a platform could earn you 5 points.
Levels	They are used to show a player's progression through a gamified system.	Moving from a less difficult game level to a more difficult one.
Leaderboards	These are used to create a platform for players to compare their performance to each other.	Comparing positions
Achievements	They are used as a form of positive reinforcement and feedback to highlight mastery.	Badges and Trophies
Narratives	Create a story to cause you players to be engaged. These stories can also help players learn fast and put into practice what they learnt.	A customer is stranded on the top of hill, it is your mission to save that customer.
Feedback	Feedbacks are used to continuously keep the player in the know of the consequence of their actions (either positive or negative).	A simple text, Points, Progression
Adventure	Allows the player to look for and find treasured times.	Hidden treasures.

2.5 Persuasive Technology and Gamification at the workplace

Before the prevalence of Gamification at workplaces, there were similar systems implemented by the Soviet Union (early to mid-20th century) and America (1900-2000) [72]. These implementations differ from Gamification at work in the sense that whilst Gamification-at-work uses game elements at workplaces (a non-game context), these implementations integrated games into workplace processes to increase productivity and motivation. Although these precursors cannot be classified as Gamification, they had features that made them like Gamification in present day workplaces. For example, the concept of points and badges is not new. In the Soviet Union, a bridge game, as it was referred to by most people in factories

made use of points and badges [72]. Points were awarded for good performances and people were rewarded with badges. Some critics were however not comfortable with this way of building a relationship between employees and their work. They believed this was against the norm of motivating employees with money or glory that came with privileges. Nelson [72] reports on a Soviet carpenter who was not comfortable about the idea of being told how to perform his duties and against the idea of competing with his colleagues at work. Workers were later on encouraged to exhibit "end-user creativity" as this has been known to create a sense of empowerment in people [73]. This system of motivating workers also gave workers a sense of relatedness not only in the companies or factories they worked in but also with other competitive companies.

2.5.1 Workplace Persuasive Technology and Gamification Frameworks

The power and importance of PT and Gamification have led to many studies proposing models and frameworks to adopt when considering the use of these technologies to motivate and persuade people. One of the earliest models of Persuasive Technology and Gamification is BJ Fogg's eight step of Persuasive Technology [74](*Figure 2*) and DiTommaso's Gamification framework for success. Other frameworks that have been developed are Andrzej's Gamification Framework [75], The Kaleidoscope of Effective Gamification [76], and Octalysis [73]. These frameworks emphasize on the significance of having clearly defined goals and an understanding of the target audience (players). Knowing and understanding the target audience allows designers to choose the appropriate persuasive strategies as well as game elements to satisfy the basic psychological needs of the target audience. Disregarding this could lead to negative outcomes like player aggression and frustration [77]. A commendable step in Fogg's model is Step 3 where there is an investigation into what is preventing the target behavior from occurring. According to Fogg, a behavior will only be exhibited if all of three conditions are met: Motivation, Ability, and Trigger [17](*Figure 2*). Fogg has noted that many attempts at implementing behaviour change using Persuasive Technology fail because designers do not understand what leads to behaviour change [17].

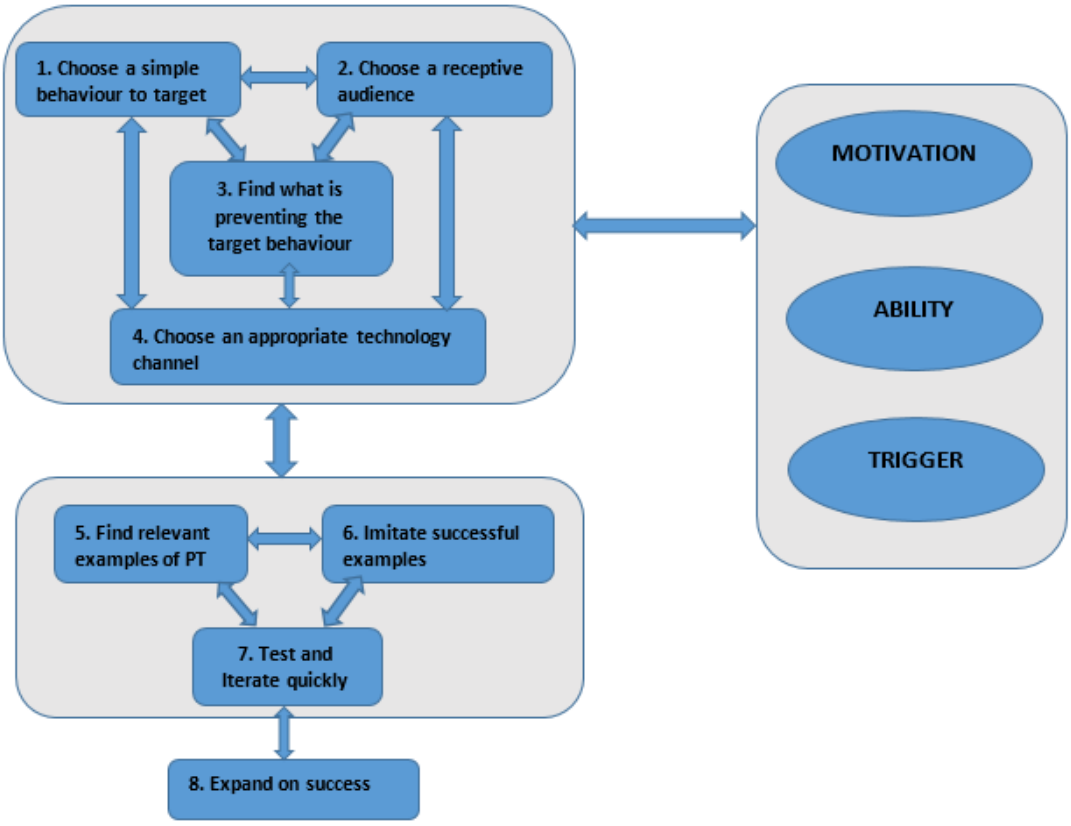

Figure 2. An adaptation of BJ Fogg's Eight Step of Persuasive Technology

DiTommaso's seven step framework for Gamification is outlined as follows:

1. Determine why you need to implement Gamification (does it fall in line with your business objects and goals and will users benefit?)
2. Identify and know your users/players (such as personality and goals)
3. Establish the goals and objectives for Gamification (Long-term or Short-term goals)
4. Identify Necessary skills and actions (Physical, Mental, Social)
5. Investigate the various points of interest (What game elements will be implemented)
6. Identify the desired outcomes (Should involve a loop of rewards and feedback)
7. Play and polish (Loop of fixing or taking out what doesn't work and making what works better)

2.5.2 Examples of Persuasive Technology and Gamification at the Workplace

Recently, Persuasive Technology and Gamification have received attention as a way of increasing employing motivation to harness positive work behaviours like increased productivity, improved job and task efficiency and reduced employee turnover. Some researchers and critics have categorized Gamification as a way to manipulate people through the use of points and badges[78]. However, Rajat Paharia [79], an industrial Gamification expert and founder of BunchBall (commercial Gamification company) has argued Gamification is one of the best ways to tap into the intrinsic motivation of employees. It is a non-arguable fact that intrinsic motivation is, as discussed in previous sections of this chapter, what drives people to internalize the habit of performing certain activities. Persuasive Technology and Gamification have been implemented in many workplaces to motivate employees to take on desirable behaviours in different domains as well as making the workplace fun. Areas where Persuasive Technology and Gamification have been used at the workplace include but not limited to creating awareness of sustainability, sales and marketing, health/physical activity, customer service, and recruitment. Table 3 presents some of these implementations, the purpose of those implementations and the persuasive and game elements that were utilized.

Table 3. Examples of Implementations of Persuasive Technology and Gamification at the Workplace

Domain	**Purpose**	**Persuasive/Game Elements**
Sustainability	Lockton et al. [80] **Scrunch:** Reducing size of Office by encouraging employees to move into a common office space at night **FootPrint:** Promotes healthy eating to reduce the emission of Carbon Dioxide **OkCommuter:** Adopt walking and biking over the use of automobiles	**Rewards:** Points, exchange of points for sustainable rewards **Surveillance:** Visualization dashboard to track performance **Social Influence** **Adventure**: hidden treasures
	Lehrer and Vasudev [81] **Green Network:** Social media application that promotes energy awareness whilst motivating energy saving behaviours among employees.	**Rewards**: points and badges **Social Influence**: forums, social comparison **Suggestions:** forums or groups to join **Surveillance**: track individual and group energy use

Customer Service	Makanawala et al. [4] **Bingo**: Effectively and efficiently solve tickets promptly **Training Game**: Imparting knowledge on new products and features	**Social Influence**: collaboration among employees **Rewards**: points **Challenges**: daily quizzes
	FreshDesk Arcade [82] To motivate helpdesk personnel to perform well at their jobs.	**Rewards:** Points, trophies **Competition** **Progression**
Sales and Marketing	**Knowledge Guru** [6] Train sales employees and help them master and retain information on new products	Narratives **Rewards**: Points
Health/Physical Activity	Foster et al. [3] **Step Matron:** Provided a competitive context for step counts read by a pedometer.	**Rewards**: Points **Achievements**: leaderboards **Social Influence** **Self-monitoring** **Goals**
Human Resource Recruitment	HackerTrail [83] Eligible candidates crack challenges to gain recognition with prospective employers. Competitive programming tournaments to win prizes	**Rewards**: Points and Badges, real life rewards **Challenges** **Competitions**
	Google Inc [84] Eligible participants are involved in solving multiple rounds of algorithmic puzzles for a change to pursue a google career.	**Challenges** **Scores** **Progression** **Competition**

2.5.3 Ethical Considerations of Persuasive Technology and Gamification at Workplaces

Despite the benefits and potentials of Gamification and Persuasive Technologies, there has been the need for guidelines on where the line should be drawn when it comes to ethical considerations when implementing them at the workplace. A few years ago, a game developer and Gamification critic, Ian Bogost[78], labelled Gamification an *"exploitationware"* because companies capitalize on it to make gains

from their employees and customers by manipulating and coercing them into doing what they want. The process of integrating a gamified system or Persuasive Technology in a business environment should not only focus on the expected benefits of implementation to the organization. Persuasive Technology and Gamification implementers must also explore and evaluate the possible harms or benefits the implementation may bring to employees. Implementers need to weigh the benefits to both parties and make sure none of them is losing out in an unreasonable margin. The most important principle here seems to be: employees must neither be exploited or manipulated. Exploitation takes place when employers take advantage of employees' vulnerabilities. Manipulation is said to have occurred if employees are limited by the level and number of choices they can make within a gamified application [85].

Despite some of the negative publicity of Gamification as a Persuasive Technology, businesses continue to make use of it to cause behavior change in their employees. As such, some researchers have considered creating frameworks that aid in designing and implementing Gamification that meet certain ethical and professional considerations. It is therefore not surprising that the Player-Centered Design as proposed by Kumar et al [86] suggests the consideration of this topic when integrating Gamification into a business process. For example,

1. *How will Gamification affect the social life and mental health of employees?*
2. *Will there be chaos among employees?*
3. *Is the data gathered of employees during Gamification private, who has access to this data?*
4. *Can Gamification be used to measure Key Performance Index in this organization?*

Using a mixed methods approach, Shahri et al [87] carefully designed and conducted a study to provide an ethical, legal and professional framework and set of guidelines for Gamification implementers to follow when thinking of integrating Gamification into the business processes of workplaces. They categorized these guidelines under the following topics: Gamification and tension at work, Gamification as a monitoring mechanism, Gamification and privacy, using Gamification as exploitation-ware, Gamification and its relation to personal and cultural values. Their findings showed that Gamification could cause tension or issues that are either problematic or accepted in a workplace based on factors such as age, personality, ranking style, organizational culture, Visibility and detail of performance, Information storage (accessibility), reward mechanisms and rules on converting Gamification rewards to tangible rewards, and honesty. For example, if tasks are difficult for employees to perform to gain points or rewards especially

if the rewards are tangible, they might cheat their way into winning or surviving. Gamification in this case turns to raise a lot more problems than it solves. When ethical, legal and professional considerations are discussed and investigated in the process of gamifying a business process, the goal is to limit the problematic issues to the minimum as it would be impossible to completely eradicate them.

For example, although some businesses and workplaces have effectively used Gamification as a measure of employees' performance, on the contrary, Makanawal et al [4] considering the context in which they implemented a gamified system for a customer service center argued that the system could not be used to measure their performance. They also ensured that employees knew that their system was being gamified and made participation voluntary as well as informed them the system would not be used as a KPI. Employees were not coerced into being part of the game as one of the basic traits of games is voluntary participation [88, 89]. Those who thought it would benefit them opted to play especially for the training game since passing the questions in the training game meant they could decide to opt out of the formal training sessions organized by the company which employees find to be time consuming and boring. Full disclosure to employees is advised when deploying gamified applications or business software in the workplace. This keeps the employees in the know even if the Gamification process is mandatory.

2.5.3 Gaps

Despite the availability of the frameworks and models presented above to support the implementation of effective gamified persuasive projects, there have been reports of most of these gamification projects exhibiting partial success with difficulty in achieving the desired success expected [90, 91]. In 2012, Gartner predicted the failure of 80% of business gamified applications by 2014 as a result of poor design [92]. A poor implementation design is not only harmful to the organization but the employees also, as it can affect employees socially and mentally in the work environment [87]. Simply put, design is key in the thought of implementing gamification at workplaces.

One of the main reasons for this problem is designing a solution to motivate a target audience without carefully studying the target group. Studying the target users has been identified by most of the frameworks above to be crucial in achieving a successful implementation. With respect to the workplace, we are looking at a place that brings together a lot of people who are very different in terms of gender,

education, income level, nationality, cultural background, generation, technology orientation, and social attitudes.

Studying the target audience might involve understanding what motivates the employees, why they are not exhibiting the target behaviour and what persuasive strategies or game elements influence them the most. Group and individual differences must also be explored to address tailoring persuasive gamified systems. Studying the target group could provide an insight into what persuasive strategies to implement. The works of researchers like Rita Orji [93, 94] and Kaptein [95] have shown that target groups or individuals respond to persuasive strategies differently and this influence might be impacted by factors like culture and gender.

Many strategies have been employed to study the target audience before implementation of Persuasive Technology and gamification at the workplace. For example, Lockton et al [80] explored the possibility of getting people at workplaces to internalize the habit of carbon saving whilst making the whole process fun, useful and rewarding at the Department of Energy and Climate Change(DECC) in the United Kingdom. They approached this by conducting a user study (ethnography) and engaged the users in physical touchpoints to identify user behaviors that needed addressing and the tools that could be used. This approach only identified the problems that needed to be solved without studying what motivates the employees or what persuasive strategies or game elements they are more influenced by. Makanawal et al.[4] adopted what they called a "player's persona" to understand their target audience. The "player's persona" contained player traits like gender, hobbies and pain-points. However, they did not explicate how this was achieved and how it informed design decisions. The structure of it however, seemed players were made to fill out a form indicating these traits.

Another part of implementing gamification at the workplace that has received less attention is understanding where employees lack motivation and what their motivating factors are. Understanding human motivation is an essential part of implementing successful persuasive gamified systems especially at the workplace [86]. As said by Gabe Zichermann [96], "*Gamification is 75% psychology and 25% technology*". People are motivated by different things and this has proven to be one of the biggest challenges of meaningful gamification. This has also been one of the intricate tasks at the workplace as people's source of motivation change due to internal and external factors [52]. Aside these individual differences between employees, various organizations have diverse cultures and the consideration of

people who have moved from one organization to another could be key in helping them fit in as people inherently do not to like change (i.e. change in organization culture).

Also, despite the many Persuasive Technology and Gamification Projects reviewed, little to no work has been done to engage employees in proper documentation of analysis and evaluations at the workplace in the field of Persuasive Technology and Gamification.

CHAPTER 3: RESEARCH METHOD

To explore the use of Persuasive Technologies and Gamification at the workplace, a Design Science Research approach was adopted. Design Science Research, which has its roots in "*The Science of the Artificial*"[97], aims to go beyond explaining and predicting human and organizational behavior to extending the capabilities of humans as well as organizations by developing and implementing solutions that have high utilities. There are five types of focus when undertaking a Design Science Project; Problem-focused, Requirements-focused, Requirements and Development focused, Development and Evaluation Focused, and Evaluation Focused Design Science Research [19]. Since the focus of this research is on producing an artefact that will provide requirement guidelines in implementing Persuasive Technology and Gamification systems among staff involved in documentation of analysis and evaluations, the Requirement-Focused Design Science Research approach was adopted. Peffers et al. [18] developed a conceptualized framework that is in line with previous works in this area and provides a nominal process model for undertaking Design Science Research; it was adopted for this research. The activities marked with the stars in *Figure 3* will be used (Requirement-Focused DSR). The final output to be communicated is a set of functional requirements that will guide the implementation of persuasive gamified system to encourage employees to engage in proper documentation of analysis and evaluations.

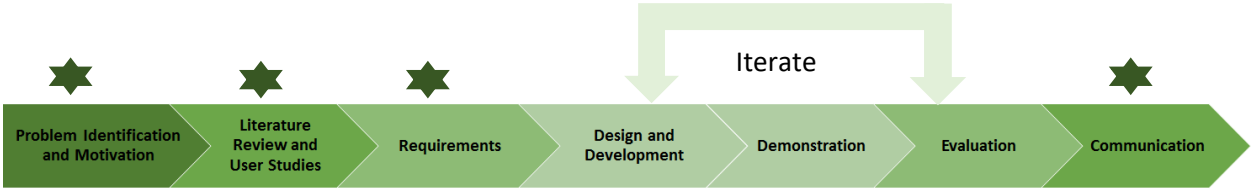

Figure 3. Design Science Research Framework adopted for the research (Adapted from Peffers et al) [12]

The activities in the framework above are discussed below:

Problem Identification: This activity involves a careful and methodical approach to identifying, defining and describing what the problem is. At the end of this activity, the researcher should be able to determine if this problem is worth solving. The underlying causes of this problem need to be identified, investigated and outlined. The root cause analysis of the problem provides informed decisions on where to start solving the defined problem as well as how to tackle the problem. The problem definition should be as simple

and precise as possible to prevent it from having multiple meanings to different people. Chapter one addresses this activity.

User Studies: A review of literature coupled with data collection and analysis.

Requirements: An artefact that can solve the problem presented in stage one is identified and outlined. This activity is sometimes viewed as a way of extending the problem explication activity. This is because the problem to be solved becomes clearer as the researcher carefully goes through the points outlined to solve the problem. An identified artefact could be a model, a method, a construct, or an instantiation. After identifying which artefact to use, the requirements of the artefact which may also take the form of functional, non-functional, structural or environmental requirements are carefully drawn.

Design and Development: At this stage, the researcher uses the requirements defined in the "Define Requirements" activity to create an artefact that satisfies all the requirements outlined.

Demonstration: This activity gives the researcher the avenue to defend the feasibility of the artefact developed.

Evaluation: The final activity in the method framework for Design Science Research presents the extent to which the artefact solves the explicated problem.

Communication: Involves the presentation of the Design Science Research Results to a research or interested audience.

3.1 User Studies

The second activity in the DSR diagram above is literature review and user studies. One of the key steps in implementing Persuasive Technology and Gamification is an understanding of what drives the target audience. A designer needs to know the various core drives of the target group to implement persuasive strategies and game elements that best appeals to these core drives. To design an effective persuasive gamified system that is based on informed decisions, two user studies were carried out to gain insight and infer some design requirements and implications.

The remaining of this chapter will discuss the research strategy, data collection tools and data analysis that were adopted for the user studies.

The research strategy employed to explore and investigate the workplace motivation and core drives of the target audience in this research was Surveys. Survey Research is defined as "*a specific type of field study that involves the collection of data from a sample of elements (e.g., adult women) drawn from a well-defined population (e.g., all adult women living in the United States) through the use of a questionnaire"*[98]. Survey was chosen as a research strategy because of its ability to provide a bird's eye view of a field of interest that is not complex. Due to this ability, survey research is best used for the collection of data on well-defined topics like people's attitude and beliefs [19].

Surveys can be administered in many forms including postal, telephone, internet, face-to-face. The deciding factors in choosing a mode of administering surveys is dependent on the ease of access to participants, budget, population, question form, length of data collection period and response rate. Internet survey was used for this research because of the ease of reach to participants and the availability of the internet. It is also an inexpensive way of collecting data.

3.1.1 Data Collection

Two separate studies were carried out to collect data for the research. The first study employed a mixed method approach and the second study employed a quantitative method approach due to the availability of survey subjects. This section presents the tools used for data collection: questionnaires and interviews, and the participants that were used in the two user studies.

Interviews

Interviews are a form of collecting data from respondents by engaging them in conversation during which the researcher asks questions relevant to a research area of interest. Interviews are especially used when the respondents are previewed to expert and privileged knowledge[19]. Interviews could either be structured or unstructured. An unstructured interview technique was used to gather and explicate the need to implement Persuasive Technology and Gamification in the first study. In an unstructured interview, the researcher leaves room for the interviewee to express their mind on the topic of interest without being held to a set of possible questions for discussion drafted by the researcher. A series of interviews were conducted with the CEO, administrator and head of technical team of an organization that specializes in implementing software used to record and report Applied Behavior Analysis data. These interviews brought to light the problem that needed to be solved and why the problem deserved to be solved. While the interviews were conducted to clearly highlight what the problems were, there was a need to understand the target audience to obtain new information and insight on what their workplace

motivation is as well as what persuasive strategies they are influenced by. Questionnaires were adopted to handle the next stage of understanding the target audience.

Questionnaires

Closed ended questionnaires which restrict the respondent to possible answers provided by the researcher were used for the user studies. Closed ended questions were adopted because they are easy to answer and require less time compared to open ended questions. Closed ended questions are also easy to analyze and interpret using statistics, leaving no room for misunderstanding respondents' responses. To ensure that the questions used are valid and measure what is intended, validated questionnaires were used to gather the data required for the user studies. Six validated questionnaires were used as tools for collecting the information about the user requirements. They are discussed in the sections and the items that make up these questionnaires are in Appendix B (page 112).

A. Work-Related Basic Need Satisfaction (WBNS)

The focus of the Self-Determination theory discussed in the previous chapter is the Basic Psychological Needs for competence, autonomy and relatedness. A satisfaction of these Basic Psychological Needs has been known to reflect an optimal functioning of people in any domain including the workplace whilst lack of these needs might lead to frustration[99]. Although many scales exist to measure people's competence, autonomy and relatedness exist, most of these scales measure a generic feeling [13] of these needs, whilst other scales are developed for a particular purpose without being validated [13]. The instrument adopted for this research is the Work-related Basic Need Satisfaction Scale [99]. This instrument was selected to investigate employee basic need satisfaction because it is empirically validated. Basic Psychological Need Satisfaction assessment aids in improving on organizational motivational sources such as job design. Based on this fact, this instrument will aid in defining the requirements of a gamified persuasive system to achieve an optimum functioning of employees whilst making the workplace fun.

This instrument is a 16-item scales (Appendix A) measuring the three constructs of the Basic Psychological Needs; autonomy, competence, relatedness. It uses a 5-point Likert Scale with 1 being "Completely Disagree" and 5 being "Completely Agree". Some of the items in the instrument are also reversed coded.

B. Work Tasks Motivation Scale for Teachers (WTMST)

Chapter two of this document discussed the concepts of intrinsic and extrinsic motivation. It also presented a sub-theory of the Self-Determination Theory called the Organismic Integration Theory. This theory posits that individuals experience different degrees of autonomy when extrinsically motivated. Per the Organismic Integration Theory, for individuals to internalize a behaviour, they pass through an internalization continuum. Each point on the internalization continuum represents a different degree of autonomy experienced by the individual. A knowledge of where individuals lie on this continuum provides insight into what motivational techniques and strategies will be effective when applied to them. This knowledge also provides a researcher information on the degree to which individuals have internalized the target behaviour by measuring the Self-Determination Index. The necessity to implement Gamification and Persuasive Technology at the workplace can be informed from this scale. This instrument can help decide whether there is a need to implement Persuasive Technology or Gamification by measuring employees' perception of the target behaviour.

Although there are other scales that can be used to investigate which part of the internalization continuum individuals fall [15, 16], the Work Tasks Motivation Scale for Teachers was adopted because the items in this instrument are more reflective of the work environment of interest to this research. This instrument was studied and validated among elementary and high school teachers with a sample size of 609 [14]. The instrument is a 15-item scale (Appendix A) measuring the five motivational constructs on the internalization continuum: amotivation, external regulation, introjected regulation, Identified regulation, and Intrinsic Motivation. It was measured on a 7-point Likert Scale with 1 being "Completely Disagree" and 7 being "Completely Agree".

C. Workplace Motivating Factors

In addition to being informed on how motivated a workplace is, it was of utmost importance to understand what motivates employees at the workplace. A review of literature presented some of the motivating factors that exist at the workplace. These motivating factors at the workplace differ from workplace to workplace and these differences are sometimes attributed to the diversity of job design [16].

For example, “interesting work” was found to be the highest motivating factor among employees of The Ohio State University’s Piketon Research and Extension Center [50]. However, another study found “Living in a safe area” to be the highest motivating factor among employees at the University of Balochistan, Pakistan [100].

The workplace motivating factors that were gathered from literature about academic workplaces are [50, 101]:

1. Job security (Loosing this job will cause a cut in part/full of my funding)
2. Freedom and discretion to decide how to carry out my responsibilities
3. Feeling of power and control over students
4. Interesting work (Allows me to express my creativity)
5. Remuneration (Wages)
6. Full appreciation of work done (Recognition for contribution)
7. Relations with other Graduate Assistants
8. Relations with Superior (Professor)
9. Sympathetic help from the department with personal problems
10. Responsibility (I feel my job is important to the success of students)
11. Achievement (This job is demanding and challenging)
12. Supervision (My superior/professor keeps tabs on me)
13. Fear of failure - I do not want to be perceived as a poor performer
14. Growth (Provides me the opportunity to acquire new knowledge and skills)

D. **Busch et al’s** [102] **Persuadability Inventory**

To implement Persuasive Technologies and Gamification that will be effective, research has shown the need to personalize persuasive strategies to groups or individuals [93, 95, 103]. Personalizing persuasive strategies is mostly done by understanding the susceptibility of individuals or groups to certain persuasive strategies. The persuasive strategies to which people from the target group or individuals are most susceptible to are implemented with high hopes that they will effectively tap into the core drives of the group or individuals. Busch et al. developed a 9-point 25-item (Appendix A) empirically validated scale to measure the susceptibility of individuals to some selected persuasive strategies from Kukkonen et al’s [62]

Persuasive System Design elements. These strategies are: rewards, competition, social comparison, trustworthiness, and social learning [102]. The strategies measured have been discussed in chapter two.

E. Kaptein et al's [95] **Susceptibility to Persuasive Strategies Scale**

The Susceptibility to Persuasive Strategies Scale is an empirically validated instrument for measuring people's susceptibility to Cialdini's six persuasive principles; Commitment, Reciprocity, Authority, Consensus and Social Learning [95, 63]. It is a 7-point 26 item scale (Appendix A). The strategies measures have been discussed in chapter two.

3.1.2 Participants

As there were two studies conducted, there were two categories of respondents; ABA front-line Staff and Graduate Assistants (University of Saskatchewan). These two categories of participants were chosen because of the importance of documentation of analysis, evaluations and observations in their line of work. This is further explained below.

ABA Front-line Staff

The participants were front-line staff of a homecare unit administering autism therapy to kids and adolescents in Edmonton. ABA sessions and programs are put together by specialist in various fields (for example speech and psychology). These programs are administered by a single front-line staff to Autistic children. During ABA sessions, the front-line staff aids and guides Autistic kids to perform target behaviours whilst performing functional behaviour assessments. Assessing functional behaviors also means that the front-line staff must directly observe the kids and take note of behaviours of interest. For example, determining a series of behaviours or activities that lead to a meltdown helps in preventing or curbing the meltdowns in future. Front-line staff oversee recording relevant happenings during ABA sessions. These recordings are entered in an application called "TN Active Care" developed by a company, called "Technology North" in Edmonton, where session reports and the general reports on progress of kids can be fetched. These reports are sent to parents or guardians to keep them in the loop on their ward's progress and to aid the specialists who design session programs to evaluate the effectiveness of the programs they designed. Improvements to programs can either be made or new techniques or strategies are adopted to facilitate modelling of target behaviours. Therefore, providing detailed and regular reports after each session is vital for the progress of the therapy of the front-line staff' charges.

Graduate Assistants

The respondents of the second study were mostly Graduate Assistants from the Computer Science Department at the University of Saskatchewan. All graduate students are eligible for applying for a job as a graduate assistant. Graduate students who are fully funded by the department have the responsibility of doing a number of service hours for the department as teaching assistants or graders. In addition to these service hours, some graduate assistants get extra hours for extra pay. Graduate students who are funded by their supervisors may be required to put in hours as research assistants. Teaching assistants are responsible for overseeing tutorials and laboratory sessions. Graders have the responsibilities of grading and submitting assignments and mid semester exams. Frequency of tutorials, lab sessions and grading is dependent on the professor handling the course. Some teaching assistants and graders grade every week with less loaded content while others perform their responsibilities less frequently with a more loaded content. A significant part of grading is the provision of comprehensive feedback to students on their performance in assignments. The feedback must point a student in the right direction on how to improve. Graduate Assistants are characterized by a busy life where they are continuously on their toes to attend classes, complete assignments, produce publishable works, whilst working towards the completion of their thesis/dissertation. This busy life is often at odds with requirement for service hours they provide to the department or supervisors for their funding, and as a result the quality of the feedback provided to students can suffer.

3.1.3 Data Analysis

This section discusses the data analysis tools and methods that were used to analyse the data. Data Analysis is used to obtain relevant information to answer research questions or present phenomena that will otherwise be unnoticeable in the collected data. All data analyses were done using IBM's Statistical Package for the Social Sciences (SPSS). SPSS provides a wide range of charts/graphs and statistical methods for analyzing data. Data gathered using the instruments described above were ordinal data except the Leaderboard preference questionnaire. Demographics and Leaderboard preference questionnaire consisted of nominal and interval data.

To establish the reliability of the responses for items that were rated using a Likert Scale, statistical tests were performed to measure the internal consistency of the responses. Internal Consistency measures the concurrency between items in an instrument and reports the reliability of the scores an instrument produces [104].

After testing for the internal consistency of the responses, a mean of the items for various constructs were calculated taking into consideration items that were reverse coded. This stage also involved choosing the right statistical test to use based on the nature (for example, normality) of the data collected.

Another data analysis performed was the calculation of the Work Self-Determination Index (WSDI). The WSDI provides a single score which is helpful in differentiating between employees who are Self-Determined (intrinsically motivated) and those who are not. A mean of the WSDI also informs researchers on whether employees in general are Self-Determined at the workplace. The WSDI has been proven by previous research to be desirable in measuring the workplace motivation of employees. It is calculated by multiplying the mean of each subscale/construct in the instrument by its weighted value [43].The WSDI ranges from ±36 to ±24 for a 7-point and 5-point Likert scales respectively [43]. A positive WSDI means employees are Self-Determined at the workplace whilst a negative WSDI means employees perform their responsibilities for the sake of a probable outcome.

Both descriptive and inferential statistics were used quantitatively to describe the data and find significant differences between groups respectively. Inferential statistics show that differences between groups did not happen by chance. A detailed description of the statistical tests used for the studies will be presented in chapters four and five.

CHAPTER 4: ABA FRONT-LINE STAFF STUDY

ABA front-line staff administer ABA programs put together by ABA specialist to ASD patients. Observations from these ABA sessions are recorded into an online system developed and maintained by a local company in Edmonton. Since ABA is data driven, it is crucial that enough data which is of high quality is provided during ABA sessions. The documentations created during ABA sessions are used to determine whether a patient is progressing with treatment that have been administered. The progress of a patient is not left to the discretion of ABA specialists. However, ABA front-line staff do not provide proper documentation (both quantity and quality) required to make these important decisions. This study was therefore aimed at investigating the persuasive strategies that ABA front-line staff are most susceptible to. The most influential strategies will inform the selection of persuasive elements to be implemented in the online system used for the ABA therapy sessions. Susceptibility of front-line employees to the various persuasive strategies were measured using two instruments developed by Kaptein et al. [95] and Busch et al. [102]. These instruments have been discussed in Chapter three. The results of this study are presented below.

4.1 Participants

Participants of study 1 were ABA front-line staff who administer programs to children living with ASD. Demographic characteristics of the sample (N = 20) used for study one is shown in *Table 4* below.

Table 4. Demographics of ABA Front-line Staff

Demographic		**N**	**%**
Age	16-34	14	70
	35-44	5	25
	Prefer not to Answer	1	5
Gender	Male	2	10
	Female	18	90
Education	Bachelor's Degree	15	75
	Trade/Technical/Vocational	1	5
	High School	2	10
	Certificate/Diploma/Equivalent		
	Prefer not to answer	2	10
Employment Status	Full Time	15	75
	Part Time	5	25

4.2 Internal Consistency and Construct Performance

The mean scores for each of the persuasive strategies measured was calculated. To test the validity of the responses from the study, an internal consistency test was performed. A Cronbach's Alpha value greater than 0.60 from both instruments established the reliability of the responses (Table 5). Statistical tests were performed to ensure the data satisfied all the conditions to perform a mixed ANOVA using persuasive strategies as a within-subjects factor and employment status and age group as between-subjects' factors. Our data passed all the conditions to perform a Three-Way Mixed ANOVA including Mauchly's Test of Sphericity (X^2 (9) = 11.34, p = 0.26) and (X^2 (9) = 11.27, p = 0.26) for the Susceptibility to Persuasive Strategies Scale and the Persuadability Inventory respectively. Mauchly's Test tests that the variances of the difference between mean score for the various persuasive strategies are equal. These results show that the data is qualified to be used for a Three-Way Mixed ANOVA.

Table 5. Internal Consistency and KMO values of Instruments

Instrument	**Cronbach's alpha (α)**	**KMO**
Kaptein's et al.'s Susceptibility to Persuasive Strategies Scale	*0.62*	*0.63*
Busch et al.'s Scale for Measuring Persuadability	*0.81*	*0.64*

4.3 Employee Susceptibility to Cialdini's Persuasive Principles

The results of the Three-Way Mixed ANOVA showed that there was a main effect of strategies on ABA front-line staff's susceptibility to the various Cialdini's Persuasive Strategies measured ($F(4, 72) = 9.78$, $p<0.0001$). This is indicative of the presence of significance differences in susceptibility of ABA employees' to Cialdini's persuasive strategies. A post-hoc comparison test disclosed that Commitment (M=5.82, SE=0.17) and Reciprocity (M=5.20, SE=0.22) were the most influential followed by Authority (M=4.80, SE=0.26), with Consensus (M=4.31, SE=0.27) and Scarcity (M=4.52, SE=0.24) being the least influential (*Figure 4*).

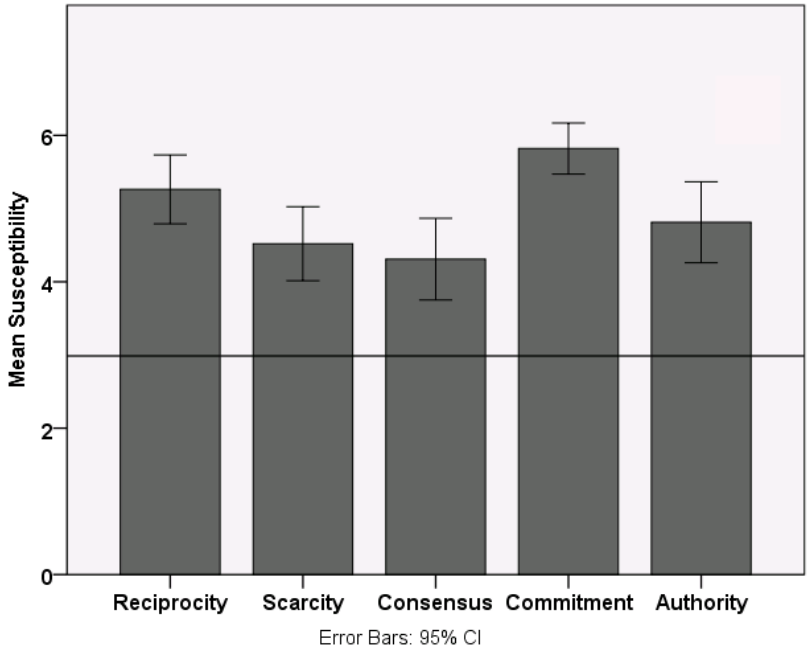

Figure 4. Bar graph of mean of the ABA employees susceptibility to Cialdini's persuasive principles measured across all participants

Employment Status and Cialdini's Persuasive Strategies Interaction

The Three-Way Mixed ANOVA indicated a statistically significant interaction between employment status and susceptibility to Cialdini's persuasive principles ($F(4,72) = 3.294$, $p<0.05$). A posthoc test showed that full time employees were more persuadable by Consensus and Scarcity than part time employees. ABA front-line susceptibility to the Cialdini's persuasive strategies grouped by employment status is shown in *Table 6 Table 7*.

Table 6. Mean susceptibility of ABA Front-line Staff to Social Influence Persuasive Strategies by age group.

Empl. Status	Commitment	Consensus	Scarcity	Authority	Reciprocity
Full Time	5.96, 0.19	4.60, 0.28*	4.80, 0.24*	4.80, 0.26	5.20, 0.27
Part Time	5.40, 0.32	3.40, 0.53*	3.68, 0.53*	3.68, 0.44	5.44, 0.46

(Mean, Standard Error). Empl Status = Employment Status

** Statistically significant differences. p<0.05;*

4.4 Employee Susceptibility to Kukkonen's Persuasive Strategies

A Three-Way Mixed ANOVA showed that persuasive strategy has a main effect on employee persuadability ($F(4, 64) = 10.165$, $p<0.0001$). As shown in Figure 5, Employees were most susceptible to trustworthiness as a persuasive strategy. A post-hoc pairwise comparison showed a statistically significant difference between employee susceptibility to Trustworthiness ($M=7.01$, $SE=0.20$) and the other strategies: Rewards ($M=5.54$, $SE=0.35$), Competition ($M=5.26$, $SE=0.31$), Social Comparison ($M = 5.12$, $SE=0.32$), and Social Learning ($M=5.78$, $SE=0.24$) ($p<0.05$, $p<0.005$, $p<0.001$, $p<0.05$ respectively). However, there were no statistically significant differences between Rewards, Competition, Social Comparison and Social Learning.

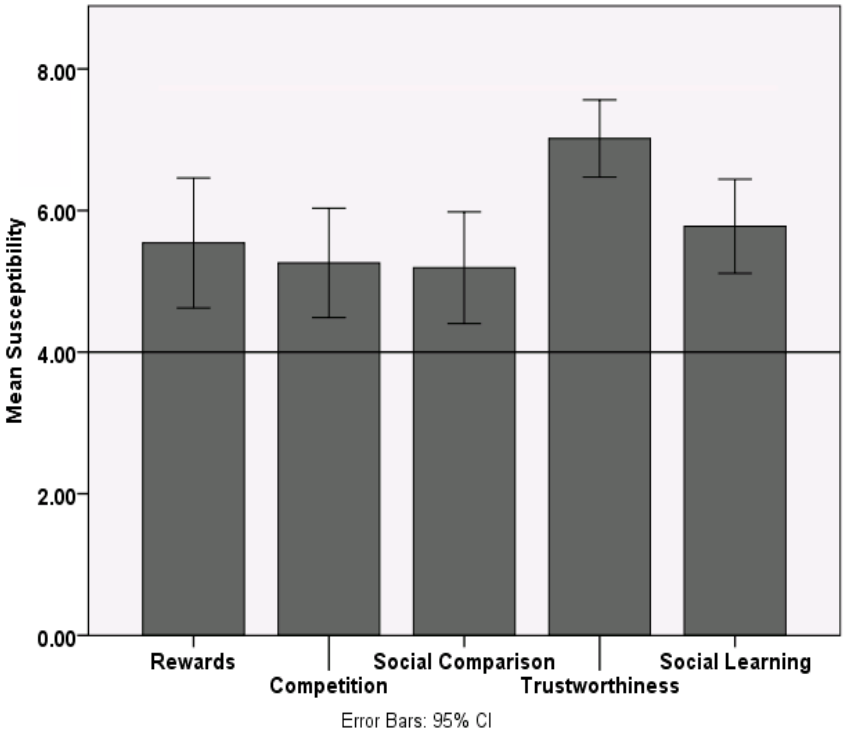

Figure 5. Bar graph of mean of the ABA employees susceptibility to Social Influence persuasive strategies measured across all participants

Age Range and Social Influence Persuasive Strategies Interaction

Although Age range did not have any effects on the five Cialdini persuasive strategies measured, a Two-Way Mixed ANOVA indicated an interaction between employees' age range and Kukkonen's five persuasive strategies ($F(4,72) = 3.294$, $p<0.05$). A pairwise comparison showed that employees belonging

to age group 34-44 were more influenced by social comparison, trustworthiness, and social learning whilst employees ranging from 16-34 years were more persuadable by rewards and competition (*Table 7*). However, a post hoc test only presented a statistically significant difference in susceptibility to trustworthiness between the two age groups ($F(1, 17) = 5.545$, $p = 0.031$, partial $\eta^2 = 0.246$). ABA front-line susceptibility to the persuasive strategies grouped by age group is shown in *Table 7*.

Table 7. Mean susceptibility of ABA Front-line Staff to Social Influence Persuasive Strategies by age group.

AGE-RANGE	REW	COM	SOC	TRU	SOL
16-34	6.08, 0.36	5.56, 0.28	5.36, 0.39	6.60, 0.27*****	5.94, 0.33
35-44	4.67, 1.24	4.80, 1.27	5.47, 0.73	7.80, 0.43*****	6.03, 0.52
** statistically significant differences. p<0.05; REW = Reward; COM = Competition; SOC = Social Comparison; TRU =Trustworthiness; SOL =Social Learning;*					

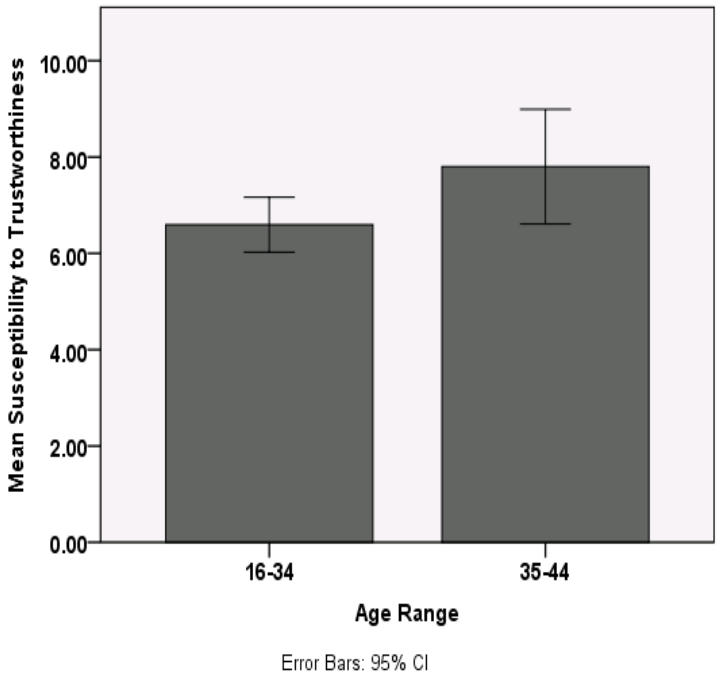

Figure 6. Bar graph of Susceptibility of Age groups to Trustworthiness

4.5 Discussion

4.5.1 Susceptibility to Cialdini's Persuasive Principles

ABA front-line staff were most influenced by Commitment among Cialdini's persuasive principles. This could probably be because front-line staff find these jobs as a source of income to support their education despite the overwhelming nature of it. Also, because it is discouraged to disrupt the routine of ASD patients, it is important to front-line staff to be committed to schedules that have been assigned to them [105]. Reciprocity and Authority were the second most influential amongst Cialdini's persuasive principles. Front-line staff might have been susceptible to Reciprocity because of the "work for pay" system existing in the organization where front-line staff administer ABA programs in exchange for wages. Authority could have been influential among front-line staff because the ABA programs that they administer are put together by doctors who have expertise in this area. Therefore, there is a tendency for them to obey instructions on the programs to administer. The least susceptibility of ABA employees to scarcity and consensus could not be explained with the data that was gathered.

Although some significant differences were found in the susceptibility of front-line staff to Scarcity and Consensus based on their employment status (full time and part time), no conclusions could be drawn on these results because of the small sample size involved.

4.5.2 Susceptibility to Social Influence Persuasive Strategies.

Trustworthiness was the most influential social influence persuasive strategy probably because they must follow and administer programs that have been developed by experts. They need to trust that these programs are the right ones for the ASD patients. This ties in with their susceptibility to authority discussed above. Also, they need to trust that their salaries will be paid to them in exchange for their services since it is their main motivation for working, as inferred from the informal interviews with ABA managers. There were however no statistical differences between susceptibility to Reward, Competition, Social Comparison and Social Learning. These results suggest that persuasive and game elements that support all the social influence persuasive strategies measured can be implemented to motivate front-line staff to be engaged. Front-line line staff may have been susceptible to Reward because they work in return for salary. This is supported by previous literature that Reward is one of most influential social influence persuasive strategies [107]. Front-line staff may also have been susceptible to Competition because the workplace has been shown by previous research to be a competitive environment especially when

promotions are involved [108]. Social Comparison and Social Learning go hand in hand most of the time. When the type of social comparison in play is an upward comparison, then social learning is bound to take place to achieve improvement [34]. It is therefore not surprising that these principles ranked the same with the other social influence persuasive strategies.

4.6 Design Requirements

This study was carried out to gain insights on how Persuasive Technology and Gamification can be leveraged to encourage front-line staff in effective documentation of analysis and evaluations of ABA therapy sessions. These requirements will be integrated into an existing system used to document ABA therapy sessions.

The results of the user study showed that persuasive or game elements that support Commitment must implemented. This can be achieved by allowing front-line staff to set goals on what work tasks or responsibilities they aim to accomplish. These goals should focus on not just the quantity of data they can collect, but also the quality. These goals can be system generated and presented to front-line staff to choose from. It is important that these goals are not forced on employees. Alternatively, employees can be allowed to set their own goals on work tasks and responsibilities they aim to achieve. Giving front-line staff the freedom to set their own goals or choose from a set of predefined goals gives them the sense of autonomy which facilitates intrinsic motivation and known to cause the internalization of behaviours [40].

Reciprocity can be implemented using rewards. Here, points should be awarded for entering data. One way to do this is to calculate the percentage of data a front-line staff has entered at the time of submitting a record and award points based on this percentage of data provided. Medals and badges can be awarded for performing commendable target behaviours or for reaching certain milestones. Also, to encourage the provision of quality documentation, an anonymous peer review system could be set up to review data gathered by front-line staff. An anonymous peer review was recommended to prevent a conflict of interest. It will also prevent ABA front-line staff from cheating the system by rating each other's works as good even when a session record was poorly entered. With the anonymous peer review system, you do not know who reviewed your work and you do not know the one whose work you are reviewing. A reward mechanism like points could be put in place to encourage peer reviewers to review an ABA therapy session

well. Using rewards this way can contribute to affirm the competence of front-line staff which in itself have been shown to promote of intrinsic motivation [40].

Also, the results of the user study showed that Competition can be leveraged to encourage front-line staff in proper documentation of analysis and evaluations. The use of Competition as a persuasive strategy is tied with other game elements that support persuasive strategies like Reward, Social Comparison, Social Learning and Trustworthiness. For Competition to exist, a reward system must be implemented (for example points), there should be transparency to ensure that players trust the gamified system (leaderboards). Also, the use of leaderboards supports Social Comparison as it allows players to compare their performances with each other.

4.7 Limitations and Future Work

One limitation of this study was that, the small sample size did not allow us to draw definite conclusions on some differences that were discovered. Also, workplace motivation and the satisfaction and frustration of Basic Psychological Needs which have been identified by previous literature to be major determinants of workplace tasks engagement was not considered in this study. Therefore, the recommendation of requirements was solely based on susceptibility to the persuasive strategies measured.

Future work, therefore, intends to use a larger sample size and consider workplace motivation in the requirement design. Also, other interaction factors that influence workplace dynamism such as culture, gender, age and employment status will be explored.

CHAPTER 5: GRADUATE STUDENT ASSISTANTS STUDY

The study of ABA front-line staff discussed in the previous chapter did not take into consideration the workplace motivation factors as well as target audience's perceived basic psychological need satisfaction and frustration at the workplace. These psychological needs are known to contribute to the well-being and ill-being of individuals and directly impact their functional performance at the workplace [13]. We therefore set out to investigate if the satisfaction of the Basic Psychological Needs of the target audience are being met. As we didn't have access to the participants in the first study anymore, we decided to continue our exploration of how to motivate employees involved in documentation of analysis and evaluations tasks but in the context of a different workplace – University teaching assistants. Our second study measured the employees' perceived Basic Psychological Need Satisfaction as well as their Self-Determination index which measures the degree to which employees have internalized their responsibilities.

5.1 Methods

This section presents the tools and procedure adopted for this user study.

5.1.1 Tools

The tools used for this study are presented below and have been discussed extensively in chapter three, section 3.1.1 (page 29).

1. **Work-Related Basic Need Satisfaction (WBNS):** This tool measures employees' Perceived Basic Need Satisfaction and frustration.

2. **Work Tasks Motivation Scale for Teachers (WTMST):** This tool measures employees' Self-Determination Index, a measure of the degree of task internalization.

3. **Workplace Motivating Factors:** This tool investigates the top five workplace motivating factors among the target audience.
4. **Persuadability Inventory:** This measures the susceptibility of the target audience to five social influence persuasive strategies.
5. **Susceptibility to Persuasive Strategies Scale:** This measures the susceptibility of the target audience to Cialdini's Persuasive Principles.

5.1.2 Procedure

An ethics permission was acquired to conduct this study. The survey was hosted online on FluidSurveys. An invitation email with a link to the survey was sent to all Graduate Assistants in the Department of Computer Science, University of Saskatchewan. Also, an invitation to take part in the study was posted on the University of Saskatchewan's online bulletin board system. Participants were required to read and agree to the content of a consent form before proceeding with the survey. Participants answered a total of 82 Likert Scale questions excluding demographic questions. Participants were also asked to pick out and rank their top five workplace motivating factors from a list of workplace motivating factors gathered from literature review. Participants were also given the opportunity to provide their emails for a chance to be entered in a draw to win a $50 gift card.

5.1.3 Participants

As discussed earlier in chapter three, the respondents of study two are graduate students of the University of Saskatchewan who put in some service hours to their departments by grading student assignments. Providing detailed and constructive feedback is important to achieve the educational purpose of the assignment, yet the quality and amount of feedback provided is often found lacking. Some of these graduate students also work some hours (aside the service hours) to make extra money. The demographics of the participants of study are shown in *Table 8*.

Table 8. Demographics of Study 2 Participants

Demographic		**N**	**%**
Age	16-34	46	83.6
	35-44	6	10.9
	Prefer not to Answer	3	5.5
Gender	Male	24	43.6
	Female	30	54.5
	Prefer not to Answer	1	1.80
Education	Masters Students	32	60
	PhD Students	22	40
Area of Study	Computer Science	38	69.10
	Psychology	1	1.80
	Management	1	1.80
	Science and Engineering	7	12.70
	Medicine	1	1.80
	Other	7	12.70

Employment Status	Part Time	55	100
Continent of Origin	Africa	14	25.50
	Asia	21	38.20
	Middle East	5	9.10
	North America	14	25.50
	Other	1	1.80

5.2 Results

This section discusses the data analysis that was performed and the results of the user study

5.2.1 Internal Consistency and Instruments/Construct Performance

A Principal Component Analysis (PCA) was performed to measure the psychometric properties and validity of responses collected. To verify that PCA was suitable to measure the validity of the responses, some tests were performed prior to the PCA analysis; Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity. The KMO measures the sampling adequacy for each variable in the questionnaire as well as all variables considered as a whole. The KMO measure is a value between 0 and 1. Kaiser's classification of KMO measure values and their meanings is shown in Table 9. Responses from the instruments used for the study reported a KMO value greater than 0.6 (recommended value of KMO Measure Value). The KMO values for the constructs are found in *Table 9*.

Table 9. KMO Measure Values and their meanings [109]

KMO Measure	**Meaning**
KMO>=0.9	Marvelous
0.8 <= KMO <0.9	Meritorious
0.7 <= KMO < 0.8	Middling
0.6 <= KMO <0.7	Mediocre
0.5 <= KMO <0.6	Miserable
KMO<0.5	Unacceptable

Bartlett's test of sphericity is used to test if an obtained correlation matrix deviates significantly from an identity matrix. Bartlett's test of sphericity tests if there are correlations between the variables measured. The absence of a correlation means that variables cannot be broken down into components. If variables cannot be broken down into components, then a PCA cannot be run. The goal of a Bartlett's test of sphericity is to reject the null hypothesis that there are no correlations between variables measures. A

Bartlett's test of Sphericity reported that all instruments used for the study rejected the null hypothesis ($p < 0.0001$) that there are no correlations between the measured variables. The Bartlett's test of Sphericity for the instruments used are found in Table 10. The results for both KMO and Bartlett's test of Sphericity indicate that the responses are valid for factor analysis.

To establish the internal validity of the various constructs measured in the study, a Cronbach's alpha test was run. The minimum Cronbach's alpha value to establish internal validity and construct validity is 0.7. All constructs measured were above the minimum Cronbach's alpha value to establish internal validity except two constructs from Kaptein's Scale (Consensus and Authority) and one construct from Busch et al.'s Scale (Social Learning). Trustworthiness reported a Cronbach's alpha value of 0.51 which might seem to be well below the recommended value of 0.7. However constructs that contain 2-3 items are allowed to have a Cronbach's alpha value of 0.4 and above [93]. The Cronbach's alpha values for the constructs measured are shown in Table 10.

Table 10. Kaiser-Meyer-Olkin (KMO) and Bartlett's test of Sphericity (BTS) measures for the instruments used for the study. Also reported are the Cronbach's alpha (internal validity) values of the constructs in the instruments.

Instrument	**Constructs**	**Cronbach's alpha (α)**
WTMST *KMO = 0.85* *BTS = (χ2(105) = 538.458, p < 0.0001)*	Intrinsic Motivation	*0.95*
	Identified Regulation	*0.89*
	Introjected Regulation	*0.86*
	External Regulation	*0.71*
	Amotivation	*0.78*
WBNS *KMO = 0.81* *BTS = (χ2(120) = 408.868, p < 0.0001)*	Competence	*0.82*
	Autonomy	*0.80*
	Relatedness	*0.86*
Kaptein's et al.'s Susceptibility to Persuasive Strategies Scale *KMO = 0.71* *BTS = (χ2(253) = 641.49, p < 0.0001)*	Reciprocity	*0.80*
	Commitment	*0.87*
	Scarcity	*0.71*
	Authority	*0.67*
	Consensus	*0.45*
Busch et al.'s Scale for Measuring Persuadability *KMO = 0.64* *BTS = (χ2(300) = 777.37, p < 0.0001)*	Rewards	*0.91*
	Competition	*0.79*
	Social Learning	*0.62*
	Social Comparison	*0.73*
	Trustworthiness	*0.51*

5.2.2 Workplace Basic Need Satisfaction (WBNS)

A One-Way Repeated Measures ANOVA was run with Perceived Basic Need Satisfaction as a within-subjects factor. This test is used to investigate the existence of statistically significant differences between the means of three or more levels of a within-subjects factor. The within-subjects factor was measured on three levels; Competence, Autonomy and Relatedness. To perform a One-Way RM ANOVA, there should be no outliers in the data, data must be normally distributed and the variances of the differences between all combinations of all levels of the within-subjects factors must be equal. The last requirement can be tested using Mauchly's test of Sphericity.

There were no outliers in the data, as assessed by the inspection of a box plot. Perceived Psychological Basic Need Satisfaction (*Figure 7*) of Autonomy (M=3.98, SE=0.11), Competence (M=4.14, S=0.08) and Relatedness (M=3.8, SE=0.15) were normally distributed with a skewness of -0.07, -0.13, 0.34 respectively (SE = 0.32) and kurtosis of -0.794, -1.21, -1.36 respectively (SE = 0.63). However, the data did not pass Mauchly's test of Sphericity ($\chi 2(2) = 15.697, p<0.001$).

Since the data violated Mauchly's test of Sphericity, a Greenhouse-Geisser correction was used to correct the One-Way RM ANOVA (BNS and Error rate). There were no statistically significant differences between the various Perceived Basic Needs Satisfaction measured ($F (1.592, 85.964) = 2.732, p=0.083$).

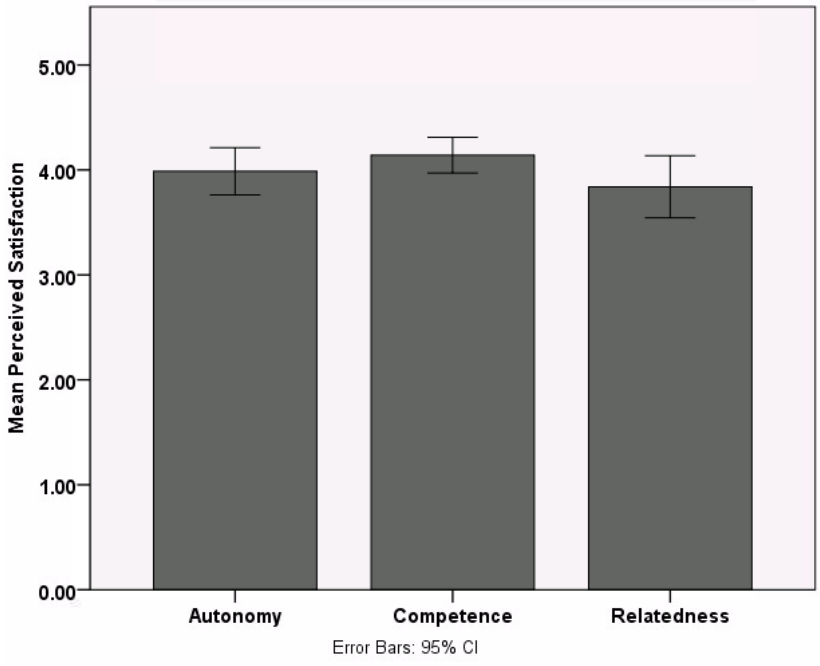

Figure 7. Bar Graph of Perceived Psychological Basic Need Satisfaction

5.2.3 Work Tasks Motivation Scale for Teachers (WTMST)

A box plot inspection showed no outliers and the various constructs were normally distributed with skewness of -0.18, -0.44, -0.33, -0.55, -0.65 (SE = 0.32) for Intrinsic, Identified, Introjection, External, Amotivation Regulation respectively and a kurtosis of -1.25, 0.97, -0.68, -0.95, -0.93 (SE= 0.63). The data violated the Mauchly's Test of Sphericity (*$\chi 2(9) = 108.54, p<0.001$*), as such, the Greenhouse and Geisser corrections for Mixed ANOVA was used.

The results showed significant main effects of Self-Determination constructs ($F_{1.84, 101.24}$=25.07, p<0.001, η^2 = 0.32) on perceived Regulation. This means there were significant differences between the various constructs measured. A post hoc pairwise comparison (Bonferroni) was run to pinpoint the actual differences between the various constructs. External Regulation (M=5.16, SE=0.24) was the highest followed by Identified Regulation (M=4.71, SE =0.24) and Intrinsic Motivation (M=4.39, SE=0.26) although there were no significant differences between them (*Table 12*). Introjected Regulation (M=3.10, SE=0.22) is the next highest followed by Amotivation (M=2.38, SE=0.20) with the lowest Self-Determination Regulation. The difference between Introjected Regulation and Amotivation was statistically significant (p<0.005). These results are shown in Figure 8.

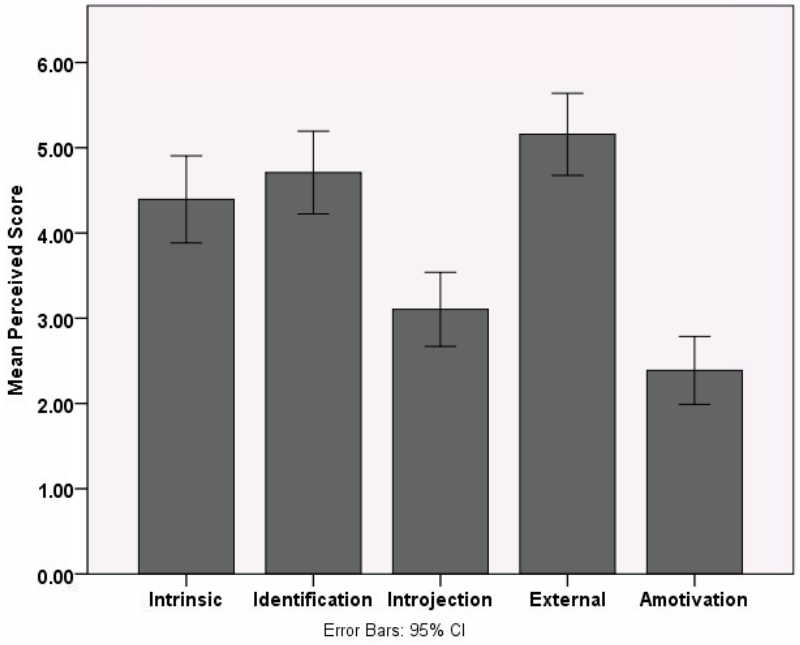

Figure 8. Bar Graph of Intrinsic Motivation, Identified Regulation, Introjected Regulation, External Regulation and Amotivation

Association Between Basic Psychological Needs and Work Self-Determination Constructs

To explore the associations between the basic psychological needs and the elements of Internalization Continuum, a Pearson Correlation was run. The correlation matrix for this test is shown in Table *11*.

Table 11. Correlation between Basic Psychological Needs and Work Self-Determination Constructs.

	INTRI	IDENT	INTROJ	EXTER	AMOT	AUTO	COMP	REL
INTRI	-							
IDENT	*0.825***	-						
INTROJ	*-0.230*	*-0.075*	-					
EXTER	*-0.448***	*-0.309**	*0.412***	-				
AMOT	*-0.630***	*-0.437*	*0.440***	*0.455*	-			
AUTO	*0.420***	*0.346***	*0.006*	*-0.163*	*-0.449*	-		
COMP	*0.151*	*0.086*	*0.086*	*0.317***	*-0.172*	*0.400***	-	
REL	*0.466**	*0.232*	*-0.095*	*-0.179*	*-0.419***	*0.653***	*0.155*	-

*INTRI=Intrinsic Motivation; IDENT=Identified Regulation; INTROJ=Introjected Regulation; EXTER=External Regulation; AMOT=Amotivation; AUTO=Autonomy; COMP=Competence; REL=Relatedness; *=p<0.05; ** = p<0.01*

There was a moderate positive correlation between Intrinsic Motivation and Relatedness and Autonomy (Table *11*). Although there was a weak positive correlation between Competence and Intrinsic Motivation, this correlation was not statistically significant.

Within Work Self-Determination Constructs

The correlation results also show that there is a very strong positive correlation between Intrinsic Motivation and Identified Regulation. There was a moderate negative correlation between Intrinsic Motivation and Amotivation as well as between Intrinsic Motivation and External Motivation. (*Table* 11)

Within Basic Psychological Needs Constructs

The correlation results showed a moderate positive association between Autonomy and Relatedness as well as between Autonomy and Relatedness (*Table 11*).

Work Self-Determination Index

As discussed in Chapter three, the WSDI for the various subscales was calculated. The WSDI for Graduate Assistants was -2.71 (*Table 12*). This is indicative of the fact that Graduate Assistants are not self-determined when it comes to their responsibilities.

Table 12. Mean, SE and Skewness of Employee Motivation. Items were rated on a 7-point Likert Scale.

WTMST Subscale	M	SE	Skewness
Intrinsic Motivation	*4.39*	*0.26*	*-0.18*
Identified Regulation	*4.71*	*0.24*	*0.44*
Introjected Regulation	*3.10*	*0.22*	*0.33*
External Regulation	*5.16*	*0.24*	*0.55*
Amotivation	*2.38*	*0.20*	*-0.65*
WSDI	**-2.68**	**1.79**	**-0.13**

M=Mean, SE= Standard Error, WTMST = Work Tasks Motivation Scale for Teachers, WSDI = Work Self-Determined Index

A multiple regression analysis was conducted to explore the relationship between employees' WSDI and their perceived basic psychological need satisfaction. There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.94. This is approximately 2, the accepted Durbin Watson Statistic to perform a multiple regression. The inspection of a scatter plot showed a linear relationship between WSDI and competence, autonomy and relatedness collectively. A partial regression plot also showed a linear relationship between WSDI each of the perceived basic psychological needs: competence, autonomy and relatedness. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. Another assumption that needs to be made when running a multiple regression is that the data must not show multicollinearity. Multicollinearity occurs when two or more of the independent variables involved in the multiple regression are highly correlated. This leads to the problem of not predicting which independent variable contributes to the variance in the dependent variable. To test for multicollinearity, two inspections need to be made: correlation coefficients and the Tolerance/VIF values. To pass the multicollinearity test, no pair of independent variables must exhibit a correlation of more than 0.7 and the VIF (inverse of Tolerance) values must not be greater than 10. The data passed the multicollinearity test. The final assumption is the absence of no outliers in the data which the data passed.

A multiple regression was run to predict WSDI from Competence, Autonomy and Relatedness. The multiple regression model predicted WSDI and this prediction was statistically significant (F (3, 51) = 4.229, $p < .005$, adj $R^2 = 15\%$). Although Autonomy and Relatedness added to the prediction of WSDI, only Autonomy added statistically significantly to the prediction of WSDI. Table 13 Shows the regression coefficients and standard errors.

Table 13. Multiple Regression Results prediction of WSDI.

Variable	B	SE_B	β
Constant	-21.006	11.985	
Competence	-3.006	2.981	-0.142
Relatedness	1.168	2.039	0.096
Autonomy	6.589	2.892	0.411*

** p< 0.05; B = Unstandardized Coefficients; SE_B = Standard Error for Unstandardized Coefficients; β= Standardized Coefficient.*

5.2.4 Workplace Motivating Factors

Graduate Assistants were provided with a list of 13 workplace motivating factors which were retrieved from literature and asked to rank them based on their importance to them. Four records were excluded because the respondents ranked all 13 items. The mean rank of each motivating factor was calculated. The top five motivating factors of Graduate Assistants are displayed in the *Table 14* below.

Table 14. Graduate Assistants Workplace Motivating factors

Motivating Factor	Rank	Mean Ranking
Job Security	*1*	*9.55*
Recognition	*2*	*8.04*
Achievement	*3*	*6.25*
Relations to Graduate Assistants	*4*	*5.96*
Responsibility	*5*	*5.35*

5.2.5 Susceptibility to Persuasive Principles/Strategies

Two instruments were used in measuring the susceptibility of employees to various persuasive strategies/principles. The results from these instruments are discussed below.

Employee Susceptibility to Cialdini's Persuasive Principles

The response measuring the susceptibility of employees to Cialdini's Principles was analyzed using a Two-Way Mixed ANOVA with susceptibility to persuasive principles as a Within-Subjects factor and Gender and Continent of Origin as a Between-Subjects factor. To run a Two-Way Mixed ANOVA test, there must be no outliers that do not impact the results of the test. However, there was one outlier in both the Reciprocity and Authority Constructs. One of the ways of dealing with outliers is to include the outliers in the analysis if they do not impact the results of the ANOVA significantly. To investigate the effect of the outliers on

the results, A Two -Way Mixed ANOVA was run both with and without the outliers. The two results did not differ significantly in the Within-Subjects factors ($p<0.001$) and Between-Subjects ($p>0.05$) results. The outliers were therefore included in the analysis of Two-Way Mixed ANOVA. The data was normally distributed with a skewness of -0.268, 0.271, 0.358, -0.743, -0.516 (SE = 0.322) and a kurtosis of -0.196, -0.816, -0.034, 0.029, -0.181(SE = 0.634) for Reciprocity, Scarcity, Authority, Commitment, and Consensus respectively. The data violated the assumption of Mauchly's test of sphericity ($\chi 2(9) = 29.90, p<0.001$), therefore a Huynh-Feldt correction was applied to correct the Two -Way Mixed ANOVA since Epsilon was greater than 0.75. Epsilon is the degree to which sphericity is assumed in a data with an Epsilon of 1 indicating an exact assumption of sphericity. The less the value of epsilon, the greater the violation of sphericity.

Levene's Test for homogeneity of Variances showed that there was a homogeneity of variances ($p>0.05$). The data also exhibited a homogeneity of covariance as determined by Box's Test of Equality of Covariance Matrices ($p>0.05$).

The main effects of persuasive strategy susceptibility showed a statistically significant difference between employees' susceptibility to the five measured Cialdini's persuasive principles ($F(4,158.24) = 30.89$, $p< 0.001$). Employees were most susceptible to Commitment (M = 5.53, SE = 0.16), Reciprocity (M = 5.40, SE = 0.14), Authority (M = 4.92, SE = 0.14), Consensus (M = 4.14, SE = 0.15), and Scarcity (M = 3.95, SE = 0.18) in that order (Figure 9). However, a post-hoc pairwise comparison showed employees were most susceptible to Commitment and Reciprocity, followed by Authority and least susceptible to Consensus and Scarcity.

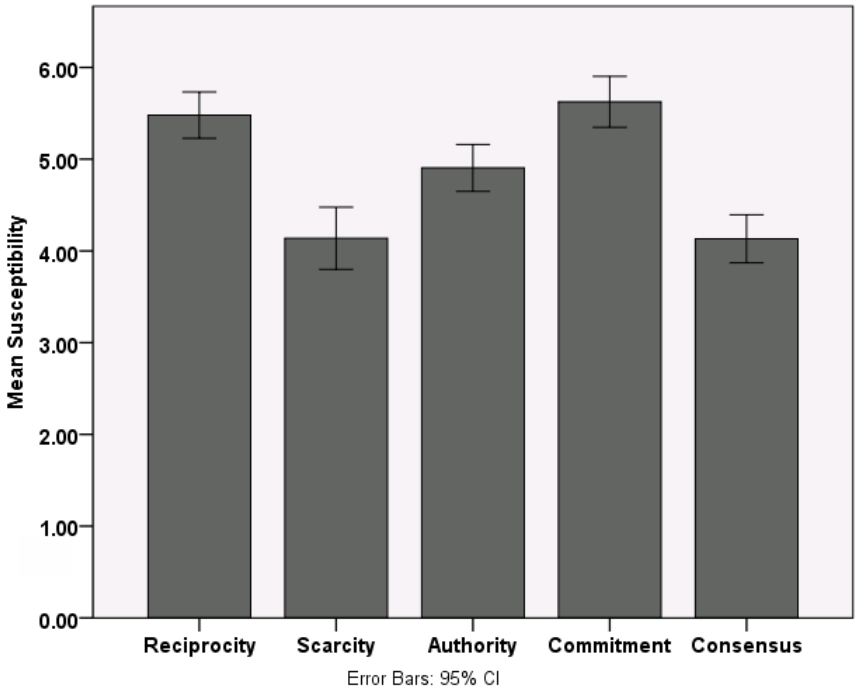

Figure 9. Bar Graph of Employees' Susceptibility to Cialdini's Persuasive Principles measured

There was a statistically significant interaction between employees' continent of origin and their susceptibility to Cialdini's persuasive principles (F (11.75, 180.13) =1.20, $p<0.05$, partial $\eta^2 = 0.38$). A Bonferroni post-hoc test showed that employees' whose continent of origin is Asia (M= 4.8, SE=0.30) are more susceptible to Scarcity as a persuasive strategy than those whose country of origin is North America (M= 3.63, SE = 0.25) and this difference is statistically significant ($p<0.05$) (*Table 15*).

Table 15. Mean susceptibility of ABA front-line staff to Social Influence Persuasive Strategies by continent of origin.

	Commitment	**Reciprocity**	**Scarcity**	**Consensus**	**Authority**
Africa	5.81, 0.25	5.59, 0.22	3.96, 0.39	4.20, 0.33	5.29, 0.20
Asia	5.61, 0.27	5.76, 0.23	4.80, 0.25*	4.35, 0.15	4.98, 0.21
Middle East	5.04, 0.19	5.16, 0.26	3.40, 0.11	4.35, 0.22	5.00, 0.31
North America	5.67, 0.25	5.09, 0.20	3.63, 0.25*	3.70, 0.25	4.42, 0.25
*(Mean, Standard Error). * represent statistically significant differences. p<0.05*					

Within Continent Influence of Persuasive Principles

In summary, Commitment is the most influential persuasive principle for Graduate Assistants that come from Africa and North America, followed by Reciprocity. On the other hand, Reciprocity is the most influential persuasive principle among Graduate Assistants from Asia and Middle East, followed by Commitment. Authority, is the third most influential persuasive principle regardless of which continent Graduate Assistants come from. With exception of Graduate Assistants from Asia, Consensus is the fourth most influential persuasive principle with Scarcity being the least influential. For Graduate Assistants from North America and Middle East, Scarcity as a persuasive principle is less likely to influence them. Also, Consensus is less likely to influence North American Graduate Assistants (*Table 15*; *Table 16*).

Table 16. Summary of Level of Influence of Cialdini's Persuasive Principles on Graduate Assistants Grouped by Continent of Origin.

Continent of Origin	**Cialdini's Persuasive Principles**
Africa	**Commitment**, Reciprocity, Authority, Consensus, Scarcity
Asia	**Reciprocity**, Commitment, Authority, Scarcity, Consensus
Middle East	**Reciprocity**, Commitment, Authority, Consensus, Scarcity
North America	**Commitment**, Reciprocity, Authority, Consensus, Scarcity
Bold and underlined Principles are the most influential.	

Employee Susceptibility to Social Influence Persuasive Strategies

The social influence persuasive strategies were measured using the Persuadability Inventory developed and validated by Busch et al. The social influence strategies the Persuadability Inventory measures are: Reward, Competition, Social Comparison, Social Learning and Trustworthiness. A Three-Way Mixed ANOVA (BBW) was used to analyse the data with susceptibility to persuasive strategies as a Within-Subjects factor and Gender and Continent as a Between Subjects factors. The 35 cells of the study design were checked for outliers. There were two outliers in one of the cells (Gender = Female, Continent = North America) from the same respondent in the Rewards and Social Learning Category. However, these outliers were not removed because the results of the Three-Way ANOVA were not statistically different with or

without the outliers. All cells of the study design were normally distributed as tested by a Kosmogorov-Smirnov test ($p > 0.5$). As mentioned earlier, the Three-Way Mixed ANOVA assumes that variance of the dependent variable is equal for all groups of the Between-Subjects factor: homogeneity of variances. There was homogeneity of variances for susceptibility to the five persuasive strategies measured ($p> 0.5$). However, Mauchly's test of sphericity showed that the assumption of sphericity had been violated ($\chi 2(9) = 33.245, p<0.001$). Since Epsilon (Ɛ) was lower than 0.75, Greenhouse-Geisser correction was used to correct the results of the Three-Way Mixed ANOVA.

There was main effects of susceptibility to persuasive strategies and this was statistically significant ($F(4, 184) = 28.23$, $p <0.01$, partial $\eta^2 = 0.38$). Employees were most susceptible to Trustworthiness (M=5.82, SE=0.11), Reward (M=5.17, SE=0.19), Competition (M=4.71, SE=0.17), Social Comparison (M=3.84, SE=0.15) and Social Learning (M=3.9, SE=0.14) in that order. There were significant differences between susceptibility to Trustworthiness and Reward, and, Trustworthiness and Competition ($p<0.05$). There was no statistically significant difference between Reward and Competition ($p>0.05$). The difference between susceptibility to Social Learning and Social Comparison was also not statistically significant($p>0.05$).

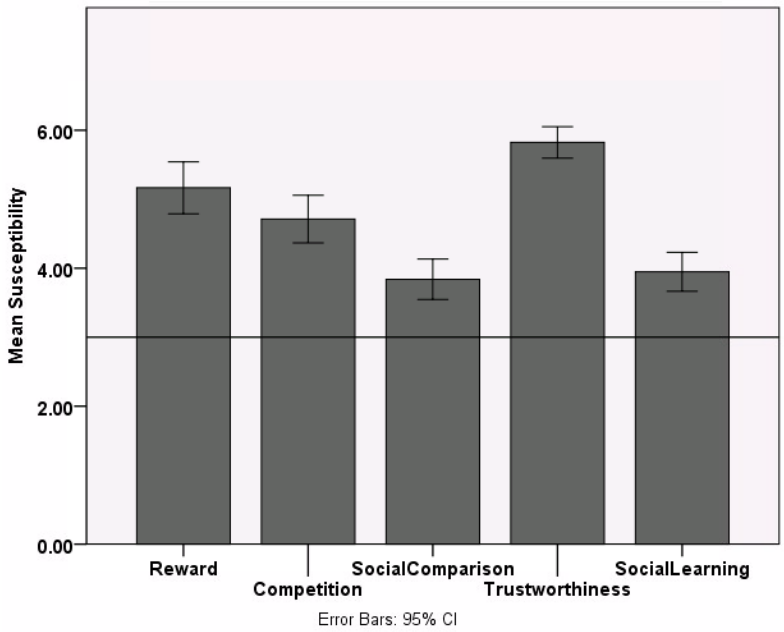

Figure 10. Bar Graph of Employees' Susceptibility to Persuasive strategies measured

Gender, Continent of Origin and Persuasive Strategy Interaction

The results of the Three-Way Mixed ANOVA also showed a statistically significant three-way interaction between susceptibility to persuasive strategies, gender and continent of origin ($F (12, 184) = 2.45$, $p = 0.015$, partial $\eta^2 = 0.14$). Continent of origin and gender of Graduate Assistants did not significantly impact susceptibility to the persuasive strategies independently.

Statistical significance for simple two-way interactions and simple simple main effects were accepted at a Bonferroni-adjusted alpha level of 0.025 and 0.05 respectively. Bonferroni corrections were made with comparisons within each simple simple main effect considered as a family of comparisons. Bonferroni corrected adjusted p-values are reported for pairwise comparisons.

Gender, Continent of Origin and Social Learning

There was a simple two-way interaction between gender and continent of origin Social Learning ($F (3,46) = 3.64$, $p = 0.019$) and this interaction was statistically significant. There was a statistically significant simple simple main effect of Gender for North America with regards to susceptibility to Social Learning ($F (1,46) = 6.41$, $p = 0.015$). Also, there was a statistically significant simple simple main effect of Continent for Males with regards to susceptibility to Social Learning ($F (1,46) = 1.22$, $p = 0.018$) but not for females.

A pairwise comparison for statistically significant simple simple main effects indicated that mean susceptibility to Social Learning was higher in North American Males ($M = 2.933$, $SE = 0.39$) than African ($M = 4.7$, $SE = 0.39$). However, there was no statistically significant difference between African Males, Asian Males ($M = 0.31$) and Middle Eastern Males ($M = 4.3$, $SE = 0.69$) (*Figure 11*).

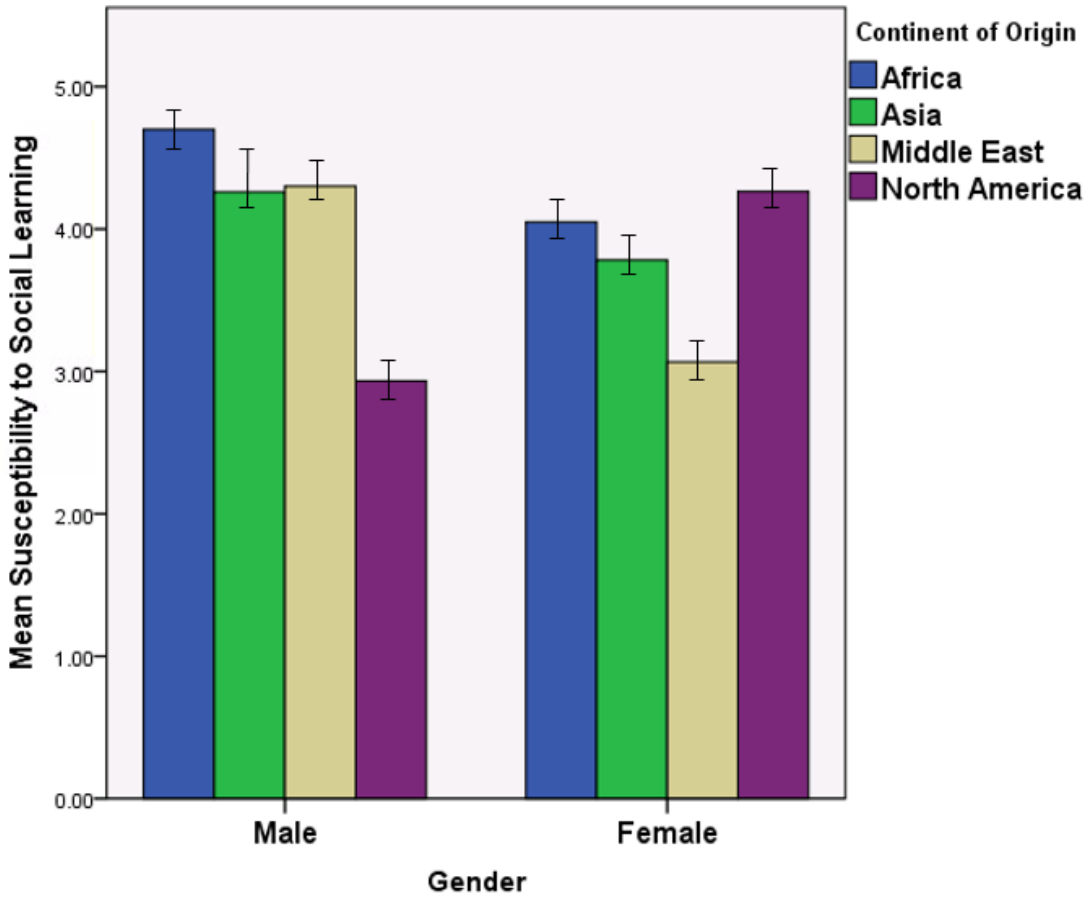

Figure 11. Bar Graph of the impact of Gender and Continent of Origin on Employee susceptibility to Social Learning

Gender, Continent of Origin and Trustworthiness

There was also a statistically simple two-way interaction between gender and continent of origin in susceptibility to Trustworthiness ($F(3,46) = 4.11$, $p = 0.012$). There was a statistically significant simple simple main effect of Gender for North America with regards to susceptibility to Trustworthiness ($F(1,46) = 9.45$, $p = 0.004$). Also, there was a statistically significant simple simple main effect of Continent for Females with regards to susceptibility to Trustworthiness ($F(3,46) = 4.69$, $p = 0.006$) but not for Males

A pairwise comparison showed that African Females ($M = 6.02$, $SE = 0.27$) and Asian Females ($M = 6.21$, $SE = 0.23$) are more susceptible to Trustworthiness as a persuasive strategy than North American Females

(M = 4.96, SE = 0.26). There was no statistically significant difference between African and Asian Females' susceptibility to Trustworthiness. There was no statistically significant difference between Middle Eastern Females (M = 5.56, SE = 0.3) and females from other continents (*Figure 12*).

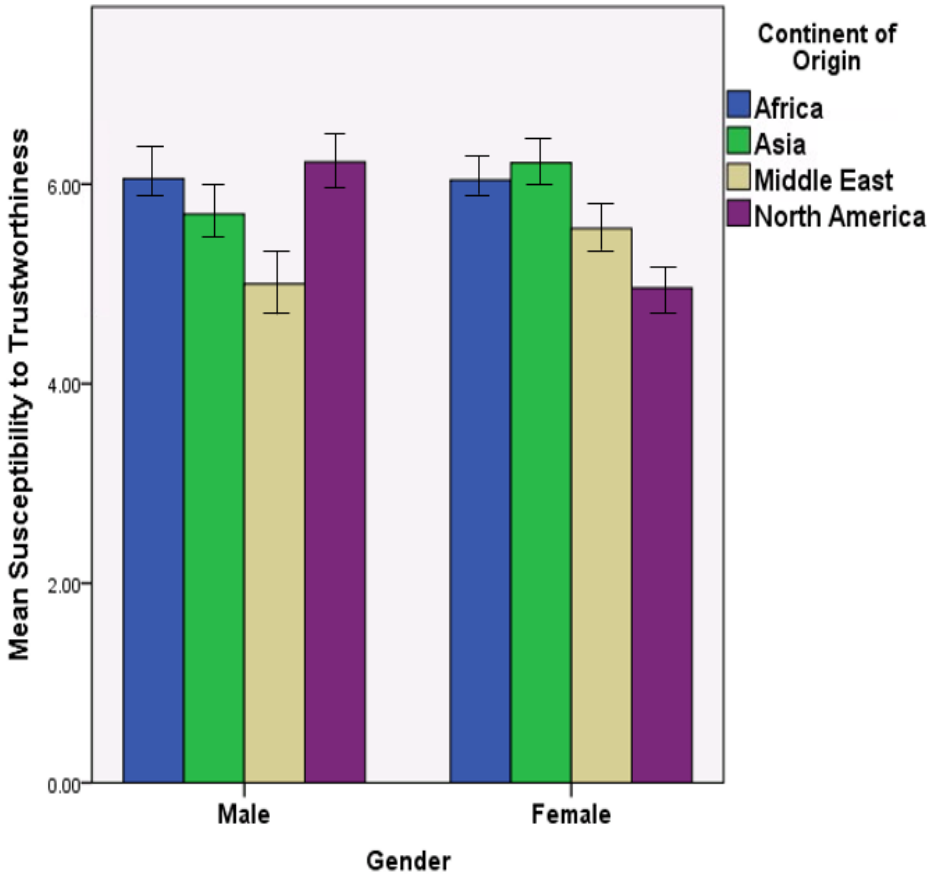

Figure 12. Bar Graph of the impact of Gender and Continent of Origin on Employee susceptibility to Trustworthiness

Correlation Among Persuasive Strategies Measured

A Pearson Correlation was run to investigate the association between the various persuasive strategies that were measured. The correlation matrix is shown in Table 17. Reward had a positive correlation with six other persuasive strategies; Competition (strong), Social Comparison (moderate), Trustworthiness (moderate), Authority (weak), Commitment (weak), and Consensus (weak). Commitment had a strong positive correlation with Reciprocity and a moderate positive association with Social Comparison and Authority.

Table 17. Correlation Matrix of Persuasive Principles

	REW	COMP	SOCC	TRUS	SOCL	RECI	SCAR	AUTH	COMM	CONS
REW	-									
COMP	**0.76****	-								
SOCC	**0.56****		-							
TRUS	**0.28***	**0.26***	-0.07	-						
SOCL	0.16	-0.05	**0.23***	-0.20	-					
RECI	0.18	0.11	**-0.03***	0.22	0.05	-				
SCAR	0.03	0.11	-0.01	0.21	0.17	**0.31***	-			
AUTH	**0.28***	**0.30***	-0.06	**0.25***	0.19	**0.49****	0.14	-		
COMM	**0.23***	**0.23***	**0.39****	**0.23***	0.12	**0.66****	0.21	**0.42****	-	
CONS	**0.28***	0.20	**0.27***	-0.06	**0.46****	0.22	**0.41****	**0.34****	0.17	-

***=p<0.01; *=p<0.05.*
REW=Reward; COMP=Competition; SOCC =Social Comparison; TRUS=Trustworthiness; SOCL=Social Learning; RECI=Reciprocity; SCAR=Scarcity; AUTH=Authority; COMM=Commitment; CONS=Consensus;

Predicting Competition

The Pearson Correlation (*Table 17*) test showed a strong positive correlation between Competition and Reward and a moderate association between Competition and Social Comparison. Reward and Social Comparison have been shown by previous research to be predictors of competitive behaviour [110]. Therefore, a multiple regression was run to predict Competition from Reward and Social Comparison. The multiple regression model predicted Competition and this prediction was statistically significant (F (2, 52) =35.336, $p < .0001$, adj R^2 = 56%). Although Reward and Social Comparison added to the prediction of Competition, only Reward added statistically significantly to the prediction of Competition. Table 13 shows the regression coefficients and standard errors.

Table 18. Summary of Multiple Regression Analysis for predicting Competition.

Variable	B	SE_B	β
Constant	0.540	0.935	
Reward	0.659	0.108	0.719**
Social Comparison	0.044	0.134	0.038

*** p< 0.001; B = Unstandardized Coefficients;*
SE_B = Standard Error for Unstandardized Coefficients;
β= Standardized Coefficient.

5.3. Discussion

5.3.1. Employee Motivation – Basic Need Satisfaction (BNS)

Research Question 1: *What are the satisfaction levels of the basic psychological needs (competence, autonomy and relatedness) of employees involved in documentation of analysis and evaluations?*

Graduate Assistants' Perceived Basic Need Satisfaction of Competence, Autonomy and Relatedness was measured quantitatively using the Work-Related Basic Need Satisfaction scale. The results showed that these needs were related to each other yet distinct, in line with previous findings [99, 111]. On a scale of 1 (Completely Disagree) to 7(Completely Agree), the mean Perceived Basic Need Satisfaction of Competence, Autonomy and Relatedness were 4.14, 3.98 and 3.80 respectively. Even though the difference between these perceived needs was not statistically significant, it depicts a workforce that finds the satisfaction of their Basic Psychological Needs around a mean of four (neutral) on a 7-point Likert scale. These findings suggest that an average Graduate Assistant does not perceive his/her basic psychological need of competence, autonomy and relatedness to be completely satisfied. That is, Graduate Assistants do not perceive themselves to act effectively and efficiently in executing their tasks and responsibilities. This might be because no form of formal training is provided to Graduate Assistants on how to accomplish their responsibilities in an effective and efficient manner before they start their jobs as Graduate Assistants. Also, Graduate Assistants do not perceive their responsibilities to be self-controlled, probably because tasks and responsibilities (Tutorial/Assignment content) are created and assigned to them with some professors providing rubrics for grading. Finally, the lives of Graduate Assistants are characterized by a busy schedule which could explain why they do not perceive themselves to have a social relationship with other Graduate Assistants even though it is important to them.

The results are also supported by previous research that Perceived satisfaction of the three basic psychological needs are determinants of the Work Self-Determination Index (WSDI) which will be discussed next [43].

5.3.2 Employee Motivation – Work Self-Determination Index (WSDI)

The Work Tasks Motivation Scale for Teachers (WTMST) was used to measure the degree to which Graduate Assistants Perceived their responsibilities to be Self-Determined. The WTMST measures the various components of the Internalization Continuum discussed in Chapter 2. Employees who are self-

determined at the workplace show a high level of commitment towards their responsibilities and exhibit a high level of workplace engagement [33]. For example teachers who are highly motivated are more engaged in their work and more satisfied, which in turn results in a positive impact on the well-being of students [14]. Amotivation recorded the lowest regulation among Graduate Assistants which is supported by previous literature to be the construct with the lowest self-regulation [14, 16]. This means that Graduate Assistants did not perceive themselves to be demotivated. Obviously, there were sources of motivation for them to be Graduate Assistants. These sources of motivation could be funding, feeling of power or control over students, and achievement.

On the other hand, Graduate Assistants perceived themselves to be slightly motivated by External regulation, Identified regulation and Intrinsic motivation. The absence of a significance difference between Intrinsic, Identification and External regulation is indicative of the fact that although Graduate Assistants performed their responsibilities for the purpose of a separable outcome, there is also a factor of them doing it because it emanates from their inner self. This is reflected in their choice of three of their five most important workplace motivating factors; *Job Security* (External Regulation), *Responsibility* (Identified Regulation), *Achievement* (Intrinsic Motivation). This could be explained by the fact that whilst Graduate Assistants might be performing their responsibilities because of the funding it brings them, they might also do it because they aim to be in academia one day and as such find pleasure in gaining the experience and helping make a difference in the academic life of students. Examining the individual constructs on the Internalization Continuum breaks down the concept of employee motivation. This deconstruction of the results of employee motivation shows a workforce that is not demotivated and somehow/slightly intrinsically and externally motivated to perform their responsibilities. Introjected regulation recorded the second lowest self-regulation on the internalization continuum among Graduate Assistants. Introjected regulation represents a type of motivation where individuals might engage in activity to maintain feelings of self-worth or to avoid guilt. This can be explained by the fact that there is no comparison of work performance among Graduate Assistants. This will therefore not be a reason why Graduate Assistants will perform their responsibilities.

5.3.3 Employee Motivation – BNS and Work Self-Determination Index Association

The significant positive correlation between Autonomy satisfaction and perceived Intrinsic and Identified regulation is not surprising. This can be explained by the concept that these constructs exhibit the highest form of autonomy on the internalization continuum [40]. However, a single score which effectively represents the self-determined degree of Graduate Assistants, the Work Self-Determination Index (WSDI) [16, 43], was calculated. Graduate Assistants scored a negative WSDI, which is characteristic of a workforce that is not self-determined. This describes a workforce that does not have a good personal experience with their responsibilities and as such do not produce desirable behavioral and performance outcomes. Implied from Pelletier et al [112], this will typically result in employees who engage in their responsibilities passively just to get the minimum amount of work required of them to gain an external reward or avoid punishment or loss. This can also be implicitly implied from the highest ranking of *Job Security* (Losing this job will cause a cut in my full/part of my funding) followed by *Recognition* as workplace motivating factors of Graduate Assistants. Due to passive behaviour of work performance, the extra effort required for optimal performance and engagement in employees' responsibilities will be absent.

The results also showed that Autonomy predicted WSDI through a multiple regression analysis. This means that perceived autonomy added significantly to Graduate Assistants' Work Self-Determination Index. This result is supported by previous literature that autonomy satisfaction is a facilitator of internalization [33]. This is also not surprising as indicated by the discussion in the previous paragraph concerning the significance of self-regulation in the internalization continuum. One way of moving individuals along the internalization continuum till they reach intrinsic motivation is to facilitate autonomous regulation on behaviours that are not self-regulated. The positive correlation between relatedness and intrinsic motivation and autonomy satisfaction concurs with previous literature on the Organismic Integration Theory that continuous increase in autonomy (internalization) in individuals is likely to occur if relatedness is facilitated [33]. This is also supported by Ryan et al.'s [113] study which showed that students who exhibited high levels of internalization for positive school behaviours were those who were connected or had social relationships with their teachers, parents and friends.

Also, perceived competence was found to be positively related to autonomy, which is a critical element for a behaviour to be internalized. This is also supported by previous literature which posits that perceived

competence is also a function of internalization as the continuous engagement in a behaviour will continue if individuals feel competence towards target behaviours in a social group[114].

Another possible implication of these results is the introduction of mechanisms to continuously remind employees of the significance of their responsibilities. This can be done by providing a meaningful and practical reasoning for the behaviours that are not inherently motivating. This technique is supported by research results that have shown that providing a rationale and choice are relevant for promoting internalization of target behaviours [115].

5.3.4 Susceptibility to Cialdini's Persuasive Principles

With regards to Cialdini's Principles, susceptibility to Commitment and Reciprocity were found to be the highest among Graduate Assistants, followed by Authority. The least susceptible principles were Consensus and Scarcity.

Graduate Assistants might have been most susceptible to Commitment because they have to follow schedule by performing tasks and responsibilities when they are needed. Its high influencing ability is also supported by a previous work by Orji [93] who found Commitment to be the most influential Cialdini persuasive principle among a general population.

The high influence of Reciprocity may be attributed to the arrangement at the workplace where the employees are paid in return for commitment to workplace duties or tasks. At the University, many of the Graduate Assistants are students receiving scholarship to cover their living expenses and tuition in exchange of a certain number of work hours in grading or teaching. Reciprocity is an inherent part of human nature where individuals feel obliged to return a favor [63]. For example, covering up for each other at the workplace is characteristic of a reciprocal behaviour. Research has also shown that an organization's productivity is closely related to the degree of reciprocity employees are willing to indulge in [116].

Authority is also influential because the nature of the workplace involves instructions passed down from a higher authority down to subordinates. Graduate Assistants are trainees in teaching and they need to follow the instructions of Faculty regarding how to grade assignments and how to present tutorial materials.

5.3.5 Susceptibility to Social Influence Persuasive Strategies

The results showed that Trustworthiness was the persuasive strategy Graduate Assistants were most susceptible to. Graduate Assistants might have shown a high susceptibility to Trustworthiness because of the nature of their jobs where they provide their services to the University in exchange for funding or hourly wages. Therefore, they would have to trust that their funding or hourly wages will come to them after executing their end of the deal. Another explanation of why Graduate Assistants showed a high susceptibility to trustworthiness could be because of their tendency to value social relationships with each other as evident by one of their top five workplace motivating factors (Relations with Graduate Assistants). The pervasive role of Trustworthiness in social cohesion and integration cannot be underestimated. It is a significant element for the survival of social relationships through social cohesion and integration [117].

After Trustworthiness, employees were more susceptible to Reward and Competition on one level and Social Learning and Social Comparison on another level. Graduate Assistants are probably more influenced by Rewards because of the nature of their jobs where they work in return for funding or hourly wages. Competition on the other hand is a widespread and remarkable workplace phenomenon [108]. It is usually characterized by the effort by employees to outperform each order to receive higher salaries, wages, bonuses or rewards, and praises. It is therefore not surprising that there was no statistical difference between Graduate Assistants' susceptibility to reward and competition. However, the current work environment of Graduate Assistants does not provide the platform for competitions.

Also, a multiple regression showed that Reward is a predictor of Competition among Graduate Assistants. This is supported by previous literature that Reward is the highest predictor of a competitive behaviour [110] and implies that individuals who are influenced by Rewards will most likely be influenced by Competition.

Social Learning and Social Comparison ranked the lowest in terms of susceptibility to social influence persuasive strategies among Graduate Assistants with a mean of 3.84 and 3.90 respectively on a scale of 1(Completely Disagree) to 7(Completely Agree). The poor susceptibility of Graduate Assistants to Social Learning and Social Comparison can be explained by previous works which found young adults (86.3% of participants) to be independently minded [106]. It may also not be surprising that Social Comparison rated low among Graduate Assistants when the score for Introjected Regulation (from Work Self-Determination

Scale) is considered. Introjected regulation and Social Comparison are similar in a way that employees may execute their tasks or compare their performance to that of their colleagues to stimulate their self-worth. Since the nature of the employment environment of Graduate Assistants does not have measures that stimulate competitive behaviors Graduate Assistants will hardly show the tendency of being susceptible to Social Comparison or exhibit Introjected Regulation.

Also, the Results from this study are supported by previous literature that males and females do not have any significant difference in the degree of trust they usually exhibit [118] [119]. However, the introduction of another factor which is culture/continent of origin, brings to light a different conjecture which is also supported by previous literature [120]. The results showed that susceptibility to Trustworthiness was impacted by both Graduate Assistants' gender and their continent of origin. Female Graduate Assistants from Africa and Asia were more susceptible to Trustworthiness than those from North America. This is in contrast to a previous study that found out that North American women prioritized integrity as opposed to Asian women who prioritized benevolence and cultural similarity at the workplace [120]. There might therefore be other factors at play that are not accounted for or explained by this study. Individuals from North America are known to belong to the individualist culture whilst those from Asia and Africa belong to the collectivist culture [93]. Individualist culture is typified by people who tend to not form many close ties to other people and normally look after themselves. They are also taught from a very young age to be independent as much as possible. Collectivists on the other hand are characterized by people who form strong bonds with each other [93] [121]. Perhaps females from Asia and Africa showed a higher susceptibility to trustworthiness because of the significance of trust amongst collectivists. In that, trust is one of the major ties that bind collectivists to achieve social cohesion.

On the other hand, African and Asian Men appeared to be more susceptible to Social Learning than North American Men. This result is not surprising as collectivists are inherently drawn to social and community integrations. Social Learning which is analogous to consensus was posited [93] to be a more useful persuasive strategy to collectivists than individualists. Orji [93] also found females to be more susceptible to consensus than males. This may explain why female Graduate Assistants exhibited the same tendency to learn or pick up behaviour (social learning) from each other regardless of their country of origin.

5.4 Design Requirements

This section represents the third activity in DSR framework discussed in Chapter 3 (page 27). It presents requirement guidelines to adopt when implementing Persuasive Technology and Gamification to engage Graduate Assistants in their tasks and responsibilities. This is based on the results from the study conducted and presented in previous sections of this chapter as well as previous literature. The results (negative Work Self-Determination Index) showed that Graduate Assistants are not engaged in their responsibilities which justifies motivating them by leveraging Persuasive Technology and Gamification. According to Kappen and Nacke [76], it is of utmost importance for an organization to determine the business need to gamify. Also, despite the highlights on the benefits of Gamification to organizations, the use of Gamification does not apply to certain applications or situations as some organizations have overestimated its potential. Brian Burke [122], a known Gamification analyst of Gartner Group also reiterated the importance of this stage of deciding to implement Gamification as expectations of clients when they think of how Gamification could be of help to their organization exceeds it's potential.

As the results clearly show, Graduate Assistants are not sufficiently engaged and as such put in the minimum effort required to have access to their funding. To implement a persuasive gamified system there is the need to define the requirements for the implementation. In this section, an attempt to define these requirements and outline possible game element designs is presented.

The satisfaction of the Basic Psychological Needs as presented in the Self-Determination Theory [33] has been proven by previous research to be necessary in the activation of people's intrinsic motivation which contributes to their well-being and brings out their best performance in tasks and responsibilities. A frustration of these needs, however, results in ill-being and a lack of engagement in tasks [40, 123], [99]. For example, Broeck et al. [99] found out that autonomy satisfaction was a major preventer of employee turnover and likened their results to previous works in other life domains that found autonomy satisfaction to be positively correlated with less school dropouts. Also, although *Relation with other Graduate Assistants* (Relatedness), *Achievement and Recognition* (Competence) were part of the five most important workplace motivating factors to Graduate Assistants, it is of concern that they do not perceive themselves to have these motivating factors satisfied.

These findings therefore suggest the investment in workplace systems that will facilitate the satisfaction of these Basic Psychological Needs of Competence, Autonomy, and Relatedness. Persuasive Technology

and Gamification can be used to achieve this by providing a platform to increase the satisfaction of Basic Psychological Needs of Graduate Assistants. This will tap into both their intrinsic and extrinsic motivation to create an engaged and productive workforce.

Therefore, the main objective of the proposed gamified application will be to foster intrinsic motivation by increasing the need of Competence, Autonomy and Relatedness among Graduate Assistants. An overview of the proposed persuasive gamified system as well as the various requirements that will contribute to achieving the objectives shown in *Figure 13* are discussed next.

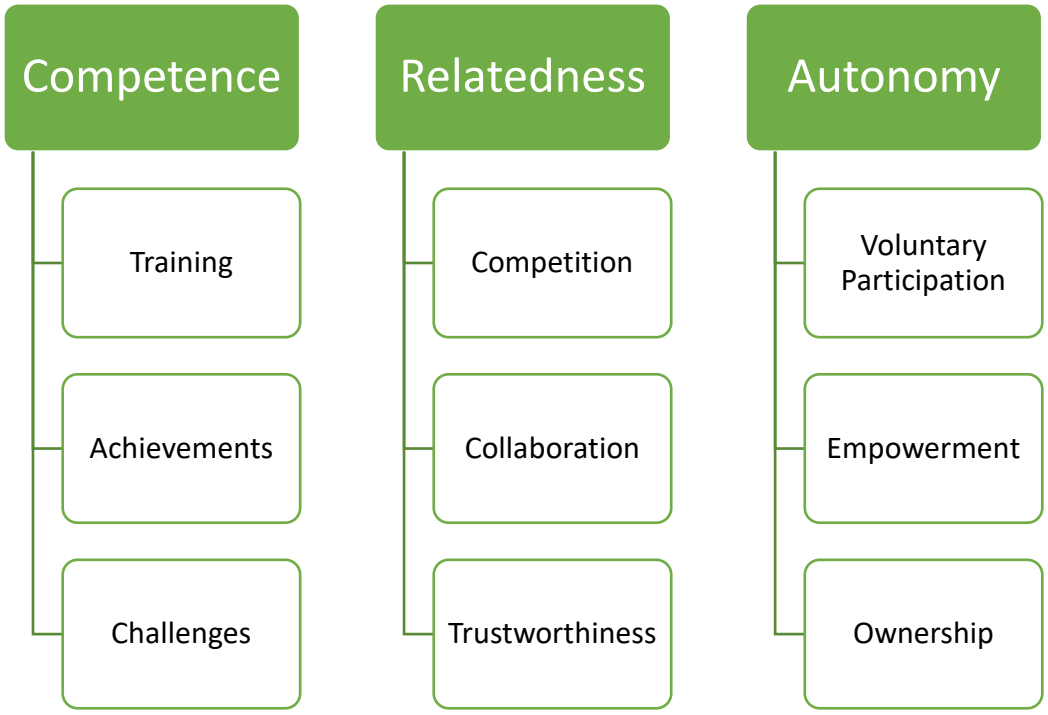

Figure 13. Objectives and Requirements of Proposed Gamified Application

5.4.2 Overview of the Proposed Gamified Persuasive System

This section presents an overview of the main functionalities of the proposed gamified persuasive system. The proposed system will provide a platform to foster a social relationship among Teaching Assistants whilst promoting the need for competence and autonomy. It will allow students to log in and upload assignments. After assignments are uploaded, Teaching Assistants would log in and download assignments for grading. After grading, marks will be awarded and feedback provided for the graded assignment. After marks and feedback are submitted, the respective student should be notified of the submitted feedback. The student will then be given the option to rate the quality of the feedback

provided. This rating will be converted into points and awarded to the Teaching Assistant who graded that assignment. HOW WILL RECIPROCATION BE AVOIDED? STUDENTS CAN TAKE REVENGE THE TA FOR GIVING POOR MARKS BY GIVING THEM LOW RATINGS? A Teaching Assistant can also gain points in the system based on actions such as grading earlier than the due time, recommending subject areas for tutorials that he/she has identified students to be struggling with, recommending struggling students for tutorials, engaging in a training game on how to grade effectively and efficiently. All these ways of accumulating points contribute to satisfying the need for Competence, Relatedness and Autonomy of Teaching Assistants. This will be discussed in detail in the remaining part of this chapter. Points that have been accumulated can be converted into electronic currency which can be exchanged for real life rewards. Also, certificates of achievements can be printed from the system based on a Teaching Assistant's performance. The various parts of the proposed system and the persuasive or game elements that can be leveraged are discussed next as well as some of the best practices to be taken into consideration.

5.4.3 Increasing Employee Competence

To provide Graduate Assistants the opportunity to improve on their perceived competence in the execution of their responsibilities, the persuasive gamified system must aid Graduate Assistants to achieve mastery. This can be achieved by providing training to Graduate Assistants along with options to exhibit what they know and have done in the form of achievements and challenges (*Figure 13*).

5.4.3.1 Training

Graduate Assistants did not perceive themselves as executing their responsibilities effectively. One of the probable reasons given was the lack of formal training provided on how to tutor and grade effectively and efficiently. Therefore, one of the requirements of a persuasive gamified system to increase the competence of Graduate Assistants is a system that will provide some form of training to Graduate Assistants. Kevin Corti [124], founder of PIXELearning Limited, posits that the selection of the appropriate game and persuasive elements can directly cause an improvement in the acquisition of skills and knowledge among employees and create a workforce that is productive. Previous works have reported much success in providing training to employees using this technique [4–6]. This training module will provide help on how to grade students properly so that written feedbacks that arise from grading can be applied and followed by the student to improve on their performance. Graduate Assistants must also be educated on the significance of providing valuable and quality feedback that students will be able to read, interpret and act on. This is necessary because the presentation and tone of a feedback might impact the

student it is intended for and this impact could be positive or negative. As reported by Susan BrookHart [125],

> "*Because students' feelings of control and self-efficacy are involved, even well-intentioned feedback can be very destructive. ("See? I knew I was stupid!")*."

A platform that brings awareness to the significance of tasks and responsibilities of workplace responsibilities and roles will aid Graduate Assistants to comprehend the effect of their actions or execution of their roles on other stakeholders involved including students and professors [124]. Training Graduate Assistants in this way will bring to life their everyday interrelated responsibilities and cause them to be actively involved in the training process [41]. There is a high probability of employees staying engaged in the training process if there is an element of fun involved as one of the reasons employees are known not to like formal trainings is because they find them to be boring [126]. Employees have also reported to prefer being trained this way because they receive instant feedback for their performance, they feel a sense of flow whilst engaged in training and they progress through different stages of difficulty [127].

Guidelines for Designing the Training Module

- **Make it a story**

  Nicholson [128] named exposition as one of the key elements when looking to gamify any situation including Gamification at the workplace. This is supported by the Narrative Transportation Theory [129] which stipulates that when people bury themselves in a narrative, their behaviour, attitude and intentions usually changes to reflect the content of the narrative. . For Narrative Transportation to be achieved, two conditions need to be met [129]. Empathizing with the characters (students) of a narrative is the first condition and the second condition is for a person to mentally visualize the contents and events of a narrative. A person who meets these conditions for narrative transportation will find themselves in a mental state of acting per what the narrative presented. To get employees engaged in a learning process, it is imperative to

present them a problem to solve in the form of a narrative and this technique has proven to yield encouraging results in training employees [4, 126].

In the proposed persuasive gamified system, a graduate assistant could play the role of a character who aims to be of significant help to students (represented by avatar on the screen) by mastering the skills of grading or tutoring. A student's happiness in this narrative could be dependent on the progression of a graduate assistants' skill acquisition during the training process. The student avatar happiness level could range from a smile to hopping around in excitement. Therefore, a Graduate Assistants' end goal in the narrative will be to make a student completely happy. The more the Graduate Assistant makes it through the various stages of the training module, the happier the avatar of the student on the screen should be.

- **Provide Feedback**

Persuasive gamified systems can help players in acquiring knowledge or engaging in productive tasks. However, players must be made aware of their progress and informed on whether they are on the right path. Prompt feedback is one of the reasons why employees prefer this method of training [127]. Games are also known to present players with constant feedback that trigger player senses and keeps them engaged and this can be categorized into two types: conscious and subconscious feedbacks [130]. Conscious feedbacks involve the use of progression and activity loops to keep players aware of their progress whilst unconscious feedback enhances interaction with the system and makes the experience more fun, natural and enjoyable. Feedback could be implemented using visual cues, points or progress bars. A workplace gamification system must make it possible for employees to learn using feedback. It should therefore concentrate on positive feedback instead of negative feedback. Positive feedback aside the fact that it is used as a form of positive reinforcement, could serve as a virtual reward and cause employees to realize their achievements and increase their self-efficacy [131].

- **Progression**

As mentioned in the previous section, implementing feedback on the proposed gamified system could be achieved using progress bars, levels and missions. Progression can be used to create awareness of an employee's competence in the training module. Progression has been discussed

to be an effective way to administer training to people as it allows the training materials to be organized into categories to increase the attention of trainees on thing at a time. With this strategy, trainees are guided and supported throughout the training process [132, 133]. As mentioned by Beth Kemp [133], it also helps guide people who have no idea where or how to start a training. Training materials should therefore be broken down into modules, levels or missions with increasing level of difficulty and complexity. Higher modules which are more difficult than lower levels should be unlocked after a player has completed the lower modules. To keep players engaged, the lower and less difficult modules must be made interesting to capture the attention of the player. This will cause them to want to play more by progressing through the various levels or modules. One way to achieve is to incorporate an attention catching narrative as discussed above [128].

Figure 14 shows a sample training environment for Graduate Assistants. The logged in user, is informed of their progress in various ways; “See who is no longer a beginner”, “Hurry to complete the intermediate lessons”, a progress bar under Training Level 2 showing the percentage of completion. Also, the user is made to empathize with the students; “Your students need you”. This also creates a sense of epic meaning which will be discussed later. The user also progresses through levels of training with higher levels unlocking after completion of lower levels. The smiling yellow avatar on the top right corner indicates the happiness level of a student. To achieve the highest level of happiness (hopping around), a Graduate Assistant must make it through the last level (Level 6) of the training module.

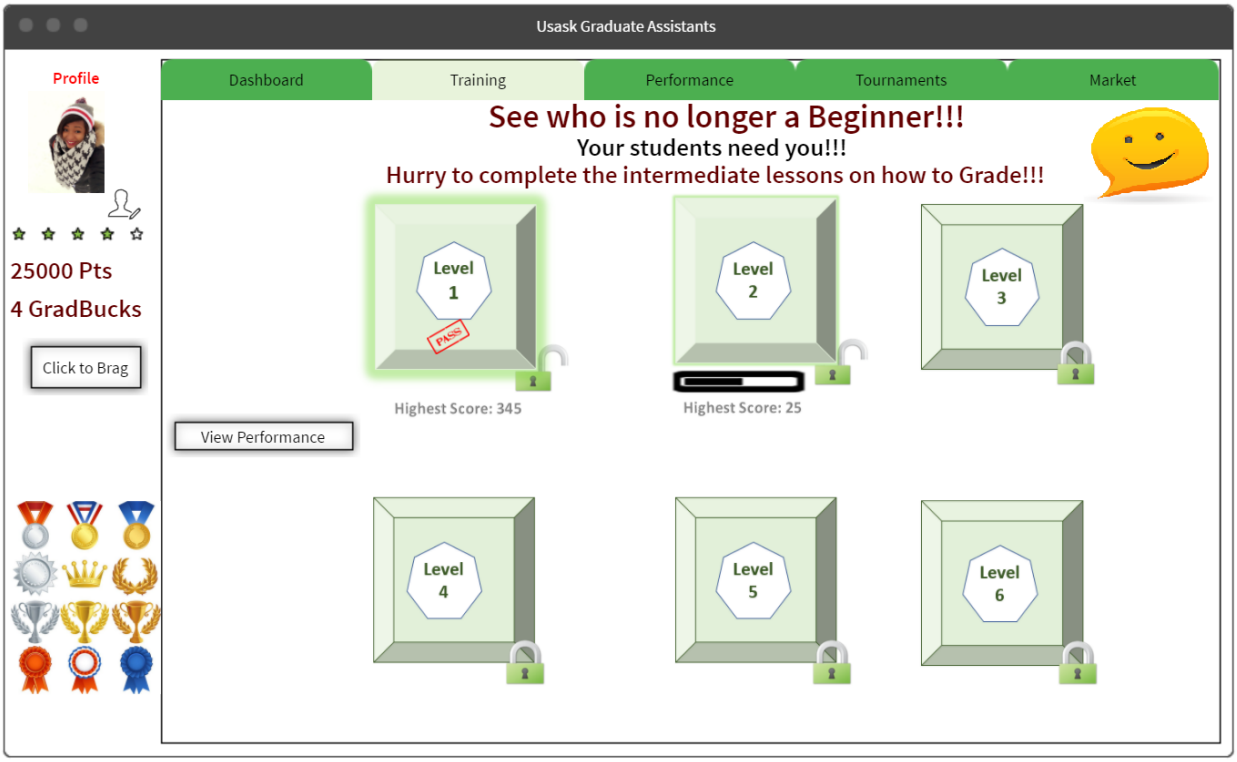

Figure 14. Mockup of a sample training environment for Graduate Assistants.

5.4.3.2 Achievements

Achievements enable people to perceive themselves as a success and feel competent [134]. To increase employee competence, the proposed persuasive gamified system should also provide Graduate Assistants the platform to have their accomplishments recognized. Building the self-esteem of employees is essential to optimizing employee gratification, motivation and productivity [36]. According to Herzberg [135], employees identify job satisfaction as a factor of certain factors like achievement, responsibility and recognition (evident in results of user study 2). These accomplishments could be work, personal or social experience related. Achievements should therefore highlight the efforts of Graduate Assistants. As shown by the results of the study, Full appreciation of work done (Recognition for contribution) was the second most motivating factor to Graduate Assistants in the execution of their tasks and responsibilities. Suggested recognition elements for Graduate Assistants together with appropriate game elements are discussed later in this section.

As Graduate Assistants perceive their jobs to be challenging (indicated by results), praise and recognition systems should be put in place to send the message that their contributions to the success of the department are respected and valued [136]. This would increase their motivation to work and put in more effort as they begin to feel their efforts mean much to the department. According to Yukai Chou [73], one of the core motivators of individuals is "Epic Meaning and Calling". This core drive makes people believe that they are doing something greater than themselves and is achieved when an individual is made to believe they are part of a bigger plan or essential to the success of another person [73]. The use of narratives is one way to bring to life the essence of achievement and epic meaning. An engaging story should be created with the player being the main hero who has to do something to cause a positive impact in the life of someone. For example, to engage a marker with a narrative by creating a sense of epic meaning, the following exposition could be used;

"Kelly Harr is a first-year undergraduate student who is having troubles with her course work. To pass the course, you hold the power to assist her achieve this goal by grading her assignments on time and giving her constructive feedbacks that she can act on to grow in the course…".

Achievements could also be implemented using points, badges, trophies, brag buttons, and likes. These game elements and how they could be leveraged to increase competence are discussed next.

Points, Badges and Trophies

One way for the efforts of Graduate Assistants (Teaching Assistants and Markers) to be recognized is to provide them real feedback on the execution of their responsibilities. Making players feel the sense of achievement can be achieved using game elements like points, badges, trophies, hi fives, likes, progress bars, levels, and missions completed [73]. These are forms of rewards and *Reward* was the second most influential persuasive strategy among the social influence persuasive strategies measured among Graduate Assistants. It is therefore of much significance to design appropriate gamification rules that will guide the play experience and the awards of these achievement and recognition elements. Per Schell [137], "*Rules are really the most fundamental game mechanic. They define the space, the objects, the actions, the consequences of actions, the constraints, and the goals*" [90]. These gamification rules can be dependent on many factors including but not limited to user actions [90, 137].

In the context of Graduate Assistants workplace, students should be asked to rate the feedbacks provided to them by Markers. They may also rate Teaching Assistants on tutorial sessions. Ratings could be converted into points based on whether they are good ratings or not. Graduate Assistants can be awarded badges or trophies based on how many points they have gathered. Performing certain actions which are commendable like inviting other Graduate Assistants onto the platform could also earn Graduate Assistants some points.

Awarding points for grading and submitting feedbacks before/on schedule should be implemented to serve as a form of positive reinforcement. Grading and providing feedback on time contributes positively to students as this feedback can help guide the execution of the next assignment. Therefore, the earlier the feedback comes in, the better for students. This has been identified as one of the principles of good practices in undergraduate education [29].

The point, badges and trophies system should be awarded based on actions and activities that have meaning to these Graduate Assistants. For example, celebrating a published academic work will be of more interest to majority of Graduate Assistants than reaching a goal of weight loss. Otherwise these game elements become another meaningless activity of making people accumulate points, badges and trophies. This could also cause these elements (points, badges and trophies) to lose their meaning of affirming achievements and recognition.

When Graduate Assistants are rewarded with either points, badges or trophies, appropriate information should accompany these rewards. Providing information to players when they are rewarded gives them a deeper understanding of why they are being rewarded. This is a good strategy as it helps retain the importance of knowledge players acquired from a task or activity [128].
Providing information to players of a gamified system is very essential to help them navigate and make informed decisions. One way of giving a player information is to tie it with exposition/narratives [88, 128] as discussed above.

Brag Button

Yukai Chou [73] described the brag button as "*an obvious desired action that users take in order to broadcast what they feel accomplished about*". It was mentioned earlier in a previous part of this chapter that, achievements can be work, personal or social experience related. Graduate Assistants should

therefore be given the opportunity to brag about their achievements. It could be about the publication of a first paper, acceptance of an academic work into a top conference or journal, or a ground-breaking discovery or innovation. A graduate assistant could also brag about a new position on a leaderboard if it is worth bragging about as this personal achievement might not be completely noticeable by other members on the platform. It should be noted, however, that the brag button will work well when there is a social interaction component to any persuasive gamified system [73]. Therefore, members of a community may be given the chance to decide whether an achievement being bragged about is worth it. This will ensure that the brag button is used wisely and not to create a lot of noise on the persuasive gamified system. If players are aware that they cannot brag about just anything, they will be careful to share relevant accomplishments that most people on the platform are interested in. To curb the problem of bragging noise that might also occur, there could be a separate page where only accomplishments which have received a defined number of approvals from members on the platform could be displayed. This technique leaves the power to Graduate Assistants on the platform to make known their achievements to other members in the community.

Likes and Kudos

Likes could also be incorporated into the platform for members to like the achievements of each other. To ensure that the "like" button is not excessively used to reduce it importance, members should be allowed to like or send kudos out a certain number of times in a defined period. This will ensure that members like only activities, achievements and recognitions that are valuable and mean much to them. This can create a footprint of users' interests so that system suggestions can be made to them based on these footprints.

5.4.3.3 Challenges

One of the top five motivating factors of Graduate Assistants at the workplace is demanding and challenging tasks or responsibilities. Challenges result in interesting work which has been identified by previous research to be a one of the most significant predictors of workplace motivation, job satisfaction and employee productivity [50]. Karl Kapp defines a challenge as a "a call to engage in a difficult, but achievable task [138]". Challenging players to a tasks that are difficult and non-achievable might lead to frustration or anxiety according to the Flow Theory [139]. On the other hand challenges that are not

difficult will lead to boredom [139]. Therefore, system generated challenges must be designed in such a way that they continually adapt to match the skills of Graduate Assistants on the proposed platform. Also, the gamification challenges should be well designed as this will motivate members of the platform to engage with it more and create a great player experience throughout the player journey [138].

Another way challenges can be incorporated onto this platform is to allow administrators of the system to create multiple challenge rooms. Each challenge room will test members on diverse topics and subject areas on courses that are taught in the department with various levels of difficulties. For example, there could be a challenge room which would offer challenges on specific subject areas like PHP or a complex and diverse subject area like web development. Members should be given the opportunity to join challenge rooms of their choice based on their skill set and knowledge. To make participation in challenge room activities more interesting, members should be required to make an entry payment with some of their points. Entry points should be returned to a participant in addition to points they accumulate from taking part in the challenge if they are able to score above a defined number of points in the challenge. This will encourage participants to join challenge rooms that match their skill set.

Just like progression discussed above, members should be made to join more difficult challenge rooms if they have been able to make it through less difficult ones. An outcome of this challenge room could be to identify top performers and what subject area a graduate assistant is good in. These top performers can be recommended to students who need tutorials or help in certain subject areas.

Players must be informed of all the rules of a challenge room and allowed to join voluntarily. This is termed as “lusory attitude” and one of the elements that affords the achievement of a gameful experience in persuasive gamified application [140]. For example, they need to be aware of how many points they get for each completed action in a challenge room and what they are allowed and not allowed to do in the challenge rooms [140]. These techniques have been leveraged in many gamified applications like Nike+ [141] and Habitica [142] and have proven to yield results [140].

5.4.4 Increasing Relatedness

Relatedness describes the need to belong and connect to members of a social group [33]. According to Ryan and Deci [33], satisfying these needs in any given context increases intrinsic motivation and leads people to perform activities that are related to the context in which it is implemented [33]. The user study showed although Graduate Assistants ranked their *relations with each other* to be one of their top five

motivation factors in the execution of their responsibilities, however, they did not perceive a satisfaction of this need to relate with each other. Therefore, one way to make Graduate Assistants more engaged and productive is to increase the satisfaction of their need to belong.

Relatedness can be achieved among Graduate Assistants using social influence strategies like Trustworthiness, Competition, and Collaboration. The results of the user study also showed that Graduate Assistants were susceptible to Trustworthiness, Rewards and Competition among the social influence Persuasive Strategies that were measured.

5.4.4.1 Competition

As discussed in the discussion section of this chapter, competition at the workplace is usually characterized by the effort of employees to outperform each other to receive higher salaries, wages, bonuses or rewards, and praises. Graduate Assistants showed the tendency to be influenced by competition as a social influence persuasive strategy. Therefore, the proposed persuasive gamified system must create the avenue for Graduate Assistants to compete based on their performance in the jobs and responsibilities as well as participation in challenges discussed above. Achievements as discussed in previous sessions will lose their meaning if there is no one to show it to [143].

Competition in gamification is usually characterized by the accrual of points, badges, trophies and appearance on a leaderboard. There should be different leaderboards for different purposes. For example, the leaderboard that supports competition based on work related activities should be different from the ones used in the challenge rooms discussed above. On the challenge platform itself, there should be separate leaderboards for the different challenge rooms created. This way, a Graduate Assistant who cannot make it high up the main leaderboard, can look into joining a group leaderboard which focuses on their skills and expertise. The leaderboard should be reset in defined periods of time to give everyone an equal opportunity to also be on top. However, there can be a main leaderboard to show the overall leader for the entire semester based on many criteria defined by the system designer and developer. The top winners could then be awarded physical or virtual certificates to show their efforts. The proposed leaderboards should be dynamic and show change in positions on the leaderboard in Real time. There should also be an annotation to point to a member's position for easy identification when they open the leaderboard.

These leaderboards could help foster and sustain a feeling of achievement and recognition which could go a long way in increasing the need for competence as discussed in the previous section. An implementation of this will not only provide the transparency needed during competitions but also the urge to work harder and improve by doing meaningful tasks and activities that get appreciated by superiors [144]. One important goal for Graduate Assistants is to finish marking on time or earlier. The earlier the feedback, the more appreciated it is by the recipient. So, competition in terms of progress in marking an assignment for example, across graders of parallel class sections can stimulate them to start earlier, and get done faster. This would be appreciated by students mostly but also by professors.

Figure *15* shows a mockup of the look of a potential leaderboard in the proposed system. The top three leaders are boldly represented with distinct colors of badges to show their ranks (Gold: 1st, Silver: 2nd, Bronze: 3rd). The position of the member logged in is indicated with the red

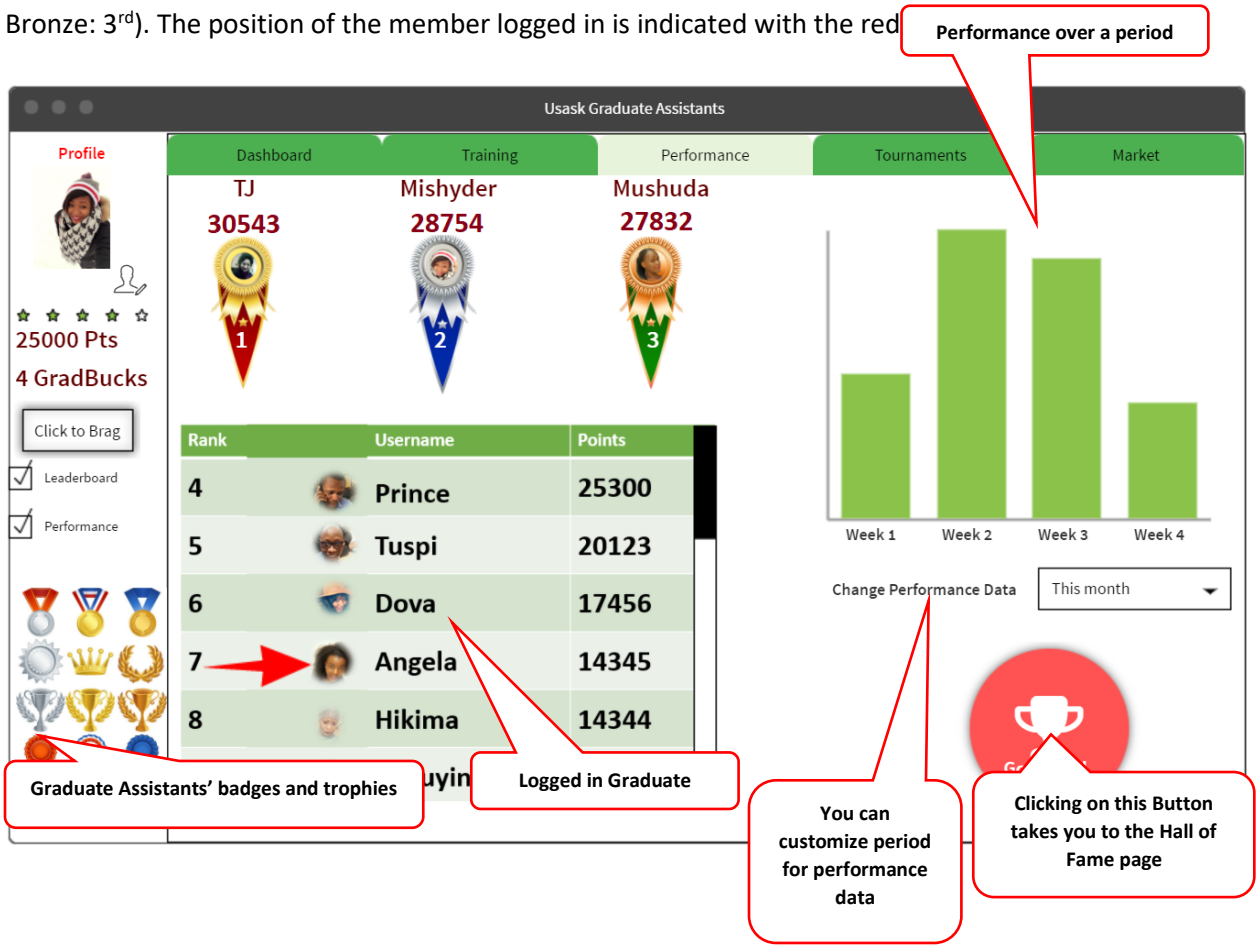

Figure 15. Mock Up of a leaderboard and performance

5.4.4.2 Collaboration

Allowing Graduate Assistants to create groups based on a common interest or course they work on can lead to an increase in employee relatedness [145]. The persuasive gamified system should provide a platform for Graduate Assistants to collaborate on matters of interest which are work related. In the context of work, Graduate Assistants can create groups based on courses that are graded and tutored. This group will serve as a platform to collaborate on performing tasks related to the courses in question. Assignments could be discussed on this platform. Provision should be made for Graduate Assistants who are not able to grade for one reason or another to seek help from other Graduate Assistants in the group. This technique will trigger the Reciprocity principle of persuasion. Of course, an employee will be willing to grade in the place of another if there is something in it for them. It could be in exchange for marking less papers the following week if that is what is agreed on. Group cohesion survives only if the members of a group have a common interest and reciprocally profit from the group [145, 146].

5.4.4.3 Trustworthiness

Trustworthiness was the most influential social influence persuasive strategy among the persuasive strategies measured. This goes to stress on the importance of trustworthiness at the workplace. In-house enterprise trust is important and fosters a workplace that is set apart by effective communication, teamwork, and performance [147]. As put by O'Hara, "*Employees are more likely to follow through on goals set by a manager they trust and to be more forthcoming about challenges they see on their level*" [147]. Trustworthiness within an organization has also been identified to be a prerequisite for increase in productivity and meaning in workplace responsibilities. This is analogous to trust being a precondition for the survival of social relationships through social cohesion and integration [117].

Trustworthiness can be operationalized in the proposed persuasive gamified systems by creating a system of transparency. Leaderboards are one way to implement transparency in a persuasive gamified system. They display the scores and rank of members of a social group involved in a competition. Graduate Assistants should be assured that their scores as represented in the system is what they deserve and no member on the platform is being favored over them. Additionally, with regards to the training module, Graduate Assistants must be able to trust that the training material is legitimate and imparts the necessary message. Ethos (communicator credibility), one of the components of the rhetoric triangle, represents the establishment of trust between the persuader and the target audience for effective persuasion to occur [148]. This implies that persuasion is hardly possible without the existence of Trustworthiness.

5.4.5 Increasing Autonomy

Autonomy refers to the need to feel in control of one's behaviour and actions [33]. The need for autonomy is necessary for maintaining intrinsic motivation contrary to Bandura's Self-Efficacy Theory [149] which does not afford such significance to autonomy [33, 150]. The proposed persuasive gamified system should create avenue for autonomy. This is because autonomy creates the feeling of empowerment which has been shown by previous research to inspire "end-user-creativity" [73]. Autonomy can be operationalized in gamification by giving the player control and power over situations that are within their boundaries as well as promoting voluntary participation in activities.

5.4.5.1 Voluntary Participation

In as much as employers might be excited about using gamification to increase productivity and engagement, employees must not be coerced into doing so because people enjoy moments more and achieve desired results when they are voluntarily trying to accomplish something difficult for which they have the right skills [4, 139]. Voluntary involvement is one of the experiential conditions in the classic definition of a game and considered one of its crucial building blocks [64]. According to Huotari and Hamari [151],

"*If a designer attempts to direct a player's decision making in a way that it reduces the player's free choice, then the design moves further away from what is in the core of a gameful experience*"

Graduate Assistants should be allowed the free will to choose whether to be on the platform or not. Graduate Assistants should not be penalized for choosing not to participate in the activities of the platform. However, to increase the chances for onboarding, attractive incentives could be used to persuade employees to join the platform willingly. One way this can be done is to provide incentives for platform members to invite their friends. When the invited Graduate Assistant joins the platform, both Graduate Assistants could be awarded with some points. A member who successfully invites a defined number of other Graduate Assistants to join the platform could be awarded with a badge. Onboarding points could also be used to motivate Graduate Assistants to join the platform. The use of incentives to promote onboarding could be successful because Rewards was the second most influential persuasive strategy amongst the social influence persuasive strategies measured for Graduate Assistants.

Figure 16 shows a demonstration of how an invitation form to a fellow Graduate Assistant could look like. The search field should only populate names of fellow Graduate Assistants to prevent invites being sent to people who are not employees. Clicking on the "send invitation" button should send an email to the corresponding Graduate Assistant. Emails should be personalized and, for example, addressing should be on a first name basis. This email should clearly state the benefit involved in signing up. For example, "You and Haida both get 20 points each for free if you sign up."

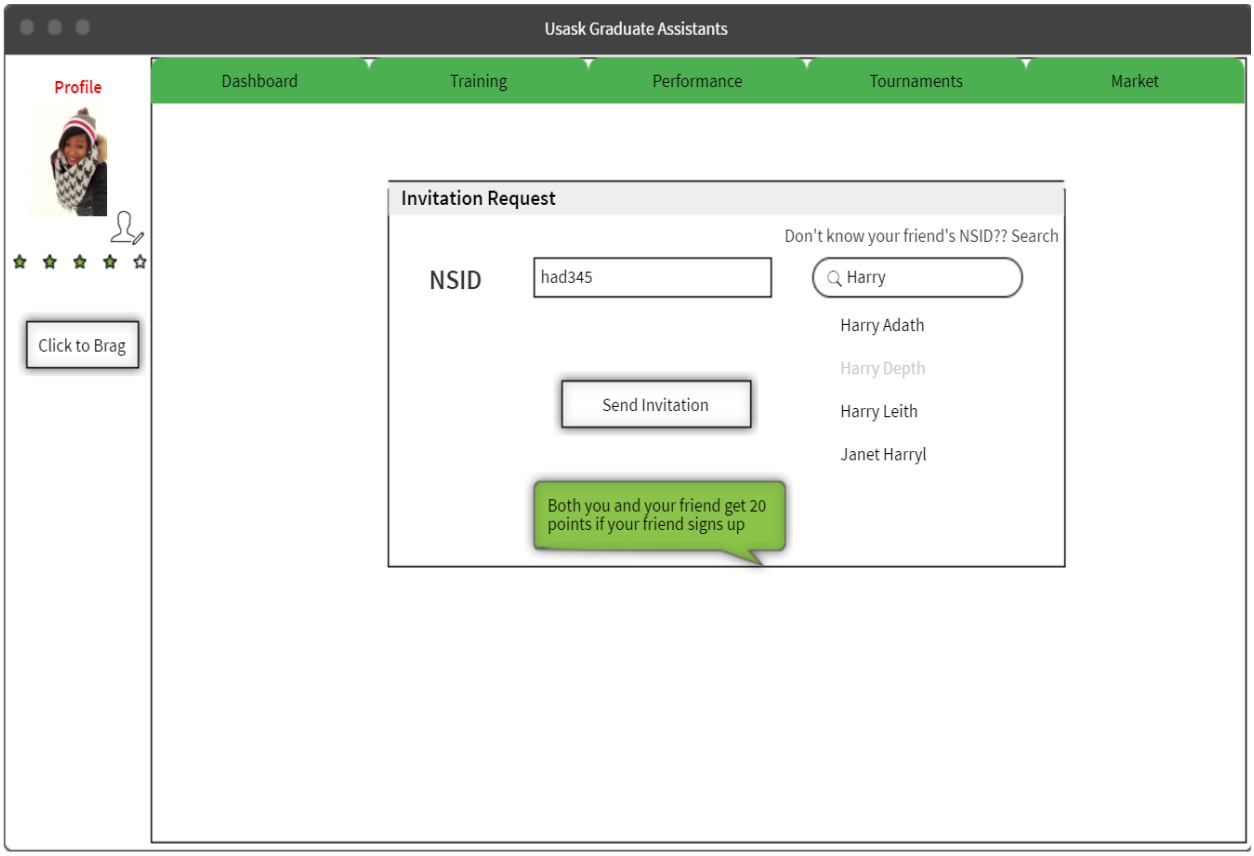

Figure 16. Invitation Request Form

Another way to encourage the onboarding process among Graduate Assistants is to offer guides and help on how to move around the application and revealing the features of the applications whilst at it [86]. Occasional pop ups could highlight some of the things the applications could allow a user to do. For example, a pop up can inform a user that they could invite a friend onto the platform and win some points if the friend accepts the invitation.

5.4.5.2 Empowerment

The proposed persuasive gamified system should give control and power to Graduate Assistants to perform certain activities and customize the gamified application to their preference. One way of achieving player empowerment is to enable Self-Expression. Self-Expression allows players to customize and build their own profiles like adding profile pictures, indicating interests and likes. This ensures that players show off their own taste of style and personality [152]. Self-Expression could also be implemented by allowing Graduate Assistants to change the theme, and look and feel of the system interface to suit them. Also, Graduate Assistants should have control over who or which group sees their profiles, scores, and other information that seem sensitive to them. It should also provide a way for users to customize the look of leaderboards.

Figure 17 shows a mockup of how a typical profile page of a Graduate Assistant could look.

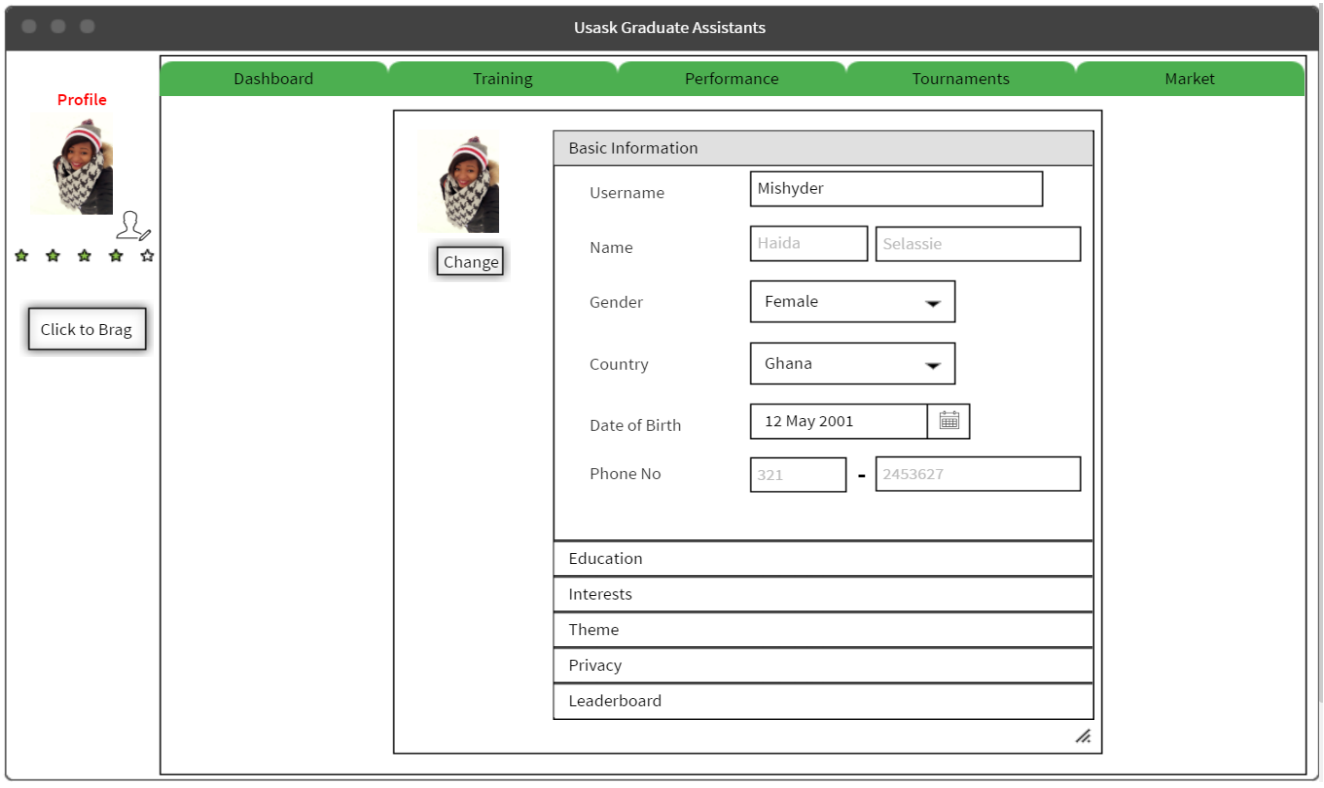

Figure 17. Profile Information

Another way of empowerment could be achieved in the proposed gamified system by allowing Markers to recommend students who are lacking in a course, subject area or topic for tutorials. Also, if all or majority of students seem not to be doing well in a topic, Markers could be allowed to recommend such

topics to the corresponding lecturer who might ask a Teaching Assistant to work on them. Graduate Assistants could also be given the power to volunteer to tutor a student who needs help with a course. This gives them a feeling of power and control of work related tasks as well as the feeling of achievement characterized by epic meaning.

5.4.5.3 Ownership

Ownership is one of the core drives of actionable gamification which is based on the principle that people will work hard to protect and improve something if they own it [73]. The game elements that have been identified to foster this core drive are virtual goods and currencies [73, 153].

For the proposed gamified system, a virtual currency and goods system should be implemented. Virtual currencies could be awarded based on activities like winning challenges. Also, a specified number of accumulated status points could be converted into virtual currencies. Status points mostly highlight or create a sense of accomplishment and cannot be usually traded for valuable goods in the system [153]. Virtual currencies form a type of point system called exchangeable points system. Contrary to status points, they can be exchanged for real or virtual goods. This virtual currency should be exchangeable for real or virtual goods. Virtual goods could range from buying boosters and power-ups to customize an avatar open locked content.

The currency economy should be designed well such that it creates an engaging experience. For example, the following questions could be considered

- What can the virtual currency buy or what is it worth?
- Should conversion of status points to virtual currencies exist?
- How many status points does a player need to convert to a virtual currency?
- What limit of status points can be converted to virtual currency?
- How much effort or labor is required to gain some virtual currency?
- Is the virtual currency exchangeable for physical goods? How much is the department/organization willing to invest in this?

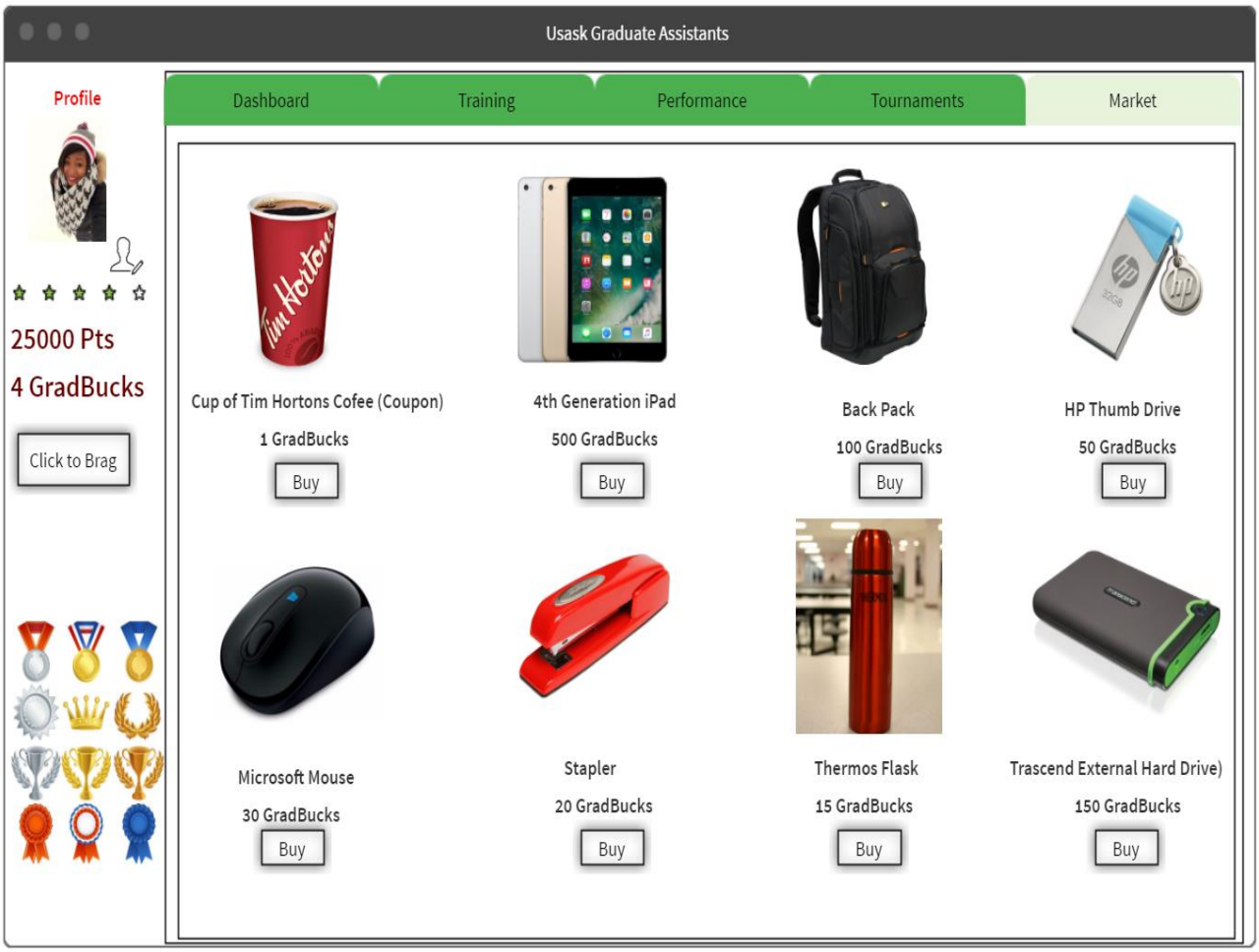

Figure 18. Mockup of a Market Where Virtual Currencies Could be Used in Exchange for Real Life Rewards

5.4.6 Other Recommended Considerations for Both Workplaces

5.4.6.1 Player Centered Design

Software developers are usually inclined towards the use of data or technology centered designs because they are the easiest to cope with technically. However, User Centered Designs have long been proven to be recommended because they have users' interests and goals at the core of the design process and solve the problems of systems that are only data or technology driven [86]. Garrette defines a User-Centered Design(UCD) as "*The practice of creating engaging, efficient user experiences*"[154]. The UCD involves a consideration of the user in every step of the design process: development, testing, and implementation phases. On the other hand, the introduction of Gamification in a user centered design process produces

a Player-Centered Design (PCD) [86]. The key feature of the Player centered design is understanding your players, that is, what they do, what motivates them etc., what kind of interfaces they prefer, and their skill set. Keeping the players in the loop during the development, testing and implementation phase also causes the users to accept the system. Gamification at the workplace may also contribute to the wellbeing of both employers and employees. Therefore, there must be investment of skills in a persuasive gamified platform that has the wellbeing, psychological and social experience of its players as its focus (human-focused design) as this can help an organization increase their social capital, employee engagement and productivity[73].

5.4.6.2 Activity Streams, Notifications and Reminders

Activity streams create a sense of awareness to users by aggregating activities from various parts of a gamified persuasive system [155]. They also help foster belonging and purpose by motivating users to take action based on what information they see on the activity stream [156]. For example, in *Figure 19*, *Mishyder* who is currently logged into the persuasive gamified system might also join the "PHP Challenge Room" just because *TJ* joined it. To prevent the Activity Stream from showing similar information as separate activities, similar activities can be combined. For example, "TJ, Prince and Dova joined the php Challenge Room". It is recommended that the Activity Stream should be adapted to the preference of the user logged in so that activities that do not interest them will not be included. This technique is used by popular social networks like Facebook and Twitter to tailor content to members.

Also, users should receive notifications about changes that relate to them in a separate window (Notifications window). This should be separated from the Activity Stream to allow for easy identification. Adding personal notifications and reminders to the Activity Stream might lead to loss in relevant information as the Activity Stream keeps changing to reflect the status of the system and can sometimes become overwhelming [156]. Notifications and Reminders can be tailored to users using any of Cialdini's Persuasive Principles by creating persuasion profiles for players. This technique was found to be effective in decreasing snacking behaviours in people [157]. Progress levels could also be put on a home page or dashboard as a reminder to complete uncompleted tasks or activities (*Figure 19*).

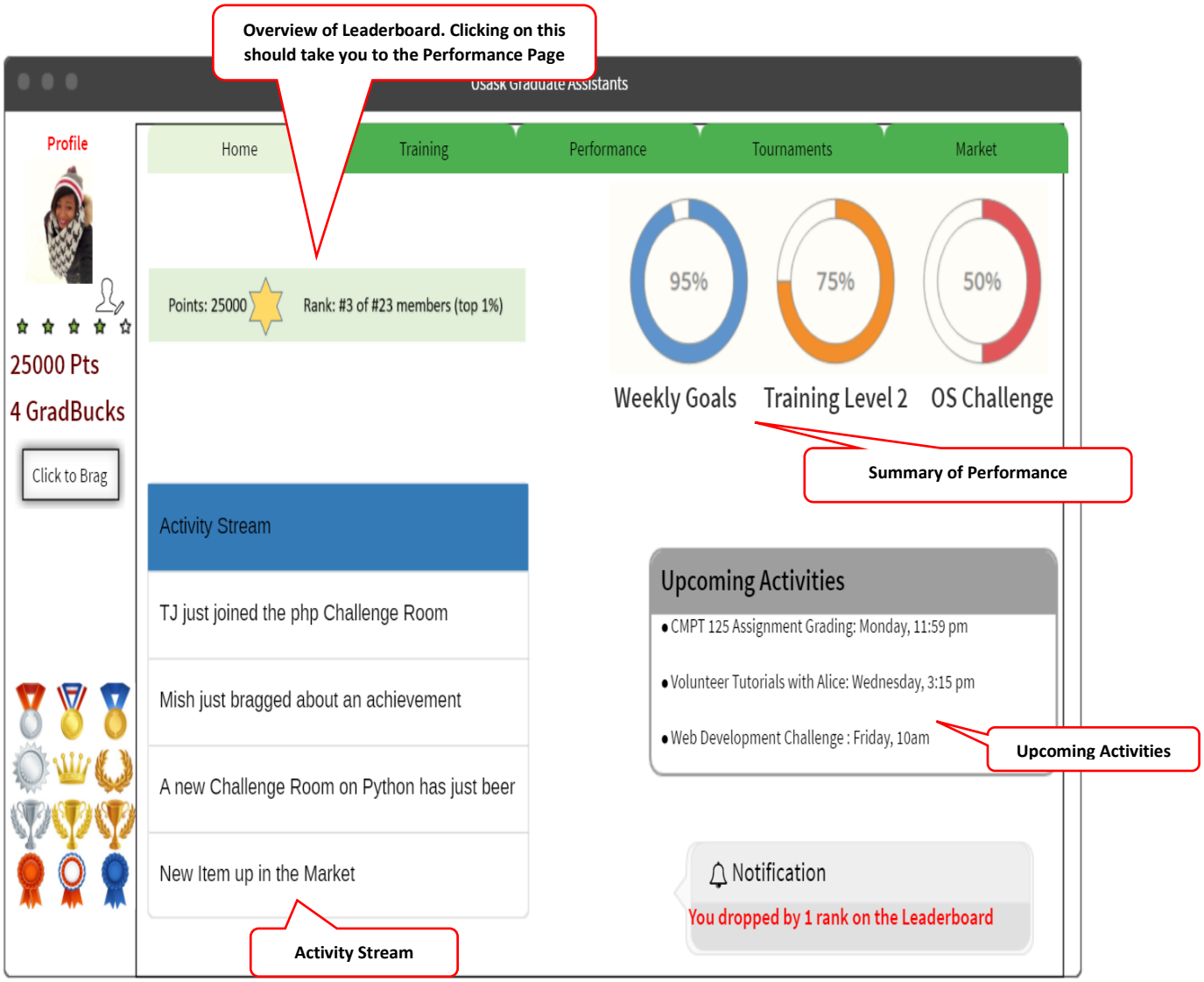

Figure 19. Mockup of a persuasive gamified system showing an Activity Stream, Notifications and Upcoming Activities

CHAPTER 6. GENERAL DISCUSSION AND CONCLUSIONS

6.1 Ethical Considerations

As discussed in chapter two, ethical issues must be addressed in the implementation of a persuasive gamified system at the workplace. Members of the proposed gamified system must be treated with respect and ethically right. One of the main concerns when it comes to ethics is to allow members to join the platform willingly and nudged instead of manipulated into performing activities [158]. This has been addressed above under Increasing Autonomy, where it was recommended that the choice to join the gamification system and participate in activities should be left to employees.

The persuasive gamified system should be made cheat proof. One way to prevent cheating in a persuasive gamified system is to use rewards that are not exchangeable for real world items [158]. However, the presence of the virtual currency system is bound to introduce mechanisms on the part of members to game the system. Cheating can be minimized by implementing transparency through reintegrative social shame and accountability [158]. According to Braithwaite [159] shaming involves "*all processes of expressing disapproval which have the intention or effect of invoking remorse in the person being shamed and/or condemnation by others who become aware of the shaming*". With reintegrative social shaming, the community on the platform disagrees with cheating but allows the shamed member to learn from their mistakes and be accepted back into the community again whilst deterring others from cheating [159].

6.2 Risks of Implementing Persuasive Technology and Gamification to Promote Documentation of Analysis and Evaluations

Despite the forecasted benefits of implementing persuasive gamified systems to encourage employees in proper documentation of analysis and evaluations, there might be some risks associated with the practice. To monitor the quality of data provided, review systems were recommended in both the ABA and Graduate Assistant workplaces. An anonymous peer-review system was recommended for the ABA workplace whilst a student rating system was recommended for the Graduate Assistants workplace.

For ABA employees, this review system might have the potential of creating tension if a reviewed employee believes the review system was not fair as peer reviews have been known to be subjective [164]. The implementation of competition and leaderboards might also cause reviewers to be biased and giving harsh reviews with the purpose of sabotaging others. This practice of anonymous peer review

systems has been found to cause demoralization at the workplace because anonymous reviewers do not get penalized for providing malicious feedbacks [164, 165]. However, these risks can be reduced by setting rules that must be followed when reviewing. For example, asking reviewers to provide only qualified and constructive criticisms.

For Graduate Assistants, if students are vicious about the ratings and comments they give to feedbacks provided to them, it might affect the self-confidence and pride of the respective Graduate Assistant. This will end up decreasing the need for competence of Graduate Assistants which is the exact opposite of what the persuasive gamified system intends to accomplish. Also, implementation of the virtual currency system might cause Graduate Assistants to shift focus from work-related tasks which might only fetch them status points to activities that will fetch them some currency that they can exchange for items [166]. This risk can be controlled by ensuring that work-related tasks in the system are monitored and additional activities are available at levels that are locked until the assigned tasks have been completed.

CHAPTER 7: SUMMARY OF THE THESIS

Persuasive Technology and Gamification have been used to achieve behaviour and/or attitude change in people by leveraging their motivating powers. They have been used at workplaces to increase employee engagement, productivity and social capital as well as promoting desirable target behaviours. However, there is little to no existing work on promoting documentation of analysis and evaluations among employees in the field of Persuasive Technology and Gamification. Also, although designers implement persuasive gamified systems at the workplace using the Self-Determination Theory, requirement analysis has not aimed to understand the employee motivation as well as the persuasive principles and strategies they are most susceptible to.

To bridge this gap, a Requirement-Focused Design Science Research approach was adopted to recommend requirement guidelines for implementing Persuasive Technology and Gamification that will engage employees in effective documentation of analysis and evaluations. To define the requirements for the proposed persuasive gamification system, two user studies were carried out in two different workplaces. These workplaces were chosen because of the importance of data entry in their success.

User Study 1 was carried out among Applied Behaviour Analysis (ABA) front-line staff. This study, investigated the susceptibility of ABA front-line staff to various persuasive strategies with the aim of recommending requirement and design guidelines based on the most influential persuasive strategies. This technique was used because of the significance of tailoring persuasive gamified systems to target groups. These requirements will be integrated into a software that is used for documentation during ABA therapy sessions. The study started with informal interviews with ABA managers who presented the problems they were currently facing which is the lack of data quantity and data quality. A survey was carried out using previously validated scales on measuring people's susceptibility to Cialdini's persuasive principles and Kukkonen and Torning's social influence persuasive strategies. The survey was administered through Fluid Surveys and employees were recruited through an organization wide email. The response rate for this user study was low with only 20 participants. The poor response rate may be attributed to the fact that the study was conducted at a time considered to be busy for ABA front-line staff. Collected data was analyzed using SPSS and to ensure that the responses obtained were reliable, a Cronbach's Alpha test was run which proved the data to be reliable. The data passed all conditions needed to perform a Three-Way Repeated Measures ANOVA with persuasive strategy as a within-subjects factor and employment status and age range as a between-subjects factor. There were significant differences

between employee susceptibility to both Cialdini's persuasive principles and Kukkonen and Torning's social influence persuasive strategies. Requirements were recommended based on the results of the user study. (Chapter 4) User Study 1 only explored the susceptibility of employees to various persuasive principles. Therefore, requirements could only be recommended based on these results.

User Study 2 was carried out among Graduate Assistants from the University of Saskatchewan. In this study, employee motivation was explored both with regards to employees' perceived satisfaction of their basic psychological needs and to what level they were inherently engaged in their responsibilities as Graduate Assistants. The Basic Psychological Needs which is a part of the Self-Determination Theory determine the well-being and ill-being of employees and directly impact their performance and engagement in tasks and responsibilities. Despite the benefits of implementing Persuasive Technology and Gamification at workplaces, it is recommended to identify the business need to gamify before embarking on a journey to motivate employees using Persuasive Technology and Gamification. The Work Self-Determination Scale which is based on the Organismic Integration Theory (part of the Self-Determination Theory) was used to explore the motivation of employees and to determine whether it was necessary to implement Persuasive Technology and Gamification among Graduate Assistants. Also, the most important workplace motivating factors among Graduate Assistants were investigated as well as their susceptibility to various persuasive principles and strategies. Participants were recruited through emails and an advertisement on University of Saskatchewan's PAWS bulletin board. 55 responses were analyzed using SPSS. Just like User Study 1, statistical tests were run to ensure that the responses collected were reliable. Inferential statistics were run to identify associations and group differences. Results of this study presented a workforce that were not engaged with their responsibilities and whose Basic Psychological Needs of Competence, Relatedness and Autonomy were not being satisfied. The study found that Graduate Assistants responded differently from the ABA front-line staff in Study 1 to both Cialdini's persuasive principles and Kukkonen and Torning's social influence persuasive strategies. Also, susceptibility to social influence persuasive strategies like Social Learning and Trustworthiness were influenced by employees' gender and continent of origin. The results of the user study coupled with literature review were used to guide the recommendations of actionable design requirements to be considered when implementing Persuasive Technology and Gamification among Graduate Assistants. These requirements are aimed at increasing Competence, Autonomy and Relatedness among Graduate Assistants. (Chapter 5)

7.1 Contributions

Most Persuasive Technology and Gamification projects in the workplace are implemented without investigating employee motivation. Designers mostly just build gamified applications by putting in persuasive and game elements they believe increase intrinsic motivation. This thesis presents all the work done to answer the research question: *How can Persuasive Technology and Gamification be leveraged to engage employees in effective documentation of analysis and evaluations?* Due to the limited timeframe for an MSc work, the thesis covers the first three stages of a Design Science Research approach adopted to outline requirements to implement a persuasive gamified system to engage employees in proper documentation of analysis and evaluations. The main contributions of the work are the two user studies of persuadability and employee motivation in two different workplace contexts, using validated tools and using the results to create a set of design requirements and guidelines (detailed in Chapters 4 and 5) based on studies and literature that can be used to implement a persuasive gamified system to promote effective documentation of analysis and evaluations among employees. The rest of this section discusses the other important contributions of this thesis to the body of research.

This research through user studies, uncovered a workforce (Graduate Assistants) whose Work Self-Determination Index indicates are not engaged with their responsibilities and tasks. Also, this workforce does not perceive their Basic Psychological Needs of Competence, Autonomy and Relatedness to be satisfied causing them to lack the intrinsic motivation to be engaged in their responsibilities. The results also showed that Basic Psychological Needs are determinants of the Work Self-Determination Index. As such, they can determine if employees are engaged at the workplace or not, which can call for a need to motivate employees to get them engaged. Autonomy was found to be positively associated with Competence and Relatedness indicating that for people to actually feel competent and really connected to others, there is the need to attribute the actions that led to those feelings to themselves. Therefore, increasing competence (achievements) and relatedness (social influence) in a persuasive gamified system without increasing autonomy will not result in the expected outcome of promoting intrinsic motivation. The five most important workplace motivating factors to this group of employees in the order of importance are Job Security, Recognition, Achievement, Relations with other Graduate Assistants and Responsibility.

Employees from both workplaces were most influenced by Commitment and Reciprocity as persuasive strategies, followed by Authority and least susceptible to Scarcity and Consensus. ABA employees were found to influenced by all the social influence persuasive strategies measured with Trustworthiness being the most significantly influential strategy. Graduate Assistants in general were most influenced by Trustworthiness, followed by Reward and Competition. However, Graduate Assistants were not influenced by Social Comparison and Social Learning. It was however interesting to find out that although Graduate Assistants are not influenced by Social Learning, factors like continent of origin and gender affected the previous results that Graduate Assistants are not susceptible to Social Learning. Whilst Social Learning will influence African, Asian and Middle Eastern Men, it will not work for North American Men. Also, although North American females were least susceptible to Trustworthiness, this is not an issue to worry about since they can still be influenced using this strategy.

Aside being the strongest predictor of Competition, Reward was also found to be positively associated with six of the persuasive strategies measured (Competition, Social Comparison, Trustworthiness, Authority, Commitment and Consensus). Reward mechanisms should therefore be designed and implemented with extreme care as they can make or unmake a persuasive gamified system.

7.2 Future Work

One limitation of this work is the small sample sizes that were used in both studies especially for study 1. The small sample size could not allow the drawing of conclusions based to workplace factors (Age range and employment status) that impacted susceptibility to the Cialdini's persuasive principles. However, considering the limited research on this work, this thesis will serve as a basis for future work to be carried out. Future work should consider using a large sample size and then exhaustively exploring most of the diverse workplace factors that could affect susceptibility to various persuasive strategies as well as employee motivation. Also, extending the study to other workplaces that thrive on availability of proper documentations will aid in providing more generalized and concrete conclusions. Another limitation is that the results are based on a self-report study. Future work should therefore consider using focus groups and interviews to investigate the attitude and thoughts of employees to implementing Persuasive Technology and Gamification in engaging employees.

Since the approach used for this thesis was a Requirement-Focused Design Science Research, the research ended on the Requirements definition stage. Future work should therefore use a Development and

Evaluation-Focused DSR approach to design, develop and evaluate a working system that will engage employees in proper documentation of analysis and evaluations. Affected stakeholders should be involved through an iterative process of the design, development, testing and evaluation activities. This reflects a Player-Centered Design which was also one of the recommendations made to consider when implementing a persuasive gamified system at the workplace. The developed persuasive gamified system can be evaluated to investigate the Perceived Ease of Use and Usefulness of the working prototypes that are developed. This will be able to predict if the new system will be accepted by the targeted employees and also provide information on how to improve system usability. The developed system should also be evaluated on its ability to appeal to the intrinsic motivation of employees as it is the main reason for implementation of the system.

PEER-REVIEWED PUBLICATIONS FROM THIS THESIS

Selassie, H.-H., Oyibo, K., Vassileva, J.: Responsiveness to Persuasive Strategies at the Workplace: A Case Study. In: Aimeur et al. (Eds.): MCETECH 2017, Proc. 7th International Multidisciplinary Conference on e-Technologies (2017). Springer LNBIP No.289 pp. 273–284 (2017).

DOI: 10.1007/978-3-319-59041-7

Selassie, H.-H., Vassileva, J.: Susceptibility of Graduate Assistants to Social Influence Persuasive Strategies. In: C. Gutwin et al. (Eds.): CRIWG 2017, Proc. 23rd International Conference on Collaboration and Technology (2017) LNCS 10391, 16 pp, 2017.

DOI: 10.1007/978-3-319-63874-4_z

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APPENDIX A – CONSENT FORMS

Consent Form for User Study 1 – ABA front-line staff

CONSENT FORM

UNIVERSITY OF SASKATCHEWAN

DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF SASKATCHEWAN
INFORMED CONSENT FORM

You are invited to participate in this survey "Engaging Users in Data Entry through Persuasive Technologies" because you are a frontline/clinical staff. Please read this form carefully, and feel free to ask the researchers any questions you might have.

Title of Study: Engaging Users in Data Entry through Persuasive Technologies

Ethics Application Number: BEH 16-250

Researchers:
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Purpose and Procedure:
The goal of this research is to investigate the level of susceptibility of individuals to different persuasive strategies. The study may contribute to the general research area of Persuasive Technology (PT) design. To achieve this, we have designed a set of questions that we need you to respond to. This can be achieved by answering the questionnaire in the next page. This study will enable system designers to implement persuasive technologies in TNActiveCare that will effectively persuade and motivate you to enter data.

Potential Benefits: Findings from the study may provide more insight into how various influential strategies affect individuals across different demographics. This will help in tailoring PT applications to different demographics.

Potential Risks: There are no known risks in this study.

Compensation: You will be entered into a draw to win one of ten $20 gift cards.

Confidentiality: This survey is hosted by Fluid Surveys, a company located in Canada and subject to Canada privacy and accessibility standards. The privacy of the information you provide is subject to the laws of Canada and as such safe and secure. Although results of this study may appear in reports, articles or papers, no identifying information (emails) will be revealed.

Dissemination of Results: Aggregated results from this study may appear in articles and papers published in peer reviewed conferences and scientific journals.

Right to Withdraw: Participation in this survey is voluntary, and you can decide not to participate at any time by closing your browser, or choose not to answer any questions you don't feel comfortable with. Your right to withdraw data from the study will apply until data has been summarized. After this it may not be possible to withdraw your data

Questions: If you have any questions concerning the study, please feel free to ask at any point; you are also free to contact the researchers if you have questions at a later time. This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board. You could call the Research Ethics Board toll free number 1-888-966-2975 or email at ethics.office@usask.ca regarding any questions on your rights as a participant.

Follow-Up or Debriefing: If you would like to know the results of this study, you can contact the researchers.

Consent to Participate:
By completing and submitting this questionnaire, your free and informed consent is implied and indicates that you understand the above conditions of participation in this study.

Consent Form for User Study 2 – Graduate Assistants

CONSENT FORM

UNIVERSITY OF SASKATCHEWAN

DEPARTMENT OF COMPUTER SCIENCE
UNIVERSITY OF SASKATCHEWAN
INFORMED CONSENT FORM

You are invited to participate in this survey "Engaging Users in Data Entry through Persuasive Technologies" because you are a Graduate Assistant (Teaching Assistant/Research Assistant/Grader). Please read this form carefully, and feel free to ask the researchers any questions you might have.

Title of Study: Engaging Users in Data Entry through Persuasive Technologies

Ethics Application Number: BEH 16-250

Researchers:
Julita Vassileva, Department of Computer Science (360-966-4886), jiv@cs.usask.ca
Humu-Haida Selassie, Department of Computer Science (360-966-4886), hus447@mail.usask.ca

Purpose and Procedure:
The goal of this research is to investigate the level of susceptibility of individuals to different persuasive strategies. The study may contribute to the general research area of Persuasive Technology (PT) design. To achieve this, we have designed a set of questions that we need you to respond to. This can be achieved by answering the questionnaire in the next page. This study will enable system designers to implement persuasive that will effectively persuade and motivate individuals to be engaged at the workplace.

Potential Benefits: Findings from the study may provide more insight into how various influential strategies affect individuals across different demographics. This will help in tailoring PT applications to different demographics.

Potential Risks: There are no known risks in this study.

Compensation: You will be entered into a draw to win a $50 gift card.

Confidentiality: This survey is hosted by Fluid Surveys, a company located in Canada and subject to Canada's privacy and accessibility standards. The privacy of the information you provide is subject to the laws of Canada and as such safe and secure. Although results of this study may appear in reports, articles or papers, no identifying information (emails) will be revealed.

Dissemination of Results: Aggregated results from this study may appear in articles and papers published in peer reviewed conferences and scientific journals.

Right to Withdraw: Participation in this survey is voluntary, and you can decide not to participate at any time by closing your browser, or choose not to answer any questions you don't feel comfortable with. Your right to withdraw data from the study will apply until data has been summarized. After this it may not be possible to withdraw your data

Questions: If you have any questions concerning the study, please feel free to ask at any point; you are also free to contact the researchers if you have questions at a later time. This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board. You could call the Research Ethics Board toll free number 1-888-966-2975 or email at ethics.office@usask.ca regarding any questions on your rights as a participant.

Follow-Up or Debriefing: If you would like to know the results of this study, you can contact the researchers.

Consent to Participate:
By completing and submitting this questionnaire, your free and informed consent is implied and indicates that you understand the above conditions of participation in this study.

APPENDIX B – MEASUREMENT INSTRUMENTS

1. Work Tasks Motivation Scale for Teachers [14]

Intrinsic Motivation

- Because it is pleasant to carry out this task.
- Because I find this task interesting to do.
- Because I like doing this task.

Identified Regulation

- Because it is important for me to carry out this task.
- Because this task allows me to attain work objectives that I consider important.
- Because I find this task important for the academic success of my students.

Introjected Regulation

- Because if I don't carry out this task, I will feel bad.
- Because I would feel guilty not doing it.
- To not feel bad if I don't do it.

External Regulation

- Because my work demands it.
- Because the school obliges me to do it.
- Because I'm paid to do it.

Amotivation

- I don't know, I don't always see the relevance of carrying out this task.
- I used to know why I was doing this task, but I don't see the reason anymore.
- I don't know, sometimes I don't see its purpose.

2. Work Basic Need Satisfaction [99]

These items were adapted to fit the context of Graduate Assistants. "at work" was replaced with "as a Graduate Assistant". Items with "R" by them are reverse coded.

Need for autonomy

- I feel likeI can be myself as a Graduate Assistant
- As a Graduate Assistant, I often feel like I have to follow other people's commands (R)
- If I could choose, I would do things as a Graduate Assistant differently (R)
- The tasks I have to do as a Graduate Assistant are in line with what I really want to do
- fI feel free to do my job the way I think it could best be done
- As a Graduate Assistant, I feel forced to do things I do not want to do (R)

Need for competence

- I really master my tasks as a Graduate Assistant
- I feel competent as a Graduate Assistant

- I am good at the things I do as a Graduate Assistant
- I have the feeling that I can even accomplish the most difficult tasks as a Graduate Assistant

Need for relatedness

- I don't really feel connected with other Graduate Assistants (R)
- As a Graduate Assistant, I feel part of a group
- I don't really mix with other Graduate Assistant (R)
- As a Graduate Assistant, I can talk with people about things that really matter to me
- I often feel alone when I am with other Graduate Assistant (R)

3. Persuadability Inventory [102]

Rewards

- It is important to me that my actions are rewarded
- It is important for me to see my success before me
- I put more ambition into something, if I know I am going to be rewarded for it
- I do more work, when I know that I will get something for it (something material)
- I am willing to change myself if I get rewarded
- Rewards motivate me

Competition

- I push myself hard, when I am in competition with others
- I like to participate in Quiz shows, where I need to assert myself against other people
- Generally, I am more ambitious than other people around me
- It is important to me to be better than other people
- I like competitive sports (for example racing)

Social Comparison

- It is important to me to be equal in comparison to others
- I like to compare myself to other people
- Before I do something, I want to know how other people have done it, so I can feel more safe
- It is important to me to know what other people are doing
- It is important to me, what other people think of me
- I adapt my style to the way my friends dress

Trustworthiness

- I think carefully about if I trust a system before I use it
- I trust information better when the source is specified
- It is important for me to be precisely informed about things that I need to do, before I do them

Social Learning

- I often adapt myself to other people
- I ask for advice from other people, before I make a decision
- I adapt my behavior quick to the model of other people
- I adapt my behavior to other people around me
- I take other people as role models for new behaviors

4. Susceptibility to Persuasive Strategies [95]

Reciprocity

- If someone does something for me, I try to do something of similar value to repay the favor.
- When I receive a gift, I feel obliged to return a gift.
- When someone helps me with my work, I try to pay them back.
- Scarcity
- I would feel good if I was the last person to be able to buy something.
- When my favorite shampoo is almost out of stock I buy two bottles.
- Products that are hard to get represent a special value.

Authority

- I am very inclined to listen to authority figures.
- I always obey directions from my superiors.
- I am more inclined to listen to an authority figure than a peer.
- I am more likely to do something if told, than when asked.

Commitment

- When I make plans I commit to them by writing them down.
- Telling friends about my future plans helps me to carry them out.
- Once I have committed to do something I will surely do it.
- If I miss an appointment, I always make it up.

Consensus

- I will do something as long as I know there are others doing it too.
- I often rely on other people to know what I should do.
- It is important to me to fit in.

DEMOGRAPHICS

What is your gender

- Male
- Female
- Other

What is your age range

- 16-34
- 35-51
- 52-71
- Other

What is your highest level of education

Are you a student?

- Yes, full-time student
- Yes, part-time student
- No, I'm not a student

What is your area of study

- Computer Science
- Psychology
- Management
- Science and Engineering
- Nursing
- Medicine
- Pharmacy and Nutrition
- Education
- Other, please specify...

Are you a gamer, if yes, what type?

- ( ) Non-gamer
- ( ) Survivor (A player that likes terror, being scared to the edge and safe again)
- ( ) Conqueror (A player not satified awith winning easily; enjoys very challenging games and defeating others)
- ( ) Daredevil (A player that likes taking risks and playing on the edge
- ( ) Mastermind (A player that likes taking risks and playing on the edge)
- ( ) Seeker (A player that seeks pleasure and wonder from the aesthetical structures)
- ( ) Socializer (A player concerned more about the welfare of those they are playinig with)
- ( ) Achiever (A player who likes to gain points, levels, success and will go to great lengths to win)
- ( ) Killer (A player that likes affecting its envirionments through action, carnage, destruction)
- ( ) Explorer (A player that likes exploring the game environment to make new descoveries)
- ( ) Other, please specify... [ ]

What is your continent of origin

- ( ) Africa
- ( ) Asia
- ( ) Middle-East
- ( ) Australia
- ( ) Europe
- ( ) South America
- ( ) North America
- ( ) Other, please specify... [ ]

What is the status of your employment

- ( ) Full-Time
- ( ) Part-Time
- ( ) Casual
- ( ) Seasonal
- ( ) Prefer Not to Answer

Are you willing to provide your Email address ?***

Your email address will only be used for entering a draw to win a gift card. It will not be released to any third-party.
If you choose not to provide your email address, we will not able to reach you when you win a gift card.

- ( ) Yes, my email is
- ( ) No, I just want to submit my response. I don't want to enter the draw