Evaluation of Gamified Learning Management System Through Technology Acceptance Model

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DEDICATION

Firstly, I dedicate my work to Almighty Allah who gave me the strength and courage to complete my research. Then, I would like to dedicate my work to my parents and teachers who stood by me and guided me, especially when I needed them the most.

CERTIFICATE OF ORIGINALITY

I hereby declare that the research work titled “Evaluation of Gamified Learning Management System through Technology Acceptance Model” is my own work and the best of my knowledge .it contains no materials previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any degree or diploma at SEECS or any other education institute, except where due acknowledgment, is made in the thesis any contribution made to the research by others, with whom I have worked at SEECS or elsewhere, is explicitly acknowledged in the thesis.

I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from others in the projects design and conception or in style, presentation and linguistic is acknowledged. I also verified the originality of contents through plagiarism software.

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Muhammad Yasir Mustafa

List of Abbreviations

GLMS	**Gamified Learning Management System**
AU	**Actual Use**
BI	**Behavioral Intention**
CTAM-TPB	**Combined TAM & Theory of Planned Behavior**
DTPB	**Decomposed Theory of Planned Behavior**
ICT	**Information and Communication Technologies**
IT	**Information Technology**
PC	**Personal Computer**
PEOU	**Perceived Ease of Use**
SEM	**Structural Equation Modeling**
PLS-SEM	**Partial Least Square Structural Equation Modeling**
PU	**Perceived Usefulness**
LP	**Learning Performance**
PE	**Perceived Enjoyment**
ATU	**Attitude toward Use**
TRA	**Theory of Reasoned Action**
MM	**Motivational Model**
UTAUT	**Unified Theory of Acceptance and Use of Technology**

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ABSTRACT

Universities have made a considerable investment in the usage of Learning Management System (LMS) to facilitate their students learning processes in e-learning; although, these systems are not used by the students to their fullest level of interest and engagement (Fathema, Shannon, & Ross, 2015). To address these issues, the concept of gamification was introduced in the LMS. The gamification is not a "full-fledged game; "rather it uses game elements e.g. leader board, badges, levels, avatar, discussion forum etc. to increase engagement and motivation. In order to investigate the impact of gamification in LMS, a Gamified Learning Management System (GLMS) was developed by a team of researchers at NUST, Islamabad, Pakistan. The purpose of this research study was to evaluate the acceptance of Gamified Learning Management System (GLMS). Technology Acceptance Model (TAM) was used to investigate how students' attitudes influence their intention and actual use of GLMS by incorporating some of the factors commonly found in the scientific literature. These factors are related to the effect of enjoyment and learning performance on the use of GLMS. The data was collected through a survey from undergraduate computing students at School of Electrical Engineering and Computer Science (SEECS) at NUST, Islamabad. The data was then analyzed using Structural Equation Modeling and regression analysis. Analysis supported that the proposed external variables: perceived enjoyment and learning performance were significant predictors of students' attitude towards GLMS. In the context of learning management system, it was concluded, that it is important to provide an atmosphere where students can live up their sense of competence, autonomy and relatedness. Therefore, GLMS may help to provide this kind of environment and becomes the basis of future e-learning at higher education level.

CHAPTER 1:

INTRODUCTION

Internet centered (LMSs) (for example Blackboard, WebCT, Moodle, Desire2Learn) are very famous and well renowned learning technologies that are very useful in distance, face-to-face process of teaching-learning, and blended learning (Connolly, MacArthur, Stansfield, & McLellan, 2007; Dahlstrom, Brooks, & Bichsel, 2014; DeNeui & Dodge, 2006; McGill & Hobbs, 2008). LMS is a content management, administration and instructional tools that allow students ,faculty and administrators to manage or organize the documentation to deliver and access the academic content" (Raban & Harper, 2008) .With the usage of computer, worldwide web, and internet tools in the learning processes, LMSs offer the blended way of faster and comparatively better communications between instructors, students and management. Though LMSs offer very supportive features for students to improve their learning processes, and the huge budget on the usage of LMSs has been made by the universities or higher education institutes around the globe but these are not tolerable by faculty and students to their fullest level of attention, curiosity and competences(Allen & Seaman, 2009; Dahlstrom, 2012; Jaschik & Lederman, 2015).

In educational perspective, technological, and scientific resources even LMS have been evolved in a complex ways.

According to Freire(Freire, Arezes, & Campos, 2012) (Freire et al., 2012)the "usability" of the systems varies to the fields in which it is being considered, it can be defined in the view point of ergonomics as "the capacity or strength of a system which is offered to the user related to the effectiveness of tasks.

It has been noticed that students and teachers were not used all the functions and features of LMSs equally, some functions are used more repeatedly than the other functions as studies in the previous researches regarding LMS (Jaschik & Lederman, 2015; Panda & Mishra, 2007; Weaver, Spratt, & Nair, 2008).Furthermore, there are many studies which has examined that the students' acceptance of numerous technologies as well as LMSs. Lee (Pituch & Lee, 2006) specified that the first one usefulness and second one is ease of use which considered as the main elements in the perceptive of student acceptance in distance learning or E-learning. Cheung(M. K. O. Lee, Cheung, & Chen,

2005) specified that the third one factor is perceived enjoyment which had also a huge impact on students' attitude of using the web-based learning systems.

The accessibility or accessibility of technology and the integration of technology in the learning or teaching process is not sufficient but also evaluation on how students perceive, embrace and use it. It has also been noticed that students frequently use LMSs as add-ons to their lectures; related to the functionalities and features of LMSs (downloading lecture's material) we reparably used by students having no direct contact with other members and faculty (Hustad & Olsen, 2013; Pajo & Wallace, 2001). All these conclusions point out that to make sure greater than before use of LMSs by students, to make the LMS much better, more research was required so that student of faculty members can use it with fullest level of their interest and motivation.

To address these issues, the concept of gamification was introduced in the LMS. "gamification" is about to use of game features or elements (e.g. leader board, badges, levels, avatar, discussion forum etc.) in non-gaming framework in order to improve user engagement, user experience, loyalty, motivation, and fun (Deterding, 2014).

In modern years gamification has been introduced as an emerging technique used in different fields like marketing (Muntean, 2011) health (J. J. J. Lee & Hammer, 2011) or interactive systems (Flatla, Gutwin, Nacke, Bateman, & Mandryk, 2011) and education (F. R. Chen & Samroengraja, 2000; Raban & Harper, 2008) to engage and motivate the customers or users. This fast development has increases scholar's interest to create engaging and attractive opportunities to facilitate the learning (B. Reeves & Read, 2009); to facilitate mass-collaboration (McGonigal, 2011) or encourage knowledge contribution (Krause & Smeddinck, 2011). Gamification increases the motivation of users in order to increase participation for the achievement of certain goals. Previous research on gamification has focused enjoyment and fun and engagement as core components (Garris, Ahlers, & Driskell, 2002; Sweetser & Wyeth, 2005).

In order to evaluate the effect of gamification in LMS, a Gamified Learning Management System (GLMS) was developed by a team of researchers at NUST University, Pakistan.

1.1. Gamified Learning Management System

As early we discussed that Gamified Learning Management System (GLMS) was developed by a team of researchers at NUST. The Existing features (quizzes, assignments, grading, discussions,

other lectures related materiel, discussion forum) and functions of the LMS were enriched by integrating the Game elements and game features. Screen shot of GLMS is given below.

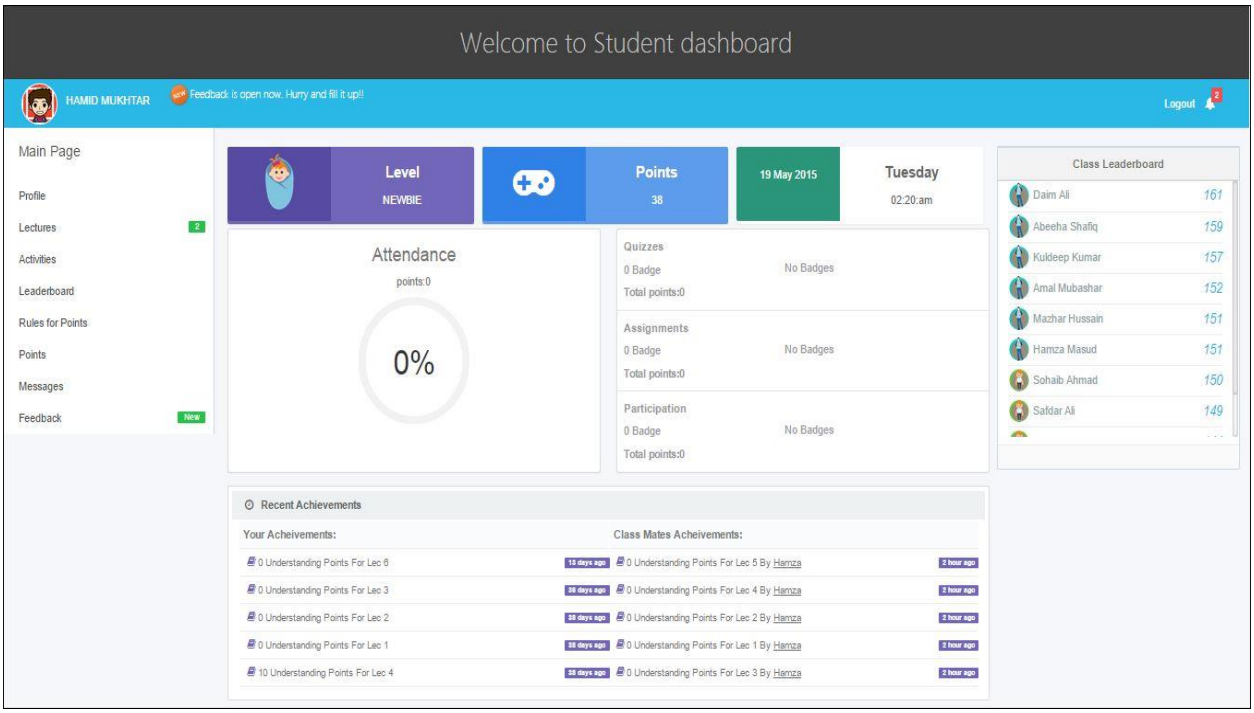
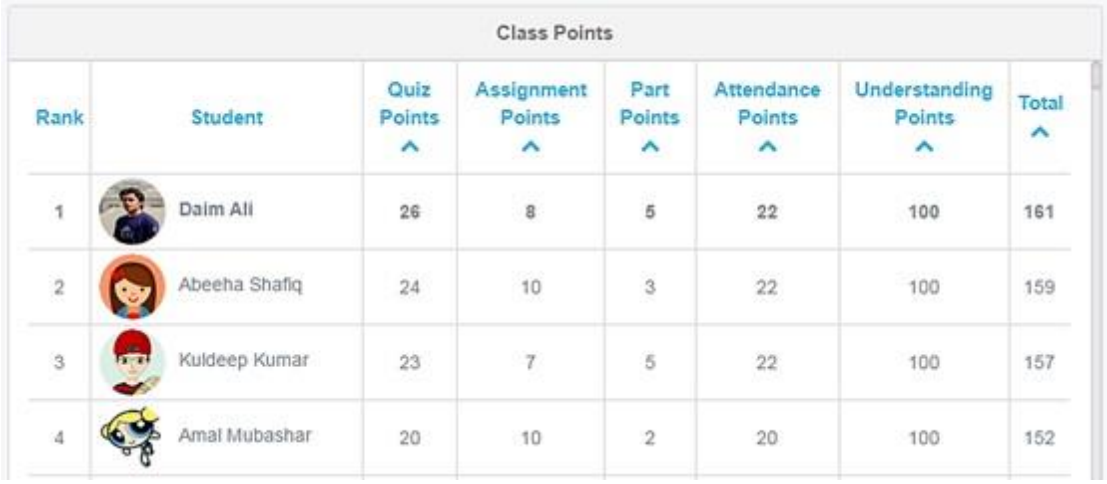


Figure 1 Gamified LMS

The main features and game elements used in GLMS are given below:

1.1.1. Points, Badges, Leader board:

Points were being used to represent the score of the students and to form a connection between external rewards and the progress of the users. They also provide feedback which is significant to sustain motivation. With points it is likely to track the user's action. One decision to make is which role points need to take in: when points should raise your spirits of competition, points should be used as scores; otherwise, when the goal is to give the user constant feedback, the progress of each individual user should not be shown to others (Werbach, 2012).



Class Points

Rank	Student	Quiz Points	Assignment Points	Part Points	Attendance Points	Understanding Points	Total
1	Daim Ali	26	8	5	22	100	161
2	Abeeha Shafiq	24	10	3	22	100	159
3	Kuldeep Kumar	23	7	5	22	100	157
4	Amal Mubashar	20	10	2	20	100	152

Figure 2 Points

Badges were used for the visual demonstration of an achievement that user can gain. The most important purpose of a badge can have, is goal-setting; it is an optional motivator Antin and Churchill (Churchill Jr, 1979) investigated five psychological roles that badges can have in a social media context; but they suggest to explore those functions in other specific contexts. The major reward is often the fun and concern of goal seeking. When the progress toward searching the goal is offered to the user, the badge then is most elective. Without presenting the route on the way to success, there is no response provided on which users could place them to progress towards the right direction (Churchill Jr, 1979).Status and declaration not only are engaging for individuals, they also could be attractive or engaging for groups.

Figure 3 Badges

Leader board was used be a fun way to drive competition among students; some students who will be fighting for the top spot in a public leader board and some will be interested in comparing their progress to their friends. Leader board is the most problematic game element. Users like to know where they stand matched to others; this could lead to de-motivating users when they identify the way to go to get on top of the list. The latter could cause students trying everything to be the first on the list. The biggest advantage of applying a leader board is the fact that it provides appropriate information about the students' progress which could have a motivating element for the user (Churchill Jr, 1979).

Figure 4: Leader Board

1.1.2. Distribution of points

It was consist of information related to the distribution of point, levels and badges for the guidance of the students. New users should be introduced to the system; otherwise they might feel gone alone. That is why Antin and Churchill (Churchill Jr, 1979) argue that a successful badge system should encompass badges which provide instructions about the activities a student can struggle for. Those badges could also introduce the highly valued "social norms which is interactivity" (Churchill Jr, 1979).

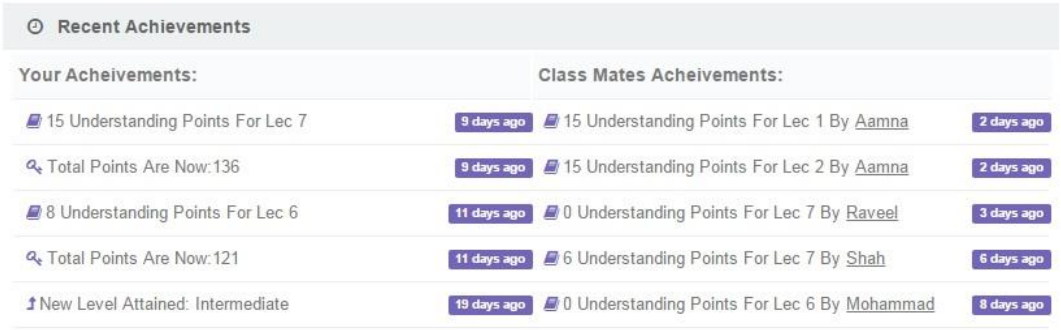


Figure 5: Points distribution

1.1.3. Avatar

Different types of avatars were used as a game element which acts as a mediator of the player's embodied interaction with the game world, the relationship of player and the avatar is a sign of relatedness.

Figure 6: Avatar

1.1.4. Progress bar/Levels

Levels were used in the system through which users were rewarded a collective value for increasing of points. As player's progress to higher levels, often features are unlocked. In order to motivate the students, Leveling is one of the highest components (Sweetser & Wyeth, 2005). Levels can be tied to use simply as a motivational note to keep players progressing forward or unlocking content on a website (Sweetser & Wyeth, 2005).

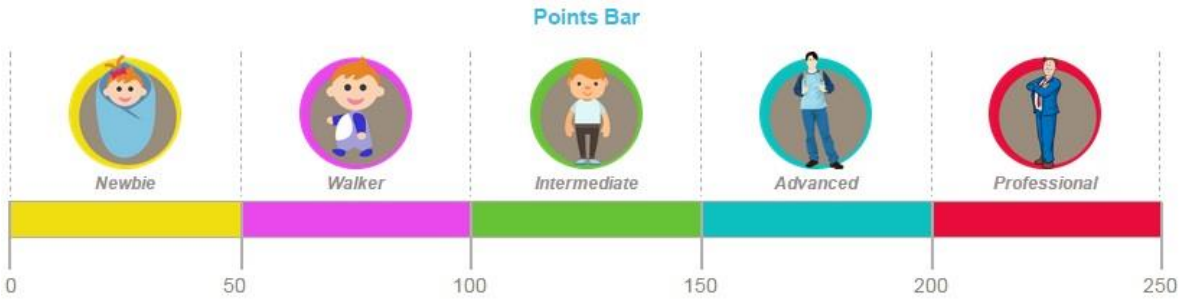


Figure 7: Progress Bar

1.1.5. Discussion Forum

Discussion forum was used to discuss the issues related to the lectures and important concepts. The points were awarded as per participation by the students.it was used to engage and motivate the users and to enhance their learning through discussion.

1.1.6. Lectures citation and understanding points

This was another new feature used in the system. Understanding levels were used beside every slide of the lecture. Levels were categories with respect to the percentage. Points were awarded on the basis of early revision and understanding level of lectures.

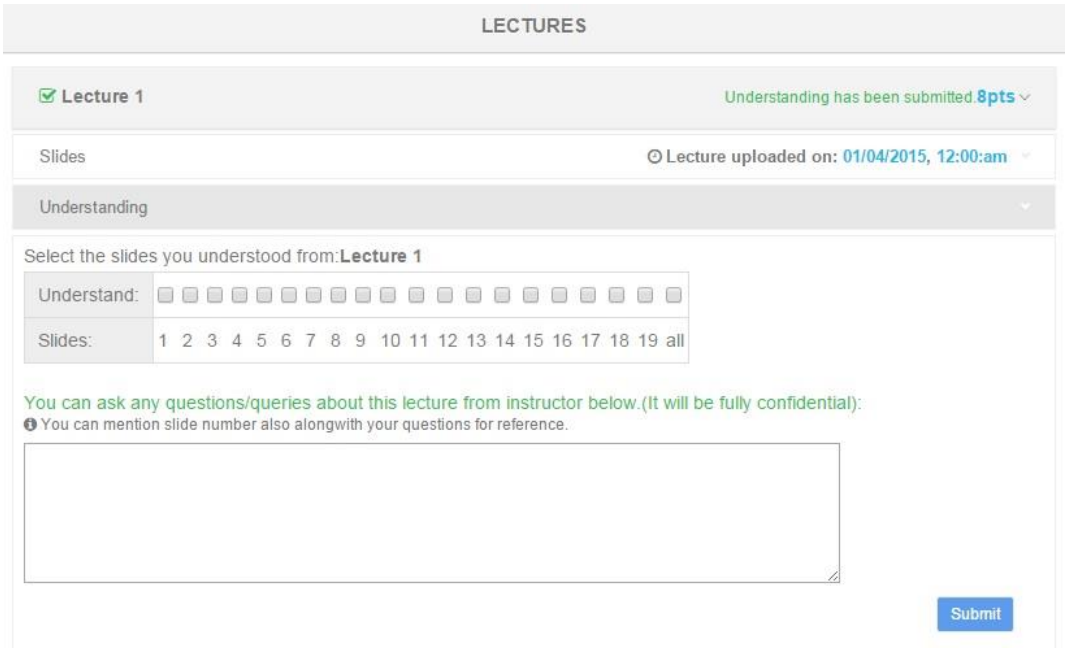


Figure 8: Lecture slides

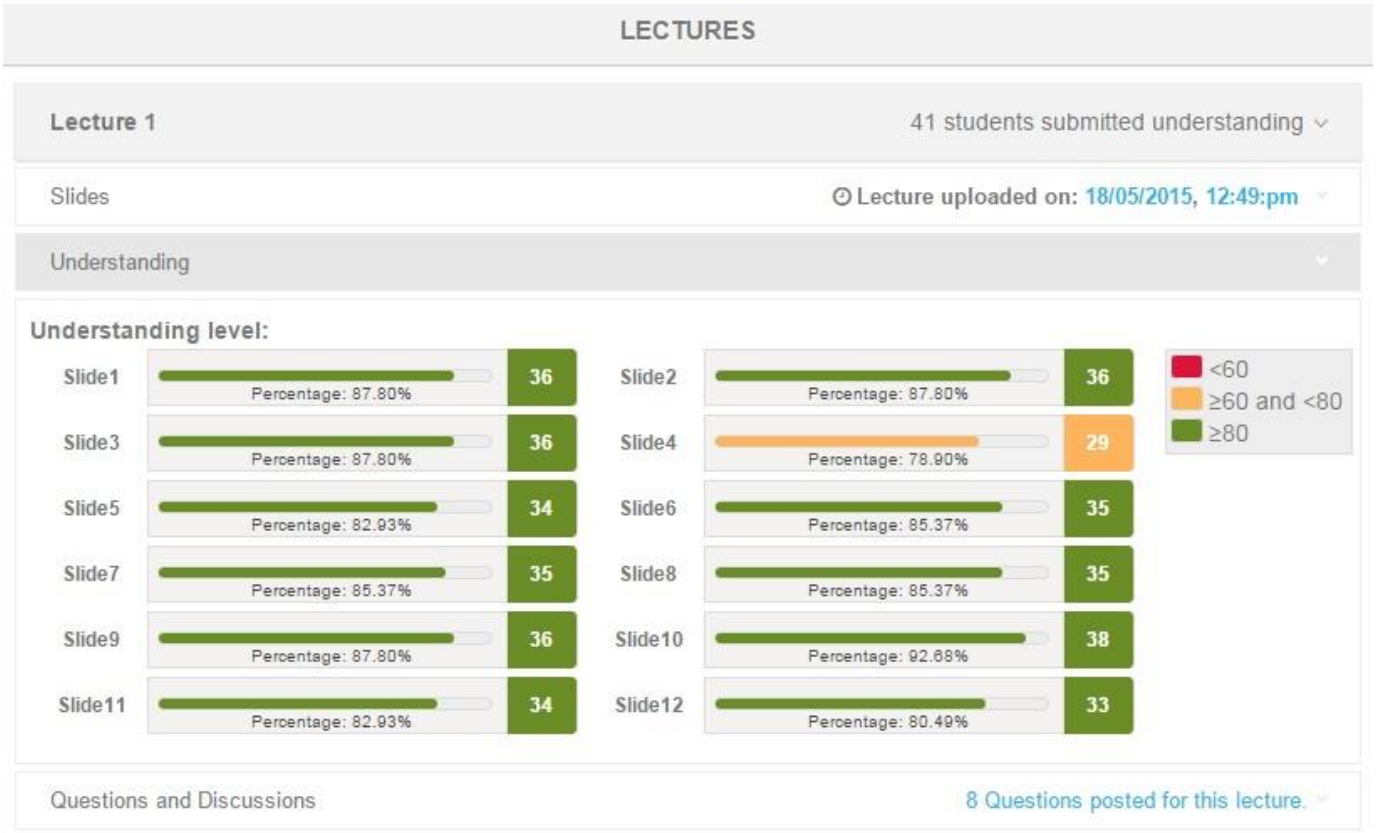


Figure 9: Lectures understanding level

Faculty Feedback:

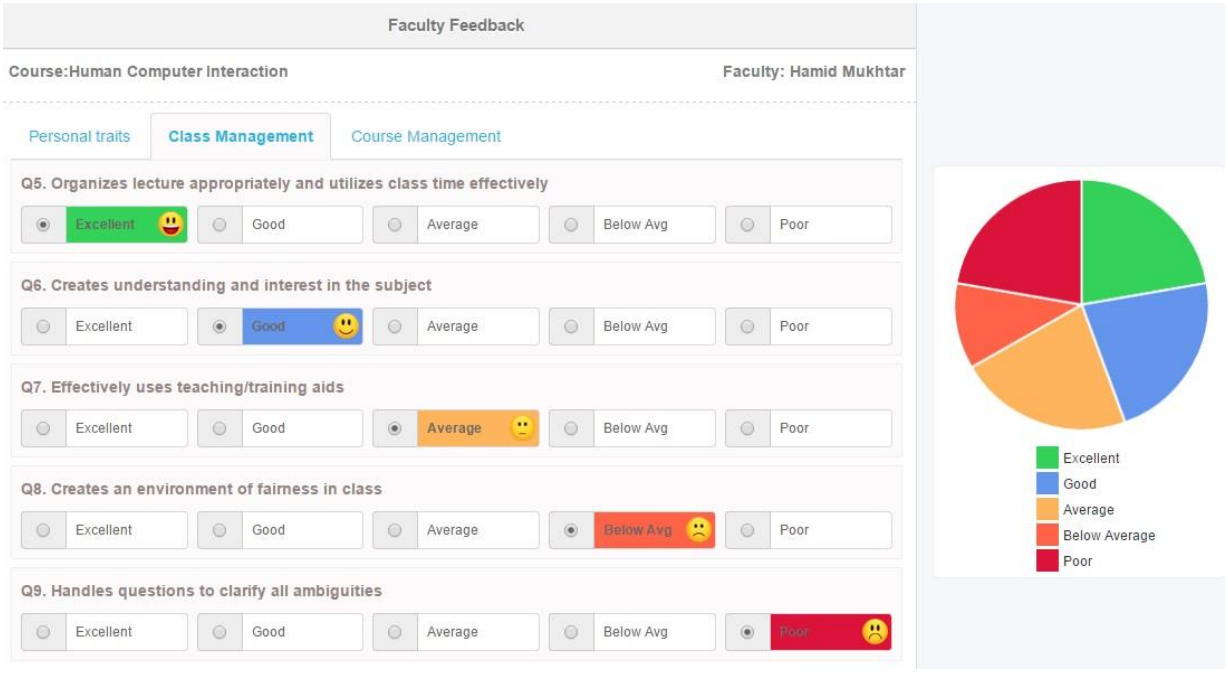


Figure 10: Faculty Feed back

Across the globe Gamification concepts into newer more advanced technologies is increasingly being studied and utilized to design better more efficient, more usable systems that can improve the usage and motivations of the users. A significant amount of work has already been carried out on Gamified systems [170] but very little work has been done on evaluation of the Gamified systems. The main reason behind conducting this research was to analyze evaluate the impact and acceptance of Gamified (GLMS) by the student of undergraduates at NUST, Islamabad.

The study would also emphasis on factors such as behavior that affect the individual's decision for selecting such technologies for their benefit. The research will result into a model or framework for exploration of GLMS acceptance and adaptation with respect to certain demographic setup such as students of SEECS. How they use or perceive GLMS to be useful? Users differ with respect to their intention for using technology; similarly their attitudes are directed to meet different purposes. Therefore, technology acceptance is defined (Aldhaban, 2012) as an awareness process composed of five major steps known as Assessment, Acceptance, Learning and Usage. Further in the same context these steps are explained as; Awareness is to learn about the technology for using

it for their benefit and reaching a decision, Assessment is to measure the usefulness of the technology beside with ease of using that technology, Learning is to build an understanding to efficiently use the technology, Usage is the actual appropriate use of the technology.

For acceptance of a technology users or members of a group consider the possible benefits by using a particular technology(Landry, Griffeth, & Hartman, 2006). And these benefits help users in making decisions pertaining to adoption of a technology (Landry et al., 2006). User's attitudes are dependent and built on analytical calculation of risk and benefits along with communication of analysis (Frewer et al., 2004). Fewer clarifies that technology adoption amongst users can be developed by creating a sense of transparency in the adoption process of a technology (Frewer et al., 2004).

It seems to be similar as technology adoption Awareness process model when comparing it to TAM, as these factors are already a part of TAM. The definitions of the five acceptance steps indicate factors already existing or combined in TAM; such as Awareness can be related to Job relevance in TAM, similarly the first main factors is perceived use fullness (PU) and the second one is perceived ease of use (PEOU) are related to assessment. Acceptance can be explained by following TAM model coupled with empirical analysis; acceptance in structural context may resemble to benefits if a particular technology is adopted, which is also present in extended versions of TAM in the form of Perceived playfulness or perceived enjoyment. The operational definition of Learning can be related in modified TAM as constructs of learning improvement as in the case of GLMSTAM. Usage in technology adoption imitates actual use of TAM. Thus Technology Acceptance Model already overwhelms the adoption concepts in a structured way, which are verified and validated through related empirical analysis.

We used the extended form of Technology Acceptance Model (TAM) in order to evaluate how student's attitude and intention is influenced to use of GLMS by incorporating the factors that are mostly or commonly found in previous literature. These factors were related to the effect of enjoyment and learning improvement. TAM is a far more established model and is evolved to integrate and keep its pace with changing technology as well as its adoption.

Thus TAM is more robust, relevant as well as consistent model for mapping acceptance including adoption of a technology in any social setup, any enterprise and virtually any evolving technology. Adoption has a very limited scope for studying the overall acceptance of a technology amongst

individuals and for business oriented enterprises. Adoption is more related to management, having more organizational context then technology emphasis.

The data was collected through a survey from two sections of undergraduate BSCS students at SEECS, NUST Islamabad. The data was then analyzed using structural equation modeling. Analysis supported that the proposed external variables: perceived playfulness, enjoyment and learning improvement were significant predictors of students' attitude towards GLMS.

This study will be first one to evaluate, investigate and report different aspects of GLMS usage in a fairly sizable population base within the university environment. This will underlined the basis for future studies. Since in Pakistan such research at this scale is not conducted we consider it as an opening and as a challenge to conduct this research and to derive associated information that meets this purpose. The research will result into a framework or model for the investigation of GLMS acceptance and adaptation. The major goal is to understand and analyze GLMS acceptance in a specific demographic group.

CHAPTER 2:

LITERATURE REVIEW

The integration of ICT has become compulsory part of many practical and learning environments (Landry et al., 2006). Still, there are many certain problems that can create hinder related to evaluation and implementation of e-learning, its benefits to students, teachers and respective universities (Fathema et al., 2015). These problems are also related to adoption rate of e-learning systems especially in Pakistan. Although Universities are spending lot of money on new learning technologies and application of that technologies but those technologies will not show their impact if not well designed and well planned. In the end result will be the wastage of money, resources and time (Connolly et al., 2007). It is very important for universities to make sure the acceptance and readiness of users before introducing or implementation ICT-based learning (Connolly et al., 2007).

There are several studies that involve in research on e-learning and evaluate or analyze the influence of students' attitude on the usage of e-learning. The individuals' opinion of the usefulness of online learning could be a complementary that can improve the academic achievement in e-learning environment (Yukselturk & Bulut, 2007).

With the quick growth and development of Gamified applications in the last decade, gamification has been integrated with different fields e.g. Marketing, Health, Business, Education and E-Learning to motivate and engage the users. There has been much consideration regarding integration of gamification in different online applications by the researchers. To following these trends, the team of researchers from SEECS NUST has integrated gamification in learning management system.

Understanding individual's perception to use learning management systems in educational institutes such as LMS is considered important as supported by different research paper’s literature reviews and academic journals.

The above-mentioned attributes (students' perceptions of attitudes toward use ease of Use, and usefulness) can justify the determining factor of students' willingness and to use GLMS. These contributing factors are related to (TAM) Model.

Literature adopts a structured focus and a standard approach using TAM (Technology Acceptance Model) to understand and explain user's behaviors and their attitude towards acceptance of system.

2.1. GAMIFIED LMS

With the appearance of World Wide Web, web-based platforms, and the opportunities for learning are in transformation state. Learning Management Systems (LMSs) is the modern example of learning revolution and management platform which deals with functions like online discussions, course management and documentation like lecture materials & assignments; to support students, teachers and administration.

In educational contents, technological resources like LMSs have progressed in a complex way; there are a lot of concerns regarding quality and usability (T. C. Reeves et al., 2002). More than 100 different vendors in the market (Schuelke-Leech, 2013) are providing Learning management services and used by different educational institutes to facilitate their students to improve their learning. These systems are not used by the students to their fullest level of interest (Jong & Wang, 2009) and engagement. To address these issues, the concept of gamification was introduced in the LMS. The gamification is not a "full-fledged game" rather it uses game elements e.g. leader board, badges, levels, avatar, discussion forum etc., to increase engagement and motivation. In order to investigate the impact of gamification in LMS, a Gamified Learning Management System (GLMS) was developed by a team of researchers at NUST, Pakistan.

There has been much consideration regarding integration of gamification in different online applications by the researchers.

With the quick growth and development of Gamified applications in the last decade, gamification has been integrated with different fields e.g. Marketing, Health, Business, Education and E-Learning to motivate and engage the users.

Game features and elements are also used by (Hamari, Koivisto, & Sarsa, 2014) to enrich the application. Game elements used in GLMS are mention below:

2.1.1 Points: Points were being used to represent the score of the students and to form a connection between external rewards and the progress of the users. They also provide feedback which is significant to sustain motivation.

2.1.2 Badges: Badges were used for the visual demonstration of an achievement that user can gain. The most important purpose of a badge can have, is goal-setting; it is an optional motivator (Icek

Ajzen, 1991) investigated five psychological roles that badges can have in a social media context; but they suggest to explore those functions in other specific contexts.

2.1.3 Leader board: Leader board was used be a fun way to drive competition among students; some students who will be fighting for the top spot in a public leader board and some will be interested in comparing their progress to their friends. Leader board is the most problematic game element. Users like to know where they stand matched to others; this could lead to de-motivating users when they identify the way to go to get on top of the list.

2.1.4 Process of on boarding: It was consisting of information related to the distribution of point, levels and badges for the guidance of the students. New users should be introduced to the system; otherwise they might feel gone alone. That is why (Churchill Jr, 1979)argue that a successful badge system should encompass badges which provide instructions about the activities a student can struggle for.

2.1.5 Avatar: Different types of avatars were used as a game element which acts as a mediator of the player's embodied interaction with the game world.

2.1.6 Levels: Levels were used in the system through which users were rewarded an increasing value for gathering of points (Icek Ajzen, 1991).

2.1.7 Discussion Forum: Discussion forum was used to discuss the issues related to the lectures and important concepts. The points were awarded as per participation by the students. It was used to engage and motivate the users and to enhance their learning through discussion.

2.1.8 Lectures citation and understanding points: This was another new feature used in the system. Understanding levels were used beside every slide of the lecture. Levels were categories with respect to the percentage. Points were awarded on the basis of early revision and understanding level of lectures.

2.2. External rewards and motivation

Rewards represent a positive external encouragement. As Cameron and Pierce explain: "external rewards are those that originate from outside the person and are generally arranged by other people" (Cameron, Pierce, & Schunk, 2004)Cognitive theorists have proposed that rewards are detrimental for individuals' intrinsic motivation and following engagement by undermining their insight of competence and autonomy or by contradictory the apparent basis of motivation to

external reasons. The first mechanism is developing for by Cognitive Evaluation Theory or CET (Spreitzer, 1995).

According to Deci (Deci, Koestner, & Ryan, 1999) et al., rewards have a potential to control the motivation of users. The objective of rewards are expected to be controlling, undermining the insight of autonomy and therefore dropping individuals' intrinsic motivation if tied to performance of standards. On the other hand, the over validation hypothesis suggests that when an external reward is introduced for an action which was previously interesting, the individual consequently attributes the basis for the activity to the external reward. Hundreds of studies have presented that "extrinsic" rewards direct attention away from intrinsically motivated learning, leading to weakened engagement once rewards are no longer offered (Cameron et al., 2004).

Cameron (Cameron et al., 2004) after reviewing 30 years of investigation on rewards, provided a summary of the settings that could lead to the negative effects of rewards: (1) task is of high initial interest; (2) use of tangible/material rewards; (3) rewards is offered beforehand (expected); (4) rewards are delivered irrespective of the person performance; (5) intrinsic motivation is indexed as free-choice behavior following the taking out of the achievements; and, (6) intrinsic motivation measured with a single valuation.

Therefore, from the initial argument of whether or not external rewards were negative per se, the logical discussion has focused on the factors that might donate to the effects of rewards on individuals' performance and motivation. As Cameron et al. explain: "the effect of achievement depends on the types of achievement is being used, how rewards are owed, and the context in which rewards are administered" (Cameron et al., 2004).

The main reason behind conducting of this research was to evaluate the usage attitude and acceptance of Gamified Learning Management System (GLMS).

Therefore, participation and acceptance of students or teachers must be considered and valued; otherwise the chances of failure or rejection of this system increases (Al-Adwan, Adwan, & Smedley, 2013).There are many organizations and universities that are offering e-learning systems which have run into various difficulties in terms of acceptance (Aldhaban, 2012). It is much important to give value to students' acceptance of e-learning and evaluate the most important factors which lead to the acceptance of e-learning environment (Aldhaban, 2012). It is also very important for developers and universities' management to evaluate how students participate and perceive the e-learning system (Koohang & Durante, 2003).

Furthermore, evaluating students' attitude and factors that influence students' intention about e-learning can be useful for management to introduce new techniques for engaging a larger number of students. Who are very keen to be involved in such type of e-learning based systems (Park, 2009). That is why, it is very important to evaluate the issues that explain students' acceptance and attitude towards using e-learning systems.

In this research study, we have considered the important theoretical factors (attitude toward use, perceived ease of use and perceived usefulness,) which are based on a certain framework or model known as technology acceptance model (TAM). Because TAM is vigorous and very suitable to evaluate the acceptance of various information system (S.-C. Chen, Li, & Li, 2011).We have also found that, a number of studies on e-learning have used TAM to evaluate the acceptance of users or learners toward a specific system (M. K. O. Lee et al., 2005; Liaw, Huang, & Chen, 2007).

Ong, Lai, & Wang (Ong, Lai, & Wang, 2004) also used TAM in their study. Where they found that both perceived ease of use and perceived useful has a significant impact of the attitude of the users toward its usage.

In another study Pan and Gunter (Pan, Gunter, Sivo, & Cornell, 2005) also used TAM to investigate a belief-attitude-behavior relationship in a Web-CT setting by using external variables .where they found that there is also a significant and positive effect of external variables (according to the features of the system) on attitude of the user.

Another study conducted by Fan Liu and Meng Chang Chen (Liu, Chen, Sun, Wible, & Kuo, 2010).the main objective of the study was to analyze the main factors that influence the attitude of students toward the usage of online system, where they used the extended TAM by adding one more factor which is perceived attraction along with other two factors i.e. perceived ease of use and perceived usefulness. The main three factors were mediator and were influenced by external variables. Those external variables were also effecting directly to attitude toward use of system.

In another study Xiaoyu Gao (Wu & Gao, 2011) conducted a study in USA. The purpose of this research study was the validation of extended TAM model. Perceived enjoyment was used as an extended factor.

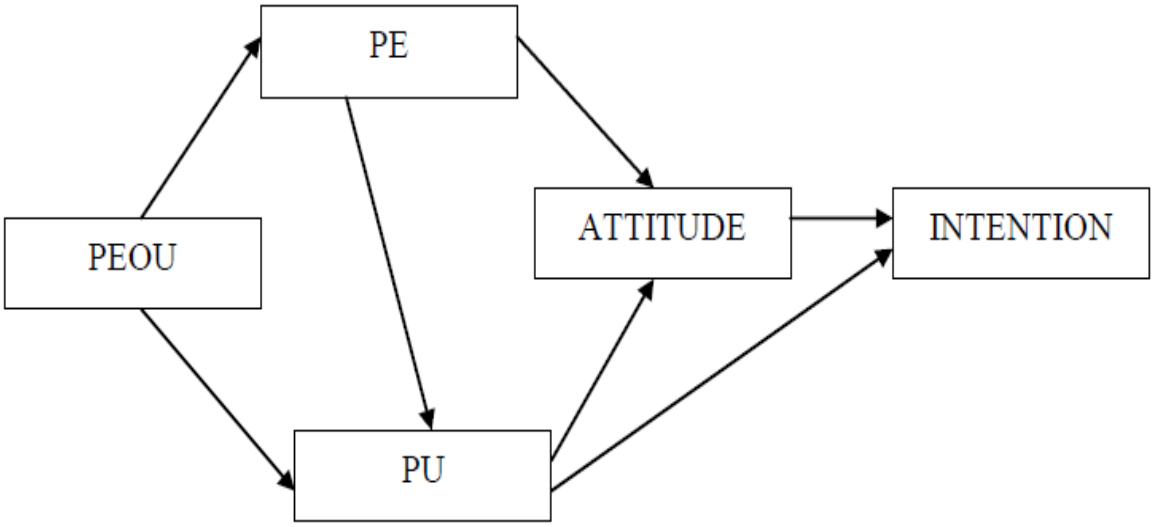


Figure 11: Extended TAM

Where they found that the perceived enjoyment has positive and significant effect on perceived usefulness and attitude toward use.

2.3 Technology Acceptance Model

TAM was proposed by Davis (Davis, 1989) in 1989 to explain the intention according to individual's behavior toward utilizing technological innovation. TAM is based on TRA also known as Theory of Reason Action, which is a psychological theory that tends to explain behavior. TAM involves two main predictors. One is PEOU and the other one is PU along with a dependent variable known as behavioral intension (BI) and Attitude toward use. Because of clear understandability, effectiveness and simplicity, TAM is a widely used and accepted model in Information Systems related research.

TAM is more specialized than TRA due to decades of Information Systems research, which is more suitable for modeling system acceptance of new technologies (Davis, 1989). The research explored the ability to anticipate user acceptance of computer technology by measuring their

intentions (Davis, 1989). Therefore GLMS acceptance can also be measured by understanding user intentions, which is termed as behavioral intentions. This construct will help us in explaining user behavior as well as future behavior of individuals for using a GLMS. In both models, behavioral intention of a user can be influenced by other factors (Davis, 1989). For example social norms (in TRA) can influence behavioral intention of a user (Davis, 1989).Similarly PU and PEOU (in TAM) can influence BI of a user (Davis, 1989).

In TAM, usefulness relates to behavioral intention directly, which means an individual can develop an intention for using a system such as a computer and this intention is based on that user's awareness for using the technology for improving his or her performance (Davis, 1989). Performance in this context is the ability to perform tasks by using a concern e-learning or other online system. Thus in both models namely TAM and TRA, Behavioral Intention is a very important determinant of usage behavior or actual behavior (Davis, 1989). The research emphasized that behavior is predictable from measures of behavioral intention (Davis, 1989). Davis et al., (Davis, 1989) further elaborated this concept that even if any other factor imposes an influence on actual use (i.e. actual behavior) of a system by users then it is influenced indirectly through Behavioral Intention. The research proved that individual use for technology such as computer can be predicted through intentions, with PU acting as a major determinant towards people intentions and the PEOU also contributing a significant role towards user's intentions (Davis, 1989).

The research demonstrates the value of combining objective usage measurements along with traditional survey data. Results give evidence of discriminate validity amongst components and constructs. Findings also provide strong scales reliability.

Paper by Dulcic et al., (Viswanath Venkatesh & Davis, 2000) describes using TAM model for research due to the only model that has acquired wide scale attention in the information systems community. Researchers in literature used a revised TAM model for evaluating PU and PEOU in terms of BI and actual use (Money & Turner, 2004; Rigopoulos & Askounis, 2007). Previous research concluded TAM to be a popular model for explaining as well as predicting system use (Chuttur, 2009) and provides consistent results.

The paper applies the Technology Acceptance Model by including additional external variables factors such as "Perceived enjoyment" & "Learning performance". The expanded Technology

Acceptance Model was used in this paper. Positive association exists between Perceived Usefulness and attitude implies that users take into account whether the system is useful for learning improvement. The association between Attitude and Behavior Intention was also found to be positive as well as significant. This research showed that Perceived enjoyment (PE) have a crucial role in individual choice of using or not using the available System. There is a significant positive correlation between PU, PEOU toward attitude.

2.4 Technology Acceptance Theories

Various models with associated theories are used for understanding and surmising the acceptance and adoption of technologies across different domains. Main goal is to identify key factors and their relationships towards technology usage by analyzing individual intentions. Therefore it is necessary to investigate different models and theories that can be applied to understand, predict and help elaborate technology use such as GLMS and its trends in IT. Use of GLMS empowers mankind in many fields of life, so much so that it is now considered as basic necessity. The focus of such studies is to understand and promote usage of IT, also for examining the barriers of technology use and intentional use with respect to actual usage. Different types of research models have different premise and directional benefits. Such theoretical framework and concepts need to be applied for developing a model for studying technological use in real scenarios for demonstrating the acceptance of Technologies (such as GLMS) in a particular demographic for reducing the gap known as digital divide. Various TAM models that were considered during the model design for GLMS are explained as follows:

2.4.1 Theory for Reasoned Action (TRA):

A multifaceted model supported with theory was presented in 1980 (Icek Ajzen, 1991). That model was related to attitude and behavior relationship (Icek Ajzen, 1991). This model was used in business and academics (Magee, 2009). TRA affirms that beliefs affect attitude as well as social norms that define the behavioral intention (Icek Ajzen, 1991). TRA has two main determinants namely attitude and subjective norm that are associated with behavior. Here attitude towards behavior implies the previous attitude of an individual for performing a behavior. In this model attitude towards a behavior is positive or negative, if the individual believes that the outcome of a behavior is positive or negative respectively. In this model subjective norm means the social

pressure toward decision making of an individual for performing a particular behavior. It is an individual's perception about what the social group prefers towards performing a behavior and how close the group is related to an individual. Many of the technology acceptance model initiate from the TRA model. An author named Han referred that this theory is frequently used by researchers to investigate determinants of IT innovation and usage behavior (S.-C. Chen et al., 2011). In technology acceptance research the TRA is also used although it was not developed with a specific aim of acceptance of technology (V Venkatesh, Morris, Davis, & Davis, 2003). However, TRA was observed to provide useful indications about user intentions to use an information system (M. Igbaria, 1993).

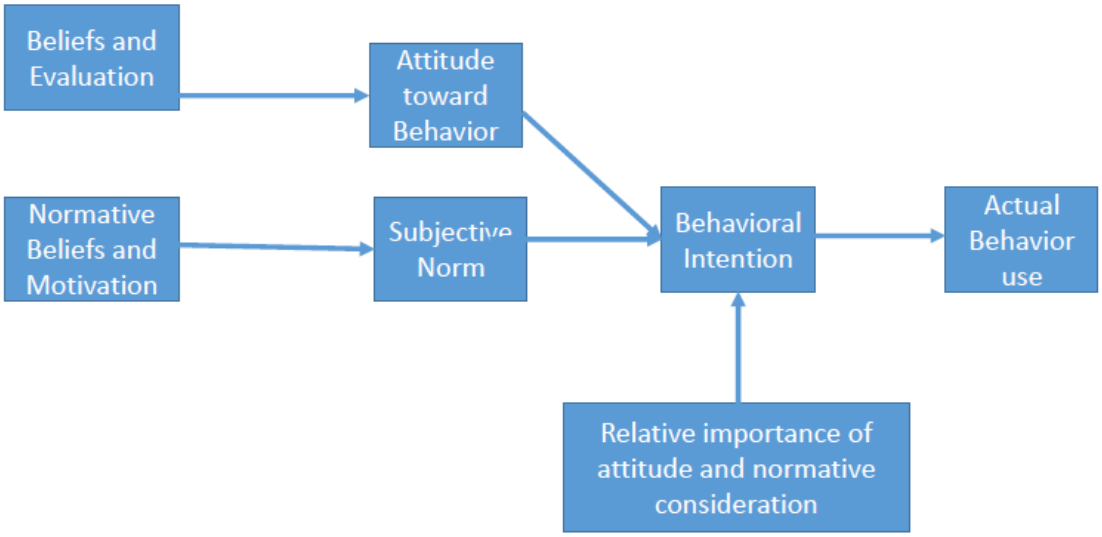


Figure 12: TRA Model

2.4.2 TPB (Theory of Planned Behavior):

Due to the certain limitations of TRA in terms of behavioral control, another theory TPB was introduced as an extension of TRA. TPB was introduced by Ajzen (Icek Ajzen, 1991). TRA main focus was to determine actual behavior of people through their intentional behavior, which is

influenced by their own attitude and by the society (Icek Ajzen, 1991). Whereas TPB was introduced as an extension of TRA for considering other constraints that affect personal behavior, such as internal or external economic position and experience for using a service / technology (Nysveen, 2005). TPB included another determinant / construct known as PBC (Perceived Behavioral Control). TPB predicts intentional behavior and is considered to be more general as compared to TRA because behavior can be deliberating (i.e. intentional) as well as planned (Chau & Hu, 2002). The intention is determined through three constructs namely attitude towards behavior, SN and PBC (Icek Ajzen, 1991).Favorable attitude and SN, implies greater PBC. In TPB certain behavior is defined through three kinds of beliefs behavioral, normative and control beliefs (M. Igbaria, 1993). (Figure 5 for model related by Ajzen (I Ajzen & Fishbein, 1980))

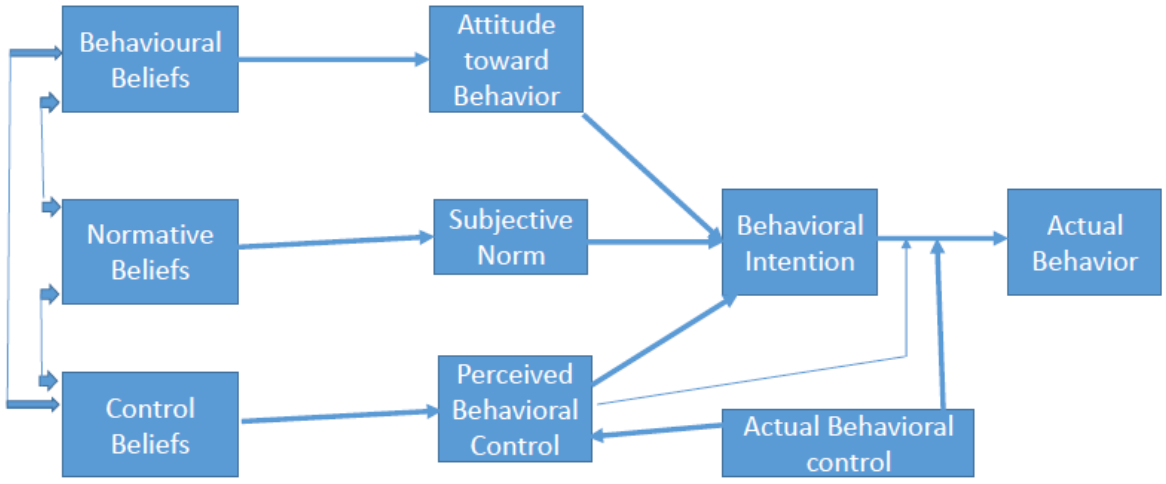


Figure 13: TBA Model

2.4.3 DTPB (Decomposed Theory of Planned Behavior):

For the understanding of IT usage DTPB was proposed by Taylor and Todd in (Park, 2009). This model further divides and explores dimensions of attitude, SN and BC (behavioral control) towards BI. Major change was the decomposition of attitude belief into PU, PEOU and compatibility with the system. These constructs are consistent while considering information technology and its usage.

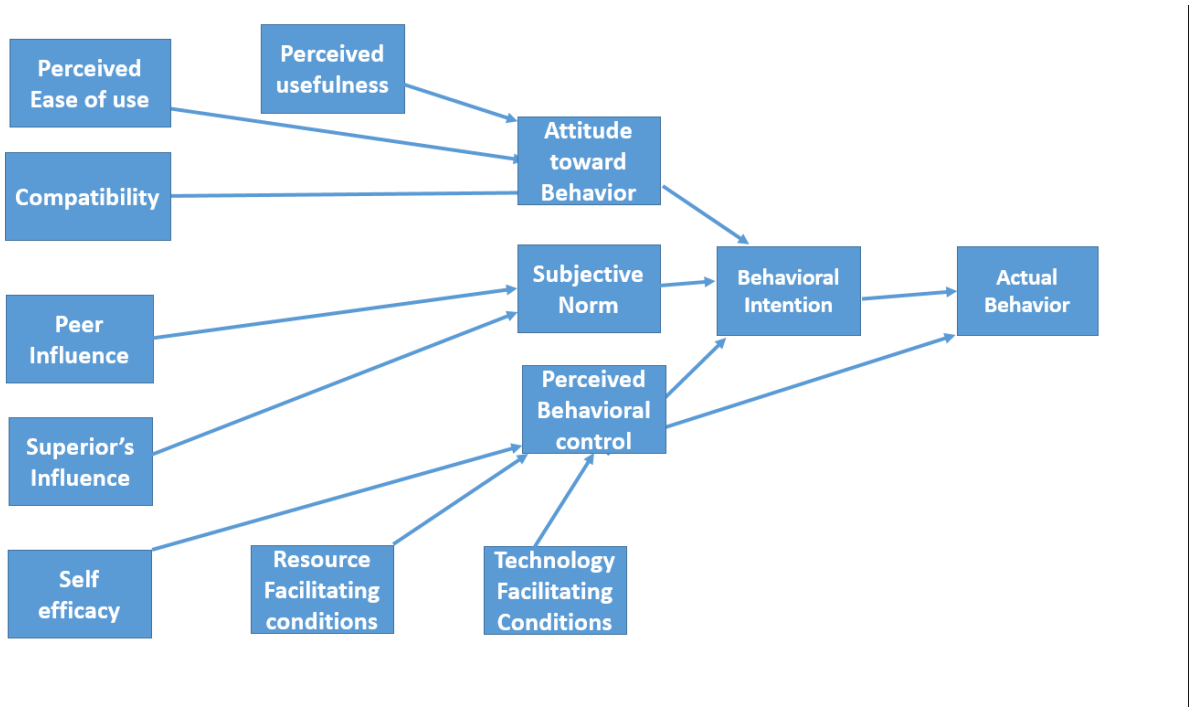


Figure 14: DTPB Model

Normative belief is divided into peer influence and superior influence due to the fact that they have different views for IT use. Perceived behavioral control was divided into three constructs called self-efficacy, resource facilitating condition & technology facilitating condition. This model is more elaborative and capable for explaining behavioral use.

2.4.4 TAM (Technology Acceptance Model):

TAM was proposed by Davis in 1989 (Davis, 1989; Wu & Gao, 2011), which is established on the basis TRA (Chau & Hu, 2002), as a tool for predicting the possibility that a new technology will be adopted within a group or an organization. Due to this it is feasible to predict future technology trend in terms of use by applying TAM when the technology is introduced. TAM utilizes TRA based theoretical foundation for determining causal linkage between PU and PEOU, as essential beliefs.

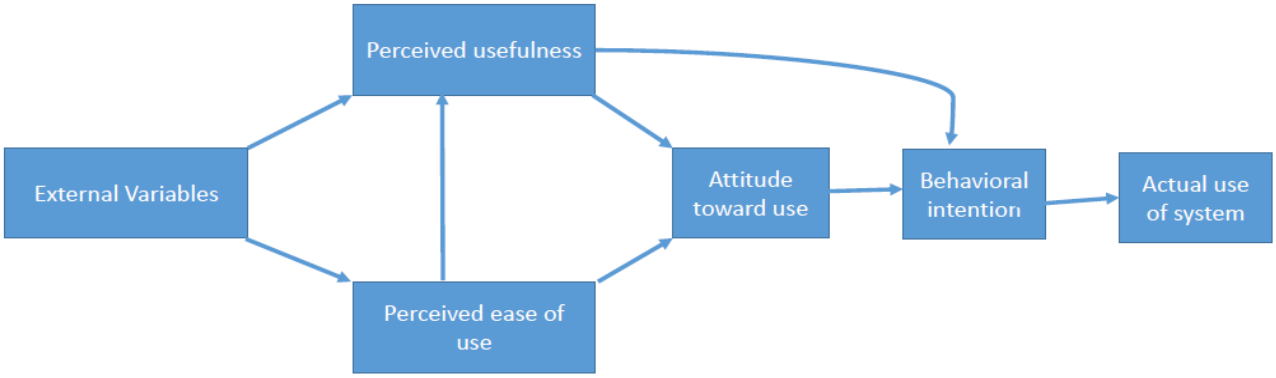
TAM in its original form consists of five components namely PU, PEOU, ATU, BI of usage, and AU (Actual Use). TAM hypothesizes and assumes that the fact for adopting a particular technology for use can be determined by two key technological factors called PU and PEOU. PU implies to the degree of belief that an individual considers a particular technology to be used for enhancing ones performance in a job or towards any given task. The term PEOU refers to the individual's

belief in a particular technology who considers it to be easy to use or free of effort [56]. Here BI means the individual's future behavior to use that technology for achieving any goal or a plan. BI then relates to 'actual system use' in terms of likelihood or anticipation based on intentions to use of technology by any individual.

The BI was incorporated in original TAM was used based on two unique aspects that is, dependent and independent variable. BI acts as a dependent variable in the situation for testifying the validity of PU & PEOU, whereas BI acts as an independent variable when expressing actual usage behavior. In a follow-up research the attitude variable is shown to observe weak predictors for BI (Taylor & Todd, 1995). As a result in many subsequent researches using TAM the use of Attitude variable was excluded. TAM by Davis articulates certain success of system in terms of adoption and use, can be readily measured by three factors concerning the user of the system, these factors are PU, PEOU and Attitude (ATU) towards system usage (Davis, 1989). The model depicts that user's perceptions determine the Behavioral Intention for using or not using a system. And testing these perceptions can be captured by considering user's perception

bout the EOU or usefulness of the certain system(Davis, 1989; Nov & Ye, 2008).

In two decades TAM has transformed into a very stable, robust, effective and greedy model for prediction of user acceptance of any technological system in use. In the first decade of TAM use for mapping acceptance of systems, a similar position was maintained by (Park, 2009). Technology Acceptance Model in general has been supported by various empirical studies and this has enhanced the capabilities of TAM as a model for evaluating the acceptance of technology in numerous ways and amongst a variety of systems in use(Sugar, Crawley, & Fine, 2004; Teo, 2009) .TAM also helps analyze and explain the adoption variation in a majority of possible information systems (Bhattacherjee & Premkumar, 2004; B.-M. Kim, Widdows, & Yilmazer, 2005). Over the time TAM as a model incorporates and accumulates different findings in terms of information systems research, which enables this model to be very suitable for modeling acceptance of different technologies such as computer acceptance (Viswanath Venkatesh & Davis, 2000).



Technology Acceptance Model by (Davis, 1986

Figure 15: TAM (Technology Acceptance Model)

TAM has certain assumptions; one is that the technology use is voluntary. The second assumption is that at a given time with sufficient information about a particular behavioral activity of an individual, the individual's behavioral intention implies that the behavioral use will resembles the actual usage. TAM is a famous model used in research papers for investigating acceptance of various technologies. The number of researchers and academics that are still utilizing Technology Acceptance Model proves the fact that this model as a valid tool with a wide scale of acceptance.

2.4.5.1 Limitations of TAM:

TAM has become one of the broadly utilized models particularly for information systems because of its higher degree of applicability, understandability and simplicity. However TAM has some imperfections and all TAM associations / relationships are not carried out or considered as they are in all studies, this is due to the extensive variation in terms of predicting result in various studies that are concerned with various systems and unique set of users.

2.4.5 Technology Acceptance Model 2 (TAM2):

TAM2 was developed by (Viswanath Venkatesh & Davis, 2000)

. The goal of this model was to extend TAM to include additional determinants of TAM for explaining PU in term of SI (Social influence), intentions to use of system and influential reasoning process. Also TAM2 was developed for making the understanding and effects of these constructs varying with enhancing the experience of users. TAM2 will help in designing changes that would increase the user acceptance and its usage of future systems.

It was noted that the illustrious usage of TAM towards information systems of professional use, but the actual use of such systems had gone low and some systems remained underutilized (Viswanath Venkatesh & Davis, 2000) moved forward to extend the TAM model, while acknowledging its original value, which was developed by Davis and by Davis, Bagozzi and Warshaw in 1989. TAM was extended by Venkatesh and Davis as a follow-up approach referred to as TAM2, in this extended model focus was to model determinants of Perceived Usefulness for gaining better understanding of technology usage intention. Davis and Venkatesh asserted that even though perceived usefulness in previous research is an important driver towards Intentional Use some determinants are still overlooked that may cause an influence. Therefore in TAM2 social influences were incorporated as a potential factor along with focus towards PU and PEOU. In TAM2 social influence theoretically operated through Perceived Usefulness (PU). In TAM2 there are three major factors that affect individual adoption towards a system that are subjective norm, voluntariness and image. Subjective norm refers to the influence of a third person or a group that affects an individual's decision for performing a specific behavior.

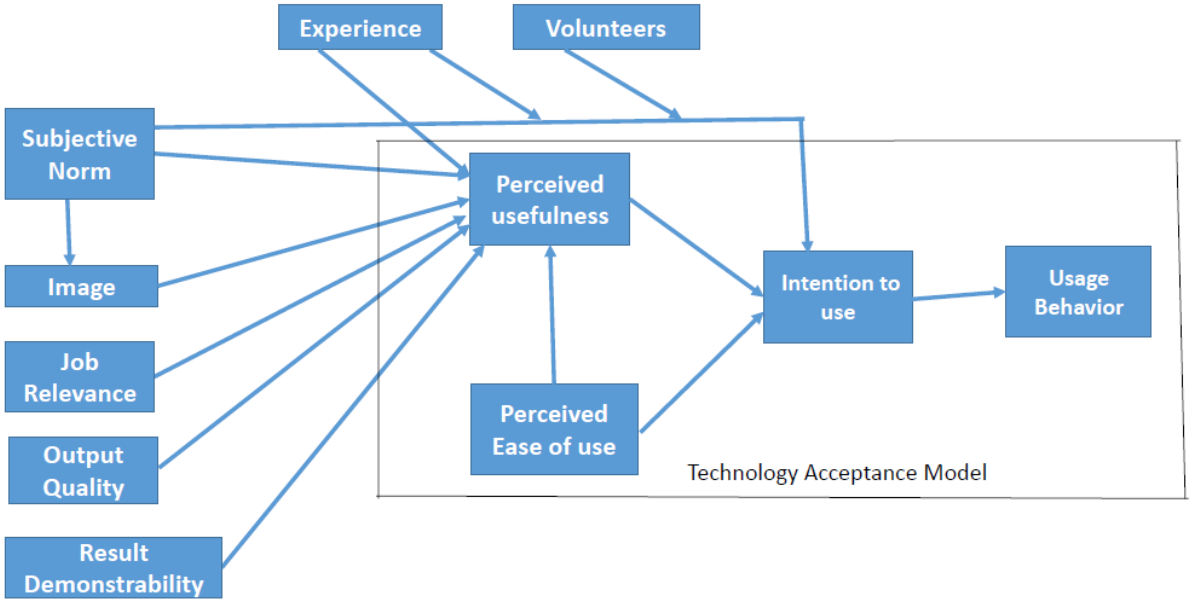


Figure 16: TAM2 Model

2.4.6 Augmented TAM/ Combined TAM & TPB (CTAM-TPB):

Factors such as social or control behavior have a significant influencing on Information Technology especially in terms of behavior usage. Therefore (Taylor & Todd, 1995)added namely subjective norm and perceived behavioral control to TAM (Taylor & Todd, 1995). This change was made to provide a complete test for essential determinants of IT use, because of predictive utility in terms of IT usage and social psychology. This model is known as (Augmented TAM) / (Combined TAM & TPB).Augmented TAM provides a capable model for IT usage acceptance for both categories of users that are experienced or inexperienced, keeping a reasonable balance of variance in intentional behavior and actual behavior (Taylor & Todd, 1995). Thus augmented TAM is useful in predicting usage behavior for users that do not have any experience with a system or a technology.

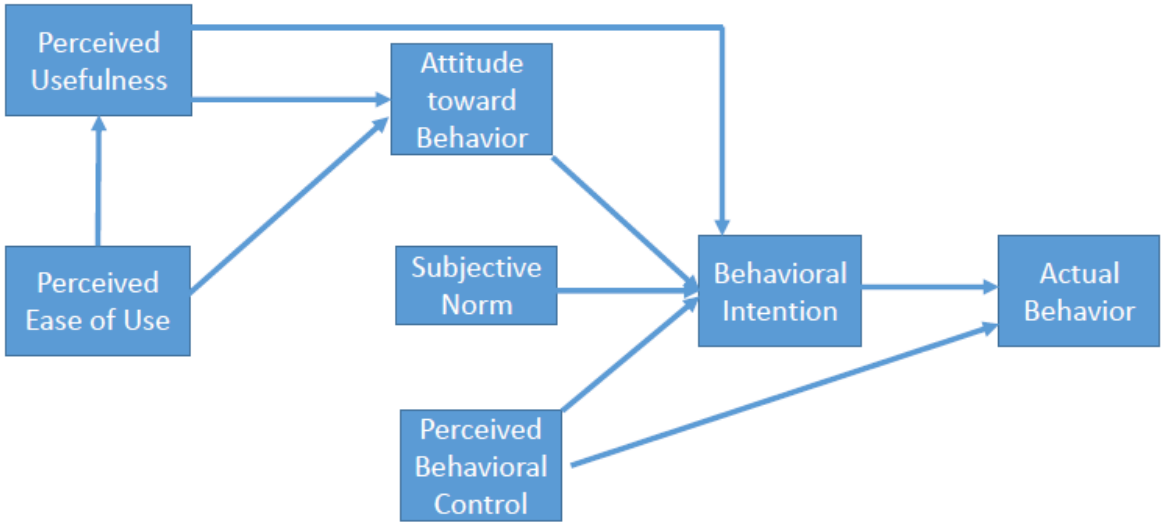


Figure 17: CTAM-TPB Model

2.4.7 Motivational Model

To analyze the application and usage use of information technology Davis 1992 also apply motivational theory. The motivational model is derived from motivational theory which suggests that human's behavior is based on extrinsic and intrinsic motivations. So the Gamification has a potential to increase the intrinsic motivation and short-term well-being according to motivational model. This viewpoint that gamification and have a greater or lesser effect on user's attitude (Przybylski, Rigby, & Ryan, 2010).

2.4.8 Unified Theory of Acceptance and Use of Technology (UTAUT)

UTAUT model represents the fact that with passage of time determinants of intention as well as behavior have been refined such that the key relationships are moderated (Sugar et al., 2004). This is explained by considering the key moderators such as age, which received less emphasis in previous models but currently in this model it affects every key relationship by moderating their effects. Similarly gender is also considered as another key moderator towards influence, and this moderation effect of gender is also supported in sociology as well as social psychology.

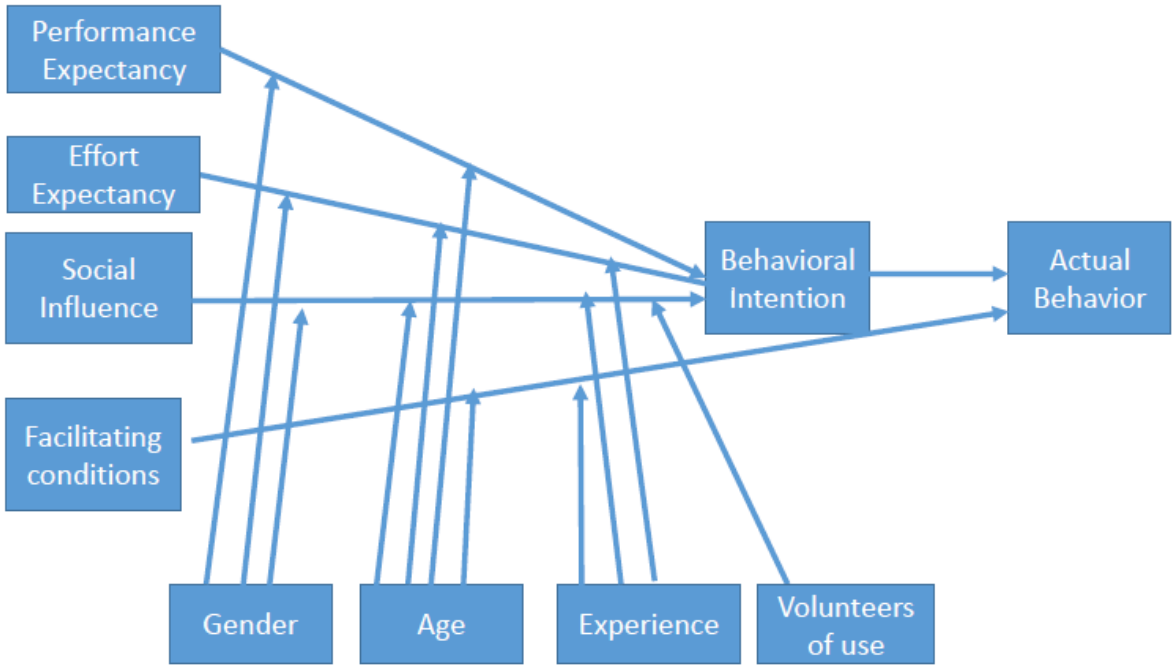


Figure 18: ATAUT

Chapter 3

METHODOLOGY

3.1 Research Methodology

To understand similar researches the literature review was studied thoroughly that were carried out in various contexts and exclusive demographics around the world. After a comprehensive literature review the research methodology was developed. The following questions were considered to measure the concepts and different factors or constructs associated to the acceptance of Gamified Learning Management System (GLMS).

1. What are the main factors behind the acceptance GLMS?

1.1 What are the relationships between these determinants?

2. What is the effect of motivational factors on the attitude toward the use of GLMS?

2.1 What is the effect of perceived enjoyment on student's attitude toward use of GLMS?

Numerous models with associated theories are used for understanding and surmising the acceptance and adoption of technologies across different domains. Main goal is to identify key factors and their relationships towards technology usage by analyzing individual intentions. Therefore it is necessary to investigate different models and theories that can be applied to understand, predict and help elaborate technology use such as GLMS. The focus of such studies is to understand and promote usage of IT, also for examining the barriers of technology use and intentional use with respect to actual usage. Different types of research models have different premise and directional benefits. Such theoretical framework and concepts need to be applied for developing a model for studying technological use in real scenarios for demonstrating the acceptance of Technologies (such as GLMS) in a particular demographic for reducing the gap. Various TAM models that were considered during the model design for GLMS are explained as follows:

TRA:

TRA confirms that beliefs influence the attitude as well as SN that define the BI (I Ajzen, 1991).TRA has two main determinants namely attitude and subjective norm that are associated with behavior. Here attitude towards behavior implies the previous attitude of an individual for performing a behavior. In this model attitude towards a behavior is positive or negative, if the individual believes that the outcome of a behavior is positive or negative respectively. In this model SN denotes the social pressure in decision making of an individual for performing a particular behavior. It is an individual's perception about what the social group prefers towards performing a behavior and how close the group is related to an individual. Many of the TAM initiate from the TRA model.

TPB:

TPB is originated from TRA.TPB was introduced by (Icek Ajzen, 1991). TRA main focus was to determine actual behavior of people through their intentional behavior, which is influenced by their own attitude and by the society (Icek Ajzen, 1991). Whereas TPB was introduced as an extension of TRA for considering other constraints that affect personal behavior, such as internal or external economic position and experience for using a service / technology (Landry et al., 2006). TPB included another determinant / construct known as PBC (Perceived Behavioral Control). TPB predicts intentional behavior and is considered to be more general as compared to TRA because behavior can be deliberating (i.e. intentional) as well as planned (Chau & Hu, 2002). The intention is determined through three constructs namely attitude towards behavior, SN and PBC (Icek Ajzen, 1991).

TAM:

TAM is established on the TRA (Icek Ajzen & Fishbein, 2005) , as a tool for predicting the possibility that a new technology will be adopted within a group or an organization. Due to this it is feasible to predict future technology trend in terms of use by applying TAM when the technology is introduced. TAM utilizes TRA based theoretical foundation for determining causal linkage between PU and PEOU, as essential beliefs.

In System acceptance related research papers the TAM is widely used model for investigating acceptance of various technologies. Many researchers are still utilizing TAM. Which is the valid prove of fact that this model is a valid tool with a wide scale of acceptance. Questionnaire was conducted based on TAM model.

3.1.2 Questionnaire

A Questionnaire was developed based on prior similar literature (Davis, 1989; FIELD, 2005) that was most challenging and important part of this study was the development of Questionnaire. The Features, Game elements and its functions were observed thoroughly before developing the survey. With the intention of follow a survey approach for data collection, It was needed to be understood that primary source for data extraction consists of human subjects in a specific demographic. For this the prior literatures review about different systems and websites. Their acceptance, survey designs and analysis strategies were keenly observed and studied. After this in the context of GLMS its features, use and capabilities were observed and questionnaire was designed.

The main focus during the development of the questionnaire was to make sure the wording of survey is easy and understandable to the relevant context. The next focus was on the arrangement of different sections on the survey to make it easy for getting the valuable information.

The design of survey requires a planning on the issues such as appearance of the survey and scaled items. A major challenge was to keep the number of questions minimum even though the required information on the critical constructs related to GLMS and its acceptance including technical aspects. About 2 months was spending on designing the survey form. Although it was too much time but we believed it will play a Vitol role in gathering the information phase and required keeping in mind some careful aspects of population preference, GLMS characteristics and features. The questionnaire that was design for the collection of data is given in appendix B. The constructs statement table is given in appendix C that gives an intuition to the questions, which were derived after studying the different questions found in literature that were used in the related contexts.

3.1.2 Target Sample

The questionnaire was very organized to keep the primary questions first in the sequence and then control questions such as gender and name/registration no. The unit of the analysis for the study was individuals. Which was implied to the level of aggregation of data collected .Meaning each response was taken as an individual data source. The survey was conducted on the target audience composed of undergraduate students of BSCS (Bachelors of Science in computer science) (BSCS-

2=30, BSCS-2B=31, BSCS-3A=40, BSCS-3B=38, BSCS-4A=41, BSCS-4B=42, BSCS-4C=40) from the SEECS at NUST, Islamabad Pakistan.

3.1.3 Pilot Testing of survey

The pilot survey was conducted, before the final survey. Total 19 survey forms were distributed and collected from the individuals. These individuals were not included in the students for the final survey. To detect any problems in questionnaire that might be lost during design phase was the main purpose of the pilot survey. Pilot survey included information and fields for students to give comments on the question items, which they find difficult, either inappropriate or ambiguous, and to give any suggestions, which would be essential in the context of this research. Also the number of question and amount of average time taken by students was noted to optimize the structure and wordings of the final survey to meet the task for extracting accurate, relevant and reliable data within a small amount of time. The pilot survey helped in the following ways: reviewing the question sequence, improvement in wording for some items, improvement in the overall layout, gaining familiarity amongst the target population, checking response rate and making a strategy for improving it. The lessons were learnt from pilot the actual survey was finalized and made ready for initiation the data collection movement after the follow-up activities.

3.1.4 Mode of Actual Survey

It is critical to articulate questions that give relevant information that might be useful, easily translated, effectively processed and would be in line to the research.

The final form of the questionnaire comprise of 26 variables to measure the five main factors of the research model; LP (seven variables), PE (five variables), PEOU (three variables), PU (4 variables), and ATU (seven variables).The Questionnaire attached a guide lines describing the purpose of the study. The main focus was on the GLMS users who had used the system, or had a very clear view of the GLMS features, game mechanics and functionality. In the strategic point of view the second thing was involved to conduct a paper based survey by the students in a controlled environment. The 5 point Likert scale was used for recording item response which is considered more relevant for measuring the attitude toward use by the target population in similar research because the five point scale is known as one of the popular scale for evaluating the agreement attitude tool (Bartlett, Kotrlik, & Higgins, 2001). The range of the scale was 1 to 5 with assign numeric values of: 1 for

strongly disagree, 2 for disagree, 3 for neutral, 4 for agree, and 5 for strongly agree. For the motivation the attendance was compulsory by the instructor.

3.1.5 Distribution & Sampling of Actual Survey

The total numbers of survey distributed were and collected were 204. Four were rejected because of incompleteness. Such survey was not the part of the study any analysis.

3.1.6 Response Rate of Actual Survey

The total numbers of valid surveys, which are considered complete, were included in the analysis and they totaled up to 200 surveys. The response rate was 95% because 204 surveys were distributed and we were able to collect each and every survey back successfully. The usable data was about 96% = 200 /204 * 100. The estimated average time to complete the entire survey by an individual was from 10 to 15 minutes. The data entry phase involved labeling each survey with a unique row or observation ID along with information of Gender and Questions numbers that reflected the batch to which the survey belonged for referencing and record keeping.

Chapter 4

RESULTS

4.1 Introduction:

The formation of the hypothesis based on Research model, Analysis of data through different techniques and testing of hypothesis are the main purpose of this chapter. Which are discussed below. The (SPSS) and (AMOS) were used for the analysis of data. In order to overcome the issues regarding incompleteness the data was edited and screened, entries verifications and handling of missing data and normality the .

After the data collection phase the usable sample size that we selected for our data analysis was a complete 200 dataset, which had no missing values.

4.2 Research model:

The development of this research model is built on the major aspects of the models and theories that have earlier been debated. TAM was used in this study where the TAM was extended by incorporating the perceived enjoyment as an extra construct along with perceived ease of use and perceived usefulness and the learning performance as an external variable. This model is well renowned in order to evaluate the acceptance of information technology based systems. According to the TAM, the real use and acceptance of a GLMS is directly determined by the attitude toward use and indirectly by the PU, PEOU and external variables.

These variables are defined in the following sections:

This study model is based on the study of the constructs that affect the usage and acceptance of the web based learning management system using the TAM extension. PE (M. K. O. Lee et al., 2005) and learning performance (Artino, 2009) was incorporated in this model but we discard intention to use, as (Ngai, Poon, & Chan, 2007) pointed out, when checking the validity and reliability of the constructs, that Instructors' determination on using an internet-based learning system had a great influence on the practice of that learning system. Even if a student's attitude towards internet based learning systems were positive, they might have no purpose of using one without their lecturers considered it necessary.

Numerous studies have already verified the existence of extrinsic and intrinsic constructs that

indirectly influence the acceptance of technologies, through PU and PEOU (Davis, 1989).GLMS usage intentions are examined by either the direct or indirect elements together with various factors along with individual features. The model was developed while keeping in view the different constructs and their contextual use within different studies related to E-learning. Game-elements were integrated in the system to engage and motivate the students toward its usage. Therefore, GLMS acceptance analysis might incorporate of different constructs. Analysis of these Factors will help in measuring the overall acceptance through user perceptions and their attitude for using a GLMS.

So, the main objective of the research study is to recognize the factors of students' acceptance of GLMS and to investigate how these factors can form the students' Attitude to use GLMS.

The research study finds to answer the given below questions:

In the research model, three primary attributes were defined as independent variables and supposed that they affect the attitude toward the use of GLMS through PU, PEOU and PE influenced by external variable as in the given below figure.

This model is partially adopted from (Wakefield, Wakefield, Baker, & Wang, 2010).

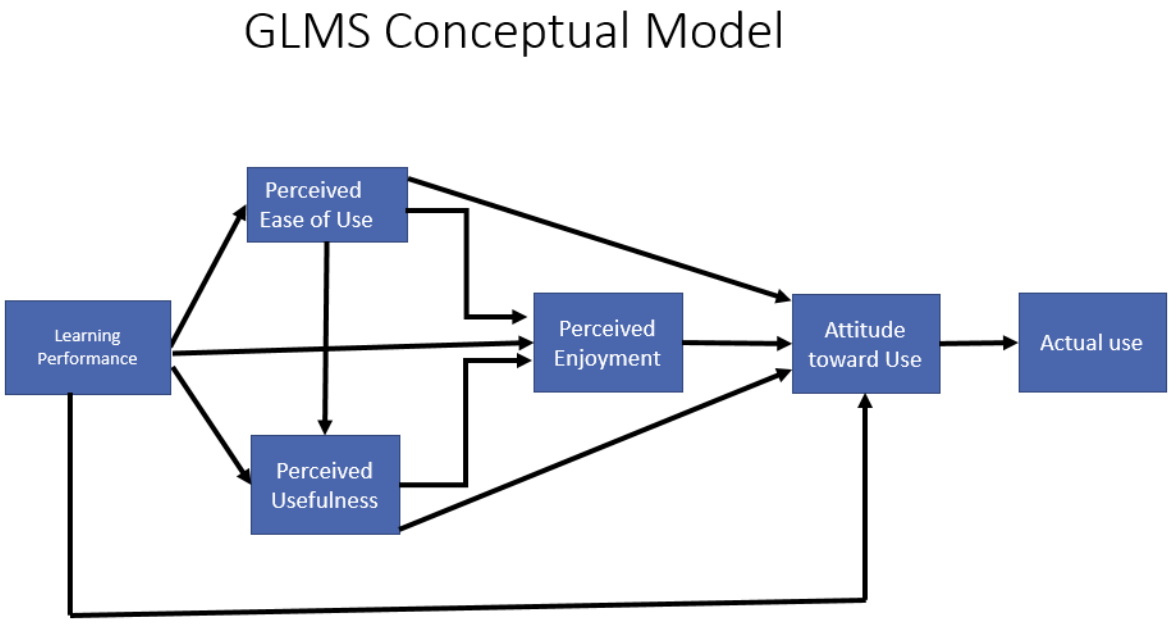


Figure 19: GLMS Conceptual Model

4.3 Model constructs & hypothesis development:

Research Questions:

Hypothesis was developed according to the following the research questions

1. What are the main factors behind the acceptance GLMS?
   1.1 What are the relationships between these determinants?
2. What is the effect of motivational factors on the attitude toward the use of GLMS?
   2.1 What is the effect of perceived enjoyment on student's attitude toward use of GLMS?

1.1.1 Learning (academic) performance

LP is defined as the perception of individual about the effectiveness of online system that it will enhance his/her academic performance (Artino, 2009). In this study the construct perceived academic or learning performance has been taken to analyses the effect of performance outcome on acceptance of system .it has been argued as one of the most important construct for assessing students' performance in prior literature (Johnson, Hornik, & Salas, 2008; J. Lee, 2008; M. K. O. Lee et al., 2005).Though, the educators and student are not connected physically in an e-learning system, Students' involvement or engagement is highly improved in such type of e-learning system has been the main reason (Chou, 2003).

Individuals or students are assumed to learn fine in e-learning environment when they discover new things through self-passed learning (Leidner & Jarvenpaa, 1995).

There are different studies which has be conducted upon the theory of social network which has discussed that with the usage of social network the communication become more effective and authentic as well (Cho, Gay, Davidson, & Ingraffea, 2007).

Learning performance is related to the features of GLMS for example discussion forum and learning material slides uploaded by the instructor.

The measures of perceived academic performance and satisfaction were amended from (J. Lee, 2008) the study conducted by Lee and Lee. The items of perceived learning assistance were developed from (Liaw, 2008) e-learning effectiveness measures. These results indicate that the use of GLMS offers sort of self-pace learning which causes to the increment of learning efficacy.

Thus, we have proposed the hypotheses on basis of learning performance.

H1-a: LP (learning performance) has a positive and significant effect on PEOU of GLMS
H1-b: LP learning performance has a positive and significant effect on PE perceived enjoyment
H1-c: LP learning performance has a positive and significant effect on PU of GLMS
H1-d: LP learning performance has a positive and significant effect on ATU of GLMS
H5: LP learning performance and PEOU has a positive and significant effect on ATU of GLMS
H6: LP learning performance and PE has a positive and significant effect on ATU of GLMS
H7: LP learning performance and PU has a positive significant effect on ATU of GLMS

1.1.2 PE (Perceived enjoyment)

As per TAM, there other few factors which have been included to this model to develop an extended Model of TAM on the biases of prior literature review, one of those are perceived enjoyment (PE) (Koufaris, 2002). The idea of PE is originated on behalf of theory known as flow theory. According to gratifications theory, perceived enjoyment could also be an integral that accomplishes the needs of users such as appealing enjoyment, entertainment or change (McGonigal, 2011).

There are lot of researches on PE (Bruner & Kumar, 2005; Dabholkar, 1996) have found that PE significantly affects intention and attitude toward use of new technology.

Another study on ‘online shopping by (H. Kim, Suh, & Lee, 2013) where they defined PE (Viswanath Venkatesh & Davis, 2000)as the state of emotion which the activity is being performed is considered to be enjoyable in its own way. According to another study (e-payment on line hopping), the results found that PU contributes 20 %, PEOU contributes 15 % and PE contributes 58 % consumers’ intention to use the system so, they predict that the positive and significant relationships between PE with PU and PEOU (V Venkatesh et al., 2003). An Information System (IS) researchers now understand that to know there is a lot of importance to know how enjoyable an IS (information system) is just like usefulness of the system (Blythe, 2003).

Thus, PE could be mediated by PU and PEOU as well as direct relationship on perceived students’ ATU of GLMS.

So, in the context of prior studies we hypotheses that

H3: Perceived Enjoyment has a positive significant effect on ATU of GLMS

1.1.3 Perceived Usefulness (PU):

Perceived usefulness is well-thought-out to be an extrinsic motivation for the users of technology. Perceived Usefulness refers to the extent to which an individual considered that outcome will be better in case of using this technology or system. ". This means if students consider that his or her performance will be increased with the use of this system, they will definitely use this system to increase their learning performance (Veletsianos & Navarrete, 2012).

PU directly affects ATU of system, as hypothesized by the proposed model in literature (Hyosun Stella & Chidambaram, 2000). Perceived usefulness strongly defines attitude toward use in Technology Acceptance Model (Flatla et al., 2011; V Venkatesh et al., 2003). According to Prior research it has shown that not only in a professional atmosphere but also outside, PU is a critical factor in user acceptance of technology (Pedersen, 2005).

In this context PU is taken as the extent of how well consumer(s) believe that a System can be used in their learning activities (Hovav, Hemmert, & Kim, 2011). It is the user belief that a Gamification enables an increase of efficiency, productivity and expediency of use (Hovav et al., 2011).

Therefore in the context of prior studies we conceptualize following hypothesis for PU:

H4-a: Perceived usefulness (PU) has a positive and significant effect ATU of GLMS

H4-b: PU has a positive and significant effect on PE of GLMS

1.1.4 Perceived Ease of Use (PEOU):

PEOU is the user's perception about particular system or technology to which a user believes that using a particular system or technology will be almost effortless (Alrafi, 2008).

Within the current study, PEOU is a student's perception about the extent of effort needed to learn through GLMS. TAM has suggested that users have a positive and significant effect on their attitude when they consider a system as an effort less (J. S. Lee, Cho, Gay, Davidson, & Ingraffea, 2003). PEOU is known as another important external factor that may affect user intention of technology adoption (Viswanath Venkatesh & Davis, 2000). If a system is perceived as used easily

then individuals will perceive a greater intention to use that system. PEOU doings as a direct factor towards usage intention, which has been studied in literature (K. K. Wong, 2013), and they have also confirmed the result on usage intention. (Magid Igbaria, Parasuraman, & Baroudi, 1996) assumed and confirmed the effect of PEOU. (Wei, Marthandan, Chong, Ooi, & Arumugam, 2009) suggested that whatever the observation in terms of technology usefulness is, the fact that how easy it is to use that technology in practical terms may still make an affect towards user initial intention to accept or continue the system. It has been concluded by many researchers that PEOU is an important anticipator in predicting user trend towards e-learning acceptance (Snowden, Spafford, Michaelides, & Hopkins, 2013).

Relating this concept towards GLMS adoption, PEOU is the extent that users may easily use GLMS and navigate through it without much effort.

In the context of prior studies we hypotheses that:

H2-a: PEOU has a positive and significant effect on ATU of GLMS

H2-b: PEOU has a positive and significant effect on PE of GLMS

H2-c: PEOU has a positive and significant effect on PU of GLMS

1.1.5 Attitude toward Use

ATU refers to the attitude that user or individual accept or reject the system (Icek Ajzen & Fishbein, 2005). If instructor believes that particular technology insufficient to fulfill their own needs and their student's needs', they will be facing difficulty while using that system (Yildirim, 2000). Thus, for the sake of successful e-learning experience, there should be a positive attitude of the users to word this technology (Trautmann, 2009).

1.2 Data Analysis

1.2.1 Demographic statistics:

In this section data extracted with respect to our demographics in context of GLMS acceptance study will be discussed. The demographic data associated to respondents for discussion consists of Gender male and female of respondents there were total 167 males and 33 were females. The information was taking out by performing frequency analysis using SPSS 21, on the data take out from the questionnaire's personal details sections, which were given on the top of the survey. The response to these personal details questions was intended and the results are reported for those who

were eagerly shared the data. The responses are completely unidentified, therefore identities of the respondents are secreted and the confidentiality is maintained.

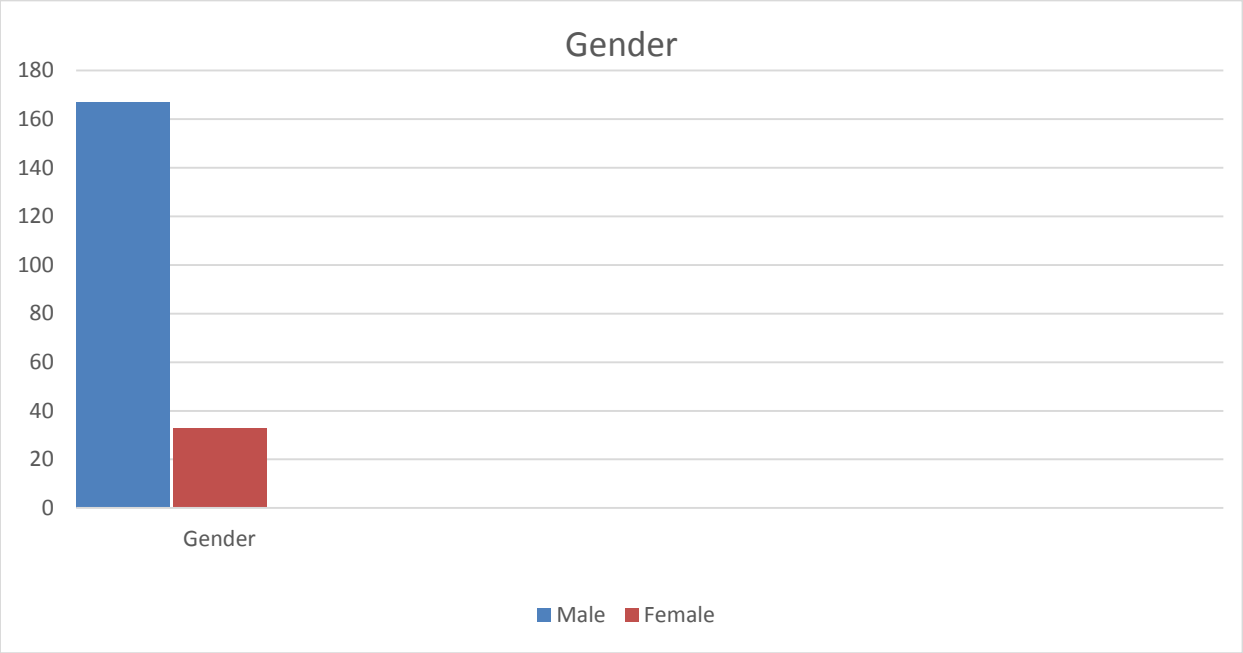


Figure 20: Gender

1.2.2 Descriptive Statistics:

Mean ratings of the measurement items were calculated by applying frequency analysis on the original dataset using IBM SPSS 21. The mean rating is actually the mean value for all the responses captured for a particular question in a survey that is under consideration for measurement, based on some defined scale. In the GLMS research, we adopted a 5 Likert-Scale questionnaire items for recording individual response to different questions from each participant. The average value for a 5 Likert-Scale is equal to 3, which represent a neutral response to a question. Over here 3 is the center value for the Likert Scale of 5 and also the average value for assessment derived by taking the average. Specifically, by taking a sum from 1 to 5 integers which represent various response categories and then dividing the sum by 5 (therefore we get the center or average value of 3). The mean rating values that are tending towards the higher limit 5 and greater than 3 reflect population response agreeing to a particular measurement question. The following table shows the Mean Ratings for different measurement items of the survey from a total

of 200 individuals. Table lists the item, the number of responses received, the mean value and their respective standard deviation, skewness and kurtoses.

Constructs	N	Mean	Std. Deviation	Skewness	Kurtosis
	Statistic	Statistic	Statistic	Statistic	Statistic
LP	200	3.0129	.45811	.039	.136
PE	200	3.3100	.47394	-.155	.771
PU	200	3.2475	.48662	-.448	1.511
PEOU	200	3.0483	.51704	.172	-.146
ATU	200	3.2879	.44107	-.277	.230
Valid N (list wise)	200				

Table 1: Descriptive Statistics

In this study, we adopted a 5 Likert-Scale questionnaire items for recording individual response to diverse questions from each contributor where 1 is for strongly disagree and 5 is for strongly agree. Table 1 shows that perceived enjoyment has highest sum score (662=mean score × no of respondents) and Learning improvement have least sum (602).Perceived enjoyment having also highest mean value(x=3.31) while Learning improvement have also lowest mean (x=3.0129). Analysis also tells that there is not any construct which has standard deviation more than '1', its mean there is not any large dispersion (Meyer, Eskandari, Grallath, & Rentsch, 2006).

After this we will identify the relationship or linear association between dependent and independent constructs. Hence, the correlation coefficient is analyzed to measure the linear association between the dependent and independent constructs. The values of the correlations coefficient are always between -1 and +1 where 1- indicate that two variables are related in a positive sense and -1 indicate that two variables are related in a – sense and correlation coefficient 0 indicates that there is no relationship between two variables.

1.2.3 Correlation Analysis of Variables:

Correlations Analysis of variables was calculated for the sake of identification of correlations between the five variables like PU, PEOU, LP, PE, and ATU. This also covers the relationship between dependent and independent variables. All variables were correlated of the basis of given results.

Constructs	PU	LP	PE	PEOU	ATU
PU	1				
	200				
LP	.478**	1			
	.000				
	200	200			
PE	.420**	.453**	1		
	.000	.000			
	200	200	200		
PEOU	.648**	.517**	.394**	1	
	.000	.000	.000		
	200	200	200	200	
ATU	.651**	.545**	.568**	.572**	1
	.000	.000	.000	.000	
	200	200	200	200	200

**. Its mean there is a significant correlation at the 0.01 level (2-tailed).

Table 2: Correlations

The multiple items for a construct was computed to get average score, By multiple items the single construct in the questionnaire was measured, that average score was used for further analysis including correlation and regression analysis for the testing of hypothesis (Wang & Benbasat, 2007). As cited in (C. C. Wong & Hiew, 2005) the correlation coefficient (CC) value (*r*) is considered to be weak if the range is 0.10 to 0.29 and from 0.30 to 0.49 will be considered medium and from 0.50 to 1.0 will be considered as a strong. Though according to (FIELD, 2005), CC should not be greater than 0.8 to avoid multi co-linearity (MC) (it is the state of very high inter-association between the independent constructs. It is consequently a type of trouble in the data,).

However as a resultant the highest correlation coefficient is 0.524and it is less than 0.8, so, there is not any problem of multi co-linearity problem in this study.
(Table2).

1.2.4 Reliability Analysis:

The reliability of scale shows that the research study is free from any random error Cronbach's coefficient alpha; (α) was used to make sure the internal reliability. The average correlation amongst all of the items was calculated through statistical techniques. It will be considered greater reliability when the range will from 0 to 1.

Variables	Cronbach's Alpha(CA)
PU	.578
PEOU	.694
PE	.685
LP	.730
ATU	.680

Table 3: Reliability Analysis

All variables(PU,PEOU,PE,LP,ATU)	.845

Table 3 shows the result of analysis of the CA scale for PU, PEOU, PE, LP and ATU, where its values of CA are more than 0.5 and are considered to be good (Hair, Black, Babin, & Anderson, 1998).
If we see the overall reliability of the survey again all variables that are .845 which is consider as a greater reliability. This shows that the survey questionnaire is a valid and reliable tool to measure all constructs consistently, Furthermore; all of the measure had been used in prior research studies.

1.2.5 Validity Analysis

To check the validity of the constructs or variable we made an exploratory analysis. The validity of a factor is defined as the extent to which a construct differs from other set of constructs. To access the validity as recommended in previous literatures the principle components with the Kaiser varimax (KV) rotation can be used (Heijden, 2004; Kaiser, 1970). We had extract 5 components (ATU, LP, PE, PU and PEOU)

4.4.5.1 EFA (Exploratory Factor Analysis)

The measurement scale was used to verify the questionnaire related to what was primarily anticipated in the theoretical model. We can say that the CFA is the prerequisite of EFA. As per recommendation in the prior literature the principal components factor analysis (FA) was applied along with Vari max Rotation (Bartlett et al., 2001)

Rotated Component Matrix(RCM) [a]					
Items	**Component**				
	1	**2**	**3**	**4**	**5**
PU1			.497		
PU2			.767		
PU3			.933		
PU4			.933		
LP1	.909				
LP2	.845				
LP3	.863				
LP4	.800				
LP5	.909				
LP6	.843				
LP7	.776				
PE1					.597
PE2					.630
PE3					.558
PE4					.660
PE5					.657
PEOU1				.823	
PEOU2				.750	
PEOU3				.861	
ATU1		.902			
ATU2		.920			
ATU3		.920			
ATU4		.698			
ATU5		.895			
ATU6		.895			
ATU7		.625			

Table 4 EFA Rotated Component Matrix (RCM)

This preliminary analysis suggested extracting five factors related to the originally proposed variables. Here the every item is loading in its related latent variable with more than 49 percent explanation and correlation. Its mean the data collection tool is valid and reliable.

1.2.6 Structural Equation Modeling (SEM):

SEM goes to the second generation of multivariate data analysis technique that is almost used in marketing based research (Kline, 2005; K. K. Wong, 2013). The use of detected measurement items to represent a number of Latent constructs or factors was the basic and main method which was involved regarding this. Whenever hidden variables or factors cannot be estimated straight they are usually inferred from measured variables and the relationships which was associated. Basically the SEM is an extension of multiple linear regression analysis which consists of multiple equations that's why simultaneous calculations are made. There are main five key stages having SEM namely, Model Estimation (ME), Model Specification (MS), Model Testing (MT), Model Identification (MI), and the last on is Model Modification (MM). Specification is for causal modeling of measurement as well as for structural model. For the purpose of identification there was a consideration of over-identified models. The stage for using a particular method for performing analysis is known as estimation, it may have different assumptions. Testing was done to analyze the model along with the data which was the main intention to extract the results. Modification was the final stage whose aim was to restructure the model to achieving the overall success for achieving standardized acceptance levels.

The SEM modeling process consists of two major phases which are called (1) The Validation of MM measurement model using CFA and (2) The Model fitness testing of the structural model using path analysis.

In this research we will work with 1st Phase of SEM which is the Validation of measurement model using CFA.

1.2.6.1 CFA (Confirmatory Factor Analysis)

This part of the chapter considered as an important part which contains the information about the measurement model, factors loading and their representations through diagrams. The information 'about scales having multiple variables to measure the factors' is also part of this chapter.

The detail process is followed through modification in measurement model.

The investigation of all constructs was done in order to ensure their uni-dimensionality. Different measurement model was used to represent each factor or construct as shown in figure. The main objective of the measurement model was to obtain best model fitness. It is evident that every single headed arrow have linked the construct (latent variable) with indicators. The error terms are also part of their indicators which are also linked with headed arrows, though they have not theoretical relationship with indicators. Correlation was shown through double headed arrow. Factor loadings are also displayed with the items. The values appearing on indicators and it are depicting squared values of multiple correlations; the correlations among factors are shown by the values on the double headed arrows. While talking about CFA, (Kline, 2005) Proposed that a model should have two main consideration (should be high factor loading for the indicators and low correlations among constructs) in order to obtain goodness of fit in model. The minimum value for factor load is suggested as .50 and any loading below the threshold is not acceptable and will cause to drop that indicator from the measurement mode l (Hair, Black, Babin, & Anderson, 2006). (Kline, 2005) also recommended that the correlation among factors should be below .85.In case of exceeding the limit of value, it shows that these are not identifiable rather single construct. There is so much importance and consideration about these two baselines which are applied in this study as well as model fitness indices.

Following sections of the chapter cover the CFA Measurement Model for different seven constructs.

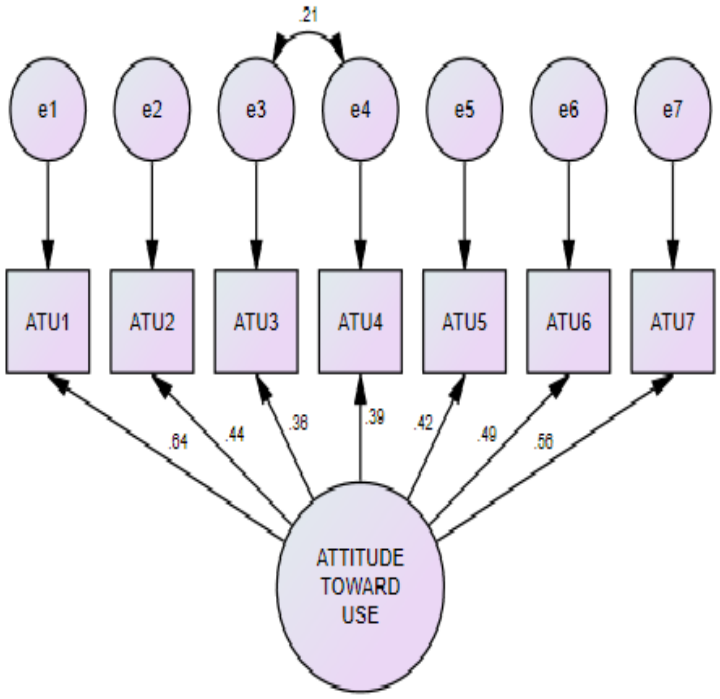
1.2.6.2 ATU (Attitude toward use) of GLMS:

Attitude toward of GLMS were measured by seven items which are shown in below table.

Items	coding
I believe that badges/levels motivated me to improve quality of tasks (Assignment and Quizzes).	ATU1
I believe that leader board motivated me to improve quality of tasks (Assignment and Quizzes).	ATU2
I believe that game elements motivated me to improve my learning.	ATU3
I often become confused when I use GLMS	ATU4
The reward base GLMS made me happy.	ATU5
I was much excited to use GLMS	ATU6
I felt very confident using the GLMS	ATU7

Table 5: Scale description for Attitude toward use of GLMS

These seven variables are pot rating those factors was analyzed using CFA which is valid and recommended technique. The goodness of fit indices were considered to be acceptable because (CMIN=1.707, GFI=.967, AGFI=.928, CFI=.924, TLI=.906, RMSEA=.060, PCLOSE=.317) see in below figure (Hair et al., 1998). A thoughtful look at the constructs loadings also shows that the values of constructs are above the threshold value and all the items are at acceptable limit (Hair et al., 1998).The correlation is also in between the acceptable limit, therefore the measure have a discriminate validity and factors exist discretely (Kline, 2005).



Model fitness Indices for ATU:

CMIN= 1.707 **TLI=.906**

GFI.967 **CFI.942**

AGFI= .928 **RMSEA.060**

PCLOSE= .317

Figure 21: CFA Measurement Model for Learning Performance

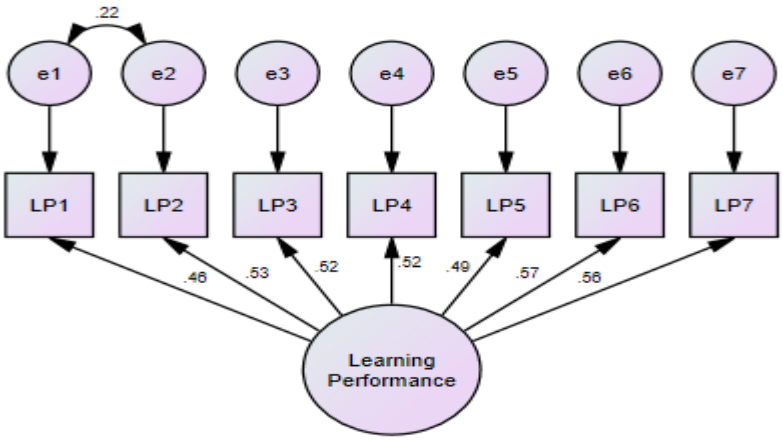
1.2.6.3 LP (Learning Performance):

LP was measured by seven items which are shown in below table.

Items	coding
By Using GLMS my Quality of tasks (Assignments, Quizzes) has improved.	LP1
Using GLMS my course performance has improved	LP2
The feature "Understanding of Lectures Slide" enabled me to understand the lectures.	LP3
The GLMS encouraged me to be more engaged with my course activities.	LP4
The personalized, constructive written feedback encouraged me to increase my engagement in discussion forum with peers and instructor.	LP5
It would make more sense if my performance is shared with my peer.	LP6
It makes sense that my performance is not shared with my peers.	LP7

Table 6: Scale description for Learning Performance

These seven variables are pot rating those factors was analyzed using CFA which is valid and recommended technique. The goodness of fit indices were considered to be acceptable because (CMIN= 1.131, TLI=.981, GFI=.989, CFI=.990, AGFI=.968, RMSEA=.026, PCLOSE=.598) see in below figure. A thoughtful look at the constructs loadings also shows that the values of constructs are above the threshold value and all the items are at acceptable limit (Hair et al., 1998).The correlation is also in between the acceptable limit, therefore the measure have a discriminate validity and factors exist discretely (Kline, 2005)



Model fitness Indices for LP:

CMIN= 1.131 **TLI=.981**

GFI=.989 **CFI=.990**

AGFI=.968 **RMSEA=.026**

PCLOSE=.598

Figure 22: CFA Measurement Model for Learning Performance

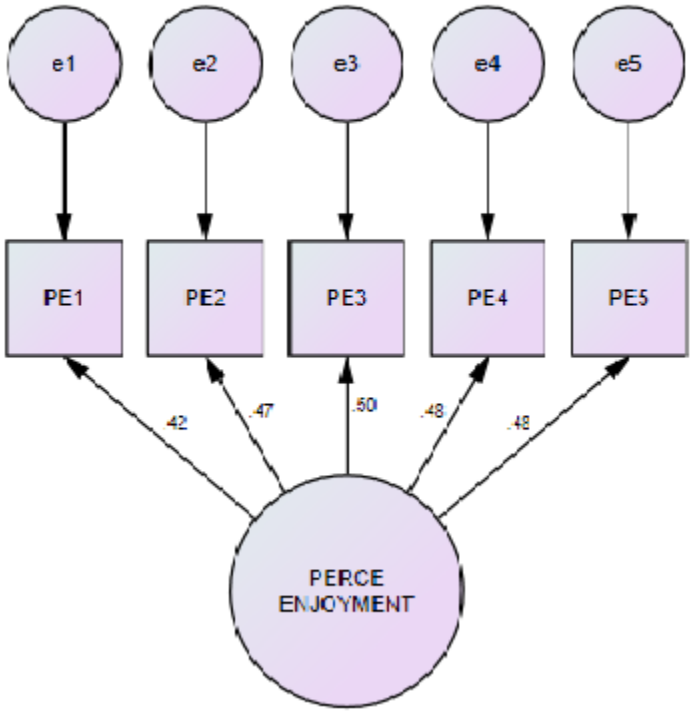
1.2.6.4 PE (Perceived Enjoyment):

PE was measured by five items which are shown in below table.

Items	coding
I enjoyed learning by using this GLMS.	PE1
Using GLMS was a pleasant experience	PE2
Using the GLMS was unpleasant/ pleasant.	PE3
I enjoyed spending my time in exploring GLMS.	PE4
I enjoyed myself when I was using the features of GLMS.	PE5

Table 7: Scale description for Perceived enjoyment

These five variables are pot rating those factors was analyzed using CFA which is valid and recommended technique. The goodness of fit indices were considered to be acceptable because (CMIN= 1.131, TLI= .901, GFI= .989, CFI= .990, AGFI= .968, RMSEA= .026, PCLOSE= .589) see in below figure. A thoughtful look at the constructs loadings also shows that the values of constructs are above the threshold value and all the items are at acceptable limit (Hair et al., 1998).The correlation is also in between the acceptable limit, therefore the measure have a discriminate validity and factors exist discretely (Kline, 2005).



Model fitness Indices for PE:

CMIN= 1.131 **TLI= .901**

GFI= .989 **CFI= .990**

AGFI= .968 **RMSEA= .0**

PCLOSE= .589

Figure 23: CFA Measurement Model for Perceived Enjoyment

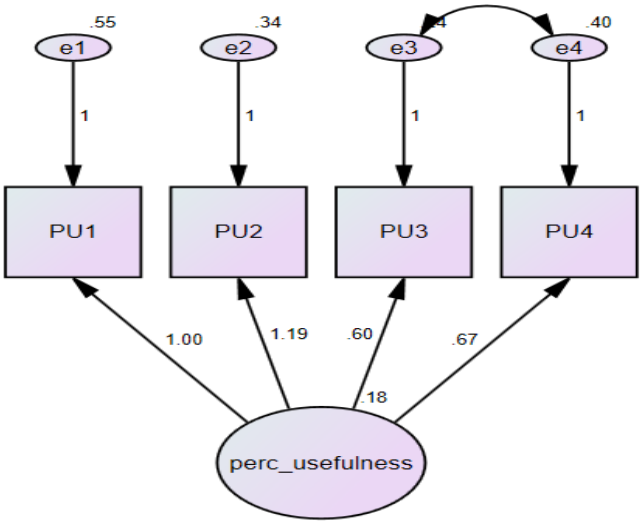
1.2.6.5 PU (Perceived Usefulness):

PU was measured by four items which are shown in below table.

Items	coding
The GLMS encouraged me to be more engaged with it and increased my activities to outperform my classmates.	PU1
The discussion forum helped me to discuss course related queries with classmates and instructor anytime anywhere.	PU2
Leader board helped me to be aware of my performance and online activities in GLMS comparison with those of my classmates.	PU3
I found GLMS as a helpful educational tool for improving learning experience.	PU4

Table 8: Scale description for Perceived Usefulness

These four variables are pot rating those factors was analyzed using CFA which is valid and recommended technique. The goodness of fit indices were considered to be acceptable because (CMIN= 1.707, TLI=.841, GFI=.826, CFI=.860, AGFI=.817, RMSEA=.040, PCLOSE=.457) see in below figure. A thoughtful look at the constructs loadings also shows that the values of constructs are above the threshold value and all the items are at acceptable limit (Hair et al., 1998).The correlation is also in between the acceptable limit, therefore the measure have a discriminate validity and factors exist discretely (Kline, 2005).



Model fitness Indices for PU:

CMIN= .400 **TLI= 1.057**

GFI= .999 **CFI= 1.00**

AGFI= .100 **RMSEA= .000**

PCLOSE= .620

Figure 24: Measurement Model for Perceived Usefulness

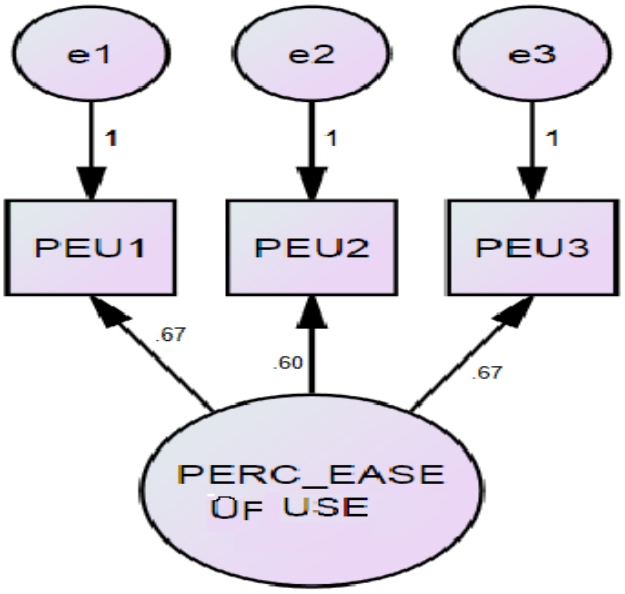
1.2.6.6 PEOU (Perceived Ease of Use)*:*

PEOU were measured by three items which are shown in below table.

Items	coding
I studied the Lectures as early as it was uploaded through the feature "Understanding of Lecture Slides.	PEOU1
Overall, I find GLMS easy to use	PEOU2
My interaction with the system was clear and understandable.	PEOU3

Table 9: Scale description for Perceived ease of use

These three variables are pot rating those factors was analyzed using CFA which is valid and recommended technique. The goodness of fit indices were considered to be acceptable because (GFI=, AGFI=, CFI, TLI, RMSEA=, PCLOSE=) see in below figure. A thoughtful look at the constructs loadings also shows that the values of constructs are above the threshold value and all the items are at acceptable limit (Hair et al., 1998).The correlation is also in between the acceptable limit, therefore the measure have a discriminate validity and factors exist discretely (Kline, 2005).



Model fitness Indices for PEOU:

CMIN= 1.707 **TLI=.841**

GFI=.826 **CFI=.860**

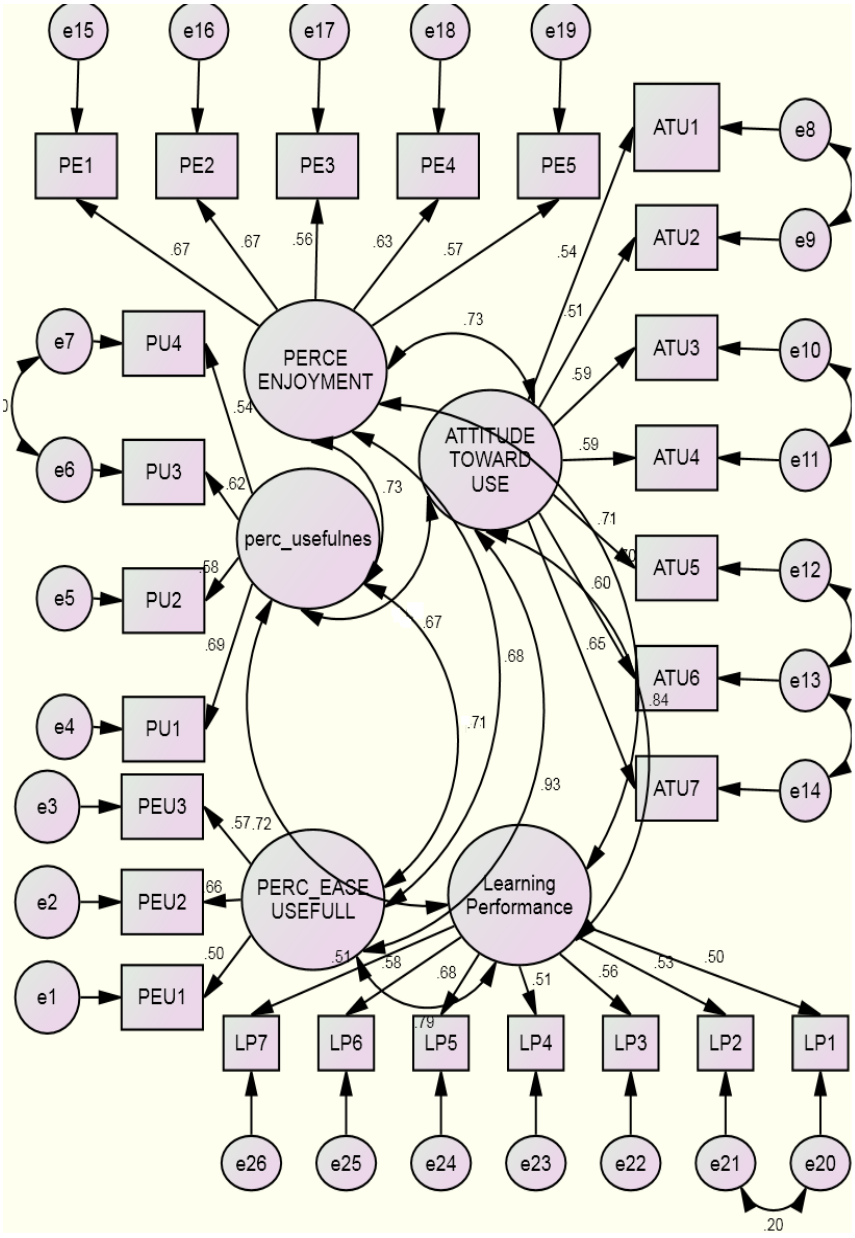
AGFI=.817 **RMSEA=.040**

PCLOSE=.457

Figure 25: Measurement Model for Perceived Ease of us

1.2.6.7 Measurement Model for GLMS:

In this Model bi-variant Pearson correlation coefficient was computed to explore the linearity between the observed variable. The all correlation values of items were significant and their ranges were from .50 to .70 which is considered high in range (Hair et al., 2006), this is indicating that the factors are highly interrelated and the linearity theory is proved between latent and main factors.



Model fitness Indices for GLMS:

CMIN= 1.707	**TLI=.851**
GFI=.868	**CFI=.970**
AGFI=.837	**RMSEA=. 050**
PCLOSE=. 497	

Figure 26: Hypothesized Five factor CFA Measurement Model for Students Attitude toward

All the loadings of each variable are justifiable to its best range from .50 to .70 (Byrne, 2010). The un-standardized Indicators found that all 27 items were significant correlated and supporting the relationship between all latent variables. So, we can say that the Model fit is accessed through these indications. Model fit is assessed. All indices have proved to be fit as per recommendations: (CMIN= 1.707, TLI=.851, GFI=.868, 837, CFI=.970, AGFI=.837, RMSEA=.050, PCLOSE=.497). Therefore, the CFA results have provided the strong support to the reliability and originality of the Model on the basis of certain measurements.

Items	Standard Factor Loadings					
	PU	PEOU	LP	PE	ATU	AVE
PU1 The GLMS encouraged me to be more engaged with it and increased my activities to outperform my classmates.	.69	0	0	0	0	.6075
PU2 The discussion forum helped me to discuss course related queries with classmates and instructor anytime anywhere.	.58	0	0	0	0	
PU3 Leader board helped me to be aware of my performance and online activities in GLMS comparison with those of my classmates.	.62	0	0	0	0	
PU4 I found GLMS as a helpful educational tool for improving learning experience.	.54	0	0	0	0	
PEOU1 I studied the Lectures as early as it was uploaded through the feature "Understanding of Lecture Slides.		.50	0	0	0	.5766
PEOU2 Overall, I find GLMS easy to use		.66	0	0	0	
PEOU3 My interaction with the system was clear and understandable.		.57	0	0	0	
LP1 By Using GLMS my Quality of tasks (Assignments, Quizzes) has improved.	0	0	.50	0	0	.5528
LP2 Using GLMS my course performance has improved	0	0	.53	0	0	
LP3 The feature "Understanding of Lectures Slide" enabled me to understand the lectures.	0	0	.56	0	0	

LP4 The GLMS encouraged me to be more engaged with my course activities.	0	0	.51	0	0	
LP5 The personalized, constructive written feedback encouraged me to increase my engagement in discussion forum with peers and instructor.	0	0	.68	0	0	
LP6 It would make more sense if my performance is shared with my peer.	0	0	.58	0	0	
LP7 It make sense that my performance is not shared with my peers.	0	0	.51	0	0	
PE1 I enjoyed learning by using this GLMS.	0	0	0	.67	0	.62
PE2 Using GLMS was a pleasant experience	0	0	0	.67	0	
PE3 Using the GLMS was unpleasant/ pleasant.	0	0	0	.56	0	
PE4 I enjoyed to spend my time in exploring GLMS.	0	0	0	.63	0	
PE5 I enjoyed myself when I was using the features of GLMS.	0	0	0	.57	0	
ATU1 I believe that badges/levels motivated me to improve quality of tasks (Assignment and Quizzes).	0	0	0	0	.54	.6285
ATU2 I believe that leader board motivated me to improve quality of tasks (Assignment and Quizzes).	0	0	0	0	.51	
ATU3 I believe that game elements motivated me to improve my learning.	0	0	0	0	.59	
ATU4 I often become confused when I use GLMS	0	0	0	0	.59	
ATU5 The reward base GLMS made me happy.	0	0	0	0	.71	
ATU6 I was much excited to use GLMS	0	0	0	0	.60	
ATU7 I felt very confident using the GLMS	0	0	0	0	.86	

Table 10: Loadings of Confirmatory Factor analysis n=200

From the Table 3, we noted that every indicator fulfilled the acceptance measure of Item Loadings, such as Perceived usefulness (.69, .58, .62, .54), Perceived ease of use (.50, .66, .57), Learning Performance (.50, .53, .56, .51, .68, .58, .51), Perceived Enjoyment (.67, .67, .56, .63, .57), Attitude toward use (.54, .51, .59, .59, .71, .60, .86), Here all having no less than half values (underlined) higher than 0.4

The Study model finally fulfills the criteria or standard for variable reliability.

This model finally conforms to the acceptance standard for both (1) Internal Consistency reliability and (2) Indicator reliability. Hence, the Gamified Learning Management System research model is concluded to be dependable or reliable.

1.2.7 Testing of Hypothesis:

Hypotheses were tested through regression technique.

1. LP versus PEOU:

H1-a: LP has a positive and significant effect on PEOU

In order to test this (H1-a) hypothesis the regression analysis was performed, i.e. LP influences PEOU**.** For this purpose, (LP) is considered as an independent variable and (PEOU) as dependent variable.

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Learning Performance	Perceived Ease of Use	.117	.263	.195

As per above table the Bata=.117, Adjusted R square is .263 and P=.195 which shows that LP has a no significant effect on PEOU.

2. LP versus PE:

H1-b: LP has a positive and significant effect on PE

In order to test this (H1-b) hypothesis the regression analysis was performed, i.e. LP influences PE**.** For this purpose, (LP) is considered as an independent variable and (PE) as dependent variable.

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Learning Performance	Perceived Enjoyment	.453	.201	.0000

As per above table the Bata=.453, Adjusted R square = .201 and P=.000 which shows that LP has a positive and significant effect on PE.

3. LP versus PU:

H1-c: LP has a positive and significant positive effect on PU

In order to test this (H1-c) hypothesis the regression analysis was performed, i.e. LP influences PU**.** For this purpose, (LP) is considered as an independent variable and PU as dependent variable.

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Learning Performance	Perceived Usefulness	.478	.224	.0000

As per above table the Bata=.478, Adjusted R square =.224 and P=.000 which shows that LP has a positive and significant effect on PU.

4. LP versus ATU:

H1-d: LP has a positive and significant effect on ATU

In order to test this (H1-d) hypothesis the regression analysis was performed, i.e. LP influences ATU**.** For this purpose, (LP) is considered as an independent variable and (ATU) as dependent variable.

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Learning Performance	Attitude toward use	.545	.294	.000

As per above table the Bata=.545, Adjusted R square = .294 and P=.000 which shows that LP has a positive and significant effect on ATU.

5. PEOU versus ATU:

H2-a: PEOU has a positive and significant effect on ATU

In order to test this (H2-a) hypothesis the regression analysis was performed, i.e. PEOU influences ATU**.** For this purpose, (PEOU) is considered as an independent variable and (ATU) as dependent variable.

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Perceived Ease of Use	Attitude toward use	.572	.324	.000

As per above table the Bata=.572, Adjusted R square = .324 and P=.000 which shows that PEOU has a positive significant effect on ATU.

6. PEOU versus PE:

H2-b: PEOU has a positive and significant effect on PE

In order to test this (H2-b) hypothesis the regression analysis was performed, i.e. PEOU influences PE**.** For this purpose, (PEOU) is considered as an independent variable and (PE) as dependent variable.

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Perceived Ease of Use	Perceived Enjoyment	.394	.151	.000

As per above table the Bata=.394, Adjusted R square = .151 and P=.000 which shows that PEOU has a positive significant effect on PE.

7. PEOU versus PU:

H2-c: PEOU has a positive and significant effect on PU

In order to test this (H2-c) hypothesis the regression analysis was performed, i.e. PEOU influences PU**.** For this purpose, (PEOU) is considered as an independent variable and (PU) as dependent variable.

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Perceived Ease of Use	Perceived Usefulness	.648	.417	.000

As per above table the Bata=.417, Adjusted R square = .648 and P=.000 which shows that PEOU has a positive significant effect on PU.

8. PE versus ATU:

H3: PE has a positive and significant effect on ATU

In order to test this (H3) hypothesis the regression analysis was performed, i.e. PE influences ATU**.** For this purpose, (PE) is considered as an independent variable and ATU as dependent variable.

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Perceived Enjoyment	Attitude toward use	.568	.319	.000

As per above table the Bata=.568, Adjusted R square = .319 and P=.000 which shows that PE has a positive significant effect on ATU.

9. PU versus ATU:

H4-a: PU has a positive and significant effect on ATU

In order to test this (H4-a) hypothesis the regression analysis was performed, i.e. PU influences ATU**.** For this purpose, (PU) is considered as an independent variable and (ATU) as dependent variable.

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Perceived Usefulness	Attitude toward use	.651	.421	.000

As per above table the Bata=.651, Adjusted R square = .421 and P=.000 which shows that PU has a positive significant effect on ATU.

10. PU versus PE:

H4-b: PU has a positive and significant effect on PE

In order to test this (H4-b) hypothesis the regression analysis was performed, i.e. PU influences PE**.** For this purpose, (PU) is considered as an independent variable and (PE) as dependent variable.

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Perceived Usefulness	Perceived Enjoyment	.420	.172	.000

As per above table the Bata=.420, Adjusted R square = .172 and P=.000 which shows that PU has a positive significant effect on PE.

5.7.1.1.1 Analysis of Mediation using Causal Step Approach

Barron & Kenny (Byrne, 2010) regression steps are integrated to check the mediation between independent and dependent variables in order to get results.

11. LP and PEOU versus ATU:

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Learning Performance	Attitude toward use	.545	.294	.000
Learning Performance	Perceived Ease of Use	.117	.263	.195
Learning Performance Perceived Ease of use	Attitude toward Use	.117 .396	.071	.183 .130

Table 11: Results of the Mediated Regression Approach for ATU (LP – PEOU)

LP significantly predicts ATU as p=0.000 and p<0.01 in this causal step method of mediation. In the 2nd equation LP does not significantly predicts Perceived Ease of use as p=0.195 and p is greater than 0.01. In 3rd equation Perceived ease of use also insignificant predict ATU when controlling LP as p=0.140 and p greater than 0.01 and the total size of regression co-efficient between LP and ATU has increased (the simple regression co-efficient=.545, the multiple regression co-efficient=-0.117) when Perceived ease of use is used as predictor along with LP. After all this it may be concluded that Perceived ease of use does not mediate the association between LP and ATU. Consequently our hypothesis $\mathbf{H_{5\ is}}$ rejected.

12. LP and PE versus ATU:

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Learning Performance	Attitude toward use	.545	.294	.000
Learning Performance	Perceived Enjoyment	.453	.201	.000
Learning Performance Perceived Enjoyment	Attitude toward Use	.403 .363	.421	.000 .0000

Table 12: Results of the Mediated Regression Approach for ATU (LP – PE)

LP significantly predicts ATU of GLMS as p=0.000 and p<0.01 in this causal step method of mediation. In the 2nd equation LP also significantly predicts Perceived Enjoyment as p=0.000 and p<0.01. In 3rd equation Perceived enjoyment significantly predicts Attitude toward use of GLMS when controlling LP as p=0.000 and p<0.01 and also the total size of regression co-efficient between Learning Performance and Attitude toward use of GLMS has (simple regression co-efficient=0.545, multiple regression co-efficient=0.403) when Perceived enjoyment is used as predictor of ATU of GLMS along with Learning Performance. From all this it may be concluded that Perceived enjoyment mediates the relationship between LP and Attitude toward use of GLMS. Therefore our hypothesis **H_6** is accepted at 1% level of significance. Moreover, it may be noted that it's a case of partial or limited mediation as the effect of LP on ATU is not zero (the regression co-efficient=0.403) when Perceived enjoyment is controlled in the third equation of Table 12.

13. LP and PU versus ATU:

Independent Variable	Dependent Variables	Beta Value	Adjusted R Square	P Value
Learning Performance	Attitude toward use	.545	.294	.000
Learning Performance	Perceived Usefulness	.478	.224	.000
Learning Performance Perceived Usefulness	Attitude toward Use	.304 .506	.495	.000 .000

Table 13: Results of the Mediated Regression Approach for ATU (LP – PU)

LP significantly predicts ATU of GLMS as p=0.000 and p<0.01 in this causal step method of mediation. In the 2nd equation Learning Performance also significantly predicts Perceived Usefulness as p=0.000 and p<0.01. In 3rd equation Usefulness significantly predicts ATU of GLMS when controlling Learning performance as p=0.000 and p<0.01 and also the total size of regression co-efficient between Learning Performance and ATU of GLMS has (simple regression co-efficient=0.545, multiple regression co-efficient=0.304) when PU is used as predictor of Attitude toward use of GLMS along with Learning Performance. From all this it may be concluded that PU mediates the relationship between Learning Performance and ATU of GLMS. Therefore our hypothesis **H_7** is accepted at 1% level of significance. Moreover, it may be noted that it's a case of partial or limited mediation as the effect of Learning Performance on Attitude toward use is not zero (the regression co-efficient=0.304) when PU is controlled in the third equation of Table 13.

Table 14 shows the outcome or result of all hypotheses collectively. This conform the statistical correlation between the hypothetical measures of research Model. Overall, eleven hypothesis were accepted and two were rejected. PEOU and PU were the same as per previous (Shroff, Deneen, & Ng, 2011; Tabachnick & Fidell, 2007)

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S.NO	Hypotheses	Path	Beta values	Adjusted R Square	P-Values	Hypothesis Outcome

1	H1-a	(LP)Learning Performance → (PEOU)Perceived ease of use	.117	.263	.1950	Rejected
2	H1-b	(LP)Learning Performance → (PE)Perceived Enjoyment	.453	.201	.0000	Accepted
3	H1-c	(LP)Learning Performance → (PU)Perceived usefulness	.478	.224	.000	Accepted
4	H1-d	(LP)Learning Performance → (ATU)Attitude toward use	.545	.294	.000	Accepted
5	H2-a	(PEOU)Perceived ease of use → (ATU)Attitude toward use	.572	.324	.000	Accepted
6	H2-b	(PEOU)Perceived ease of use → (PE)Perceived enjoyment	.394	.151	.000	Accepted
7	H2-c	(PEOU)Perceived ease of use → (PU)Perceived usefulness	.648	.151	.000	Accepted
8	H3	(PE)Perceived Enjoyment → (ATU)Attitude toward use	.394	.417	.000	Accepted
9	H4-a	(PU)Perceived usefulness → (ATU)Attitude toward use	.651	.421	.000	Accepted
10	H4-b	(PU)Perceived usefulness → (PE)Perceived Enjoyment	.420	.172	.000	Accepted
11	H5	(LP)Learning performance and (PEOU)Perceived ease of use → (ATU)Attitude toward use	.117 .396	.071	.183 .130	Rejected
12	H6	(LP)Learning performance and perceived enjoyment → (ATU)Attitude toward use	.403 .363	.421	.000 .000	Accepted
13	H7	(LP)Learning Performance and Perceived usefulness→ (ATU)Attitude toward use	.304 .506	.495	.000 .000	Accepted

Table 14: Summary of Hypothesis

As a resultant of regression analysis the eleven out of thirteen hypotheses were accepted. As per previous studies (Shroff et al., 2011; Tabachnick & Fidell, 2007) PEOU has a significant and positive effect on PE and ATU. The Users may have favorable attitude to word GLMS which perceived it as easy to use or useful. (Shroff et al., 2011) reveals that the positive feelings of the users to ward particular system or technology may lead them to associate with the sustainable use of the system. Additionally, (Cho et al., 2007) found that the users having technical knowledge

consider the system useful. Consequently, this suggests that Perceived enjoyment is influenced by PEOU and Perceived Enjoyment. The conclusions of this study also reveal that L.P, PU, PEOU and PE have a significant effect on ATU. This could be happened because of the fact that users are willing to use GLMS, while focusing on its benefits like learning performance and Enjoyment. Additionally, (Davis, 1989) admit the attitude has a vital role in the usability of particular system in predicting the technology easy to use or usefulness. It is probable that users may use technology even if they don't have positive attitude toward it. Users would most possibly engagement in technology if its benefits were openly visible through its simplicity, ease of use or usefulness.

Chapter 5

DISCUSSION

5.1 Learning Performance:

As seen from table 14, for hypothesis (**H1-a**) the calculated (p = 0.1.95) from learning performance to PEOU indicate an insignificant relationship. Adjusted R square = .263 its mean the dependent variable is just 26 percent explain to the independent variable which is not according to the prior literature. Beta value =.117 shows that there is a positive effect of LP on PEOU because .117 is the positive value. Hence there (**H1-a)** is rejected. It's mean that the learning performance has no effect on PEOU. Because students perceived that the performance of their learning has no relation with PEOU.

For hypothesis (**H1-b**) the calculated (p= .000) from LP to Perceived enjoyment indicate the significant relationship. Adjusted R square = .453 its mean the dependent variable is 45 percent explain to the independent variable which is good according to the prior literature. Beta value =.201 shows that there is a positive effect of LP on PE because .201 is the positive value. Hence there (**H1-b)** is accepted. Its mean student perceived that if their learning performance will increase than it will be enjoyable for them. Here learning performance has a positive and significant effect on perceived enjoyment.

For hypothesis (**H1-c**) the calculated (p= .000) from LP to PU indicate the significant relationship. Adjusted R square = .478 its mean the dependent variable is 47 percent explain to the independent variable which is good according to the prior literature. Beta value =.224 shows that there is a positive effect of LP on PE because .224 is the positive value. Hence there (**H1-c)** is accepted. Its mean student perceived that if their learning performance will increase than it will be beneficial for them. Here learning performance has a positive and significant effect on perceived usefulness.

For hypothesis (**H1-d**) the calculated (p= .000) from LP to ATU of GLMS indicate the significant relationship. Adjusted R square = .545 its mean the dependent variable is 54 percent explain to the independent variable which is good according to the prior literature. Beta value =.294 shows that there is a positive effect of LP on PE because .294 is the positive value. Hence there (**H1-d)** is accepted. Its mean student perceived that if their learning performance has a direct, positive and

significant effect on the attitude of the student towards the usage of GLMS. Here learning performance has a positive and significant effect on ATU of GLMS.

Now we will explain the mediation effect of PEOU, perceived enjoyment, and PU between Learning performance and ATU of GLMS. The Barron & Kenny (Byrne, 2010) approach was applied for mediation.

For Hypothesis **H5** Learning Performance significantly predicts ATU as p=0.000 and p<0.01 in this causal step method of mediation. In the 2nd equation Learning performance does not significantly predicts PEOU as p=0.195 and p is greater than 0.01. In 3rd equation PEOU also insignificant predict ATU when controlling Learning Performance as p=0.140 and p greater than 0.01 and the total size of regression co-efficient between Learning performance and ATU has increased (the simple regression co-efficient=.545, the multiple regression co-efficient=-0.117) when PEOU is used as predictor along with Learning Performance. After all this it may be concluded that PEOU does not mediate the association between Learning performance and Attitude toward use. Consequently our hypothesis $\mathbf{H_{5\ is}}$ rejected.

For Hypothesis **H6** Learning Performance significantly predicts ATU of GLMS as p=0.000 and p<0.01 in this causal step method of mediation. In the 2nd equation Learning Performance also significantly predicts Perceived Enjoyment as p=0.000 and p<0.01. In 3rd equation Perceived enjoyment significantly predicts ATU of GLMS when controlling Learning performance as p=0.000 and p<0.01 and also the total size of regression co-efficient between Learning Performance and ATU of GLMS has (simple regression co-efficient=0.545, multiple regression co-efficient=0.403) when Perceived enjoyment is used as predictor of ATU of GLMS along with Learning Performance. From all this it may be concluded that Perceived enjoyment mediates the relationship between Learning Performance and ATU of GLMS. Therefore our hypothesis $\mathbf{H_6}$ is accepted at 1% level of significance. Moreover, it may be noted that it's a case of partial or limited mediation as the effect of Learning Performance on ATU is not zero (the regression co-efficient=0.403) when Perceived enjoyment is controlled in the third equation of Table 12.

For Hypothesis **H6** Learning Performance significantly predicts ATU of GLMS as p=0.000 and p<0.01 in this causal step method of mediation. In the 2nd equation Learning Performance also significantly predicts PU as p=0.000 and p<0.01. In 3rd equation Usefulness significantly predicts ATU of GLMS when controlling Learning performance as p=0.000 and p<0.01 and also the total size of regression co-efficient between Learning Performance and ATU of GLMS has (simple

regression co-efficient=0.545, multiple regression co-efficient=0.304) when PU is used as predictor of ATU of GLMS along with Learning Performance. From all this it may be concluded that PU mediates the relationship between Learning Performance and ATU of GLMS. Therefore our hypothesis **H_7** is accepted at 1% level of significance. Moreover, it may be noted that it's a case of partial or limited mediation as the effect of Learning Performance on ATU is not zero (the regression co-efficient=0.304) when PU is controlled in the third equation of Table 13.

5.2 PEOU:

As seen from table 14, the calculated (p = 0.000) from PEOU to PU indicates a direct significant relationship. We can therefore state that, PEOU features increases the PU of a GLMS. Path coefficient value (β) from for this relationship is equal to 0.648. *Hence H2-c is accepted*. The explained variance value adjusted R Square values as shown in table 14. The adjusted R Square value for PU is 0.151. This value is greater than 0.1, which is considered good for Attitude toward use. So, R2 is explaining the two variables with respect to their predicators. As seen from table 10, the (p = 0.000) from PEOU to ATU indicates a direct significant relationship. Therefore coefficient value (β) for this relationship is equal to 0.572. *Hence (H2*-a) *is accepted*.
As seen from table 10, the (p = 0.000) from PEOU to Perceived Enjoyment indicates a direct significant relationship. Therefore coefficient value (β) for this relationship is equal to 0.394. *Hence (H2*-b) *is also accepted*.

The independent variables for PEOU are: Learning Performance. Hypothesis (H2-a), (H2-b) and (H2-c) are completely supported and accepted from results. Individuals perceive that the easier it is to use a GLMS the more will it be useful for performing tasks. This is because the easier it is to use an advanced features the clearer and understandable will be its use in the eyes of the users (students). The easier it is to perform tasks the more is the GLMS preferred, as displayed from the analysis the relation from PEOU towards ATU of GLMS is significant. That is to say the more it is easy for the user to use a GLMS the more easily and effectively it can be used for performing tasks. Users usually adopt a system on which they can rely, for example GLMS offers enjoyable environment as shown from the hypothesis (H2-b) the relationship from Perceived enjoyment and PEOU is significant. This makes a GLMS not only reliable but also comfortable for performing

multiple tasks with a higher degree of convenience and trust. In a GLMS one can perform computation, get rewards and get recognition making it an easy to use.

This means that there is no direct effect from PEOU towards Behavioral Intention. However we note that hypothesis H4-b and H3 are accepted therefore there exists a mediation effect through PU towards attitude toward use. This shows that there is a significant indirect effect from PEOU through PU and Perceived enjoyment to ATU (also known as mediation effect) another mediating effect is Perceived enjoyment is between PEOU and ATU which is also significant. Use of GLMS does not require specialized skills as a student of BSCS. The data collected from this demographic consists of individuals mostly youth that are student and seems that they are using traditional LMS, therefore they already feel it very easy to use a GLMS so there focus might be towards usefulness rather than ease of use. Therefore the survey shows that the focus of the sample is towards the factors that make the GLMS beneficial in terms of usefulness but at the same time relate that ease of use is important but having an effect through PU of a GLMS.

5.3 Perceived Enjoyment:

As seen from table 14, for hypothesis (**H3**) the calculated (p = 0.000) from Perceived enjoyment to ATU of GLMS indicate significant relationship. Adjusted R square = .417 its mean the dependent variable is just 41 percent explain to the independent variable which is good according to the prior literature. Beta value =.394 shows that there is a positive effect of perceived enjoyment on ATU of GLMS because.417 is the positive value. Hence there (**H3)** is accepted. Its mean that Students perceived enjoyment has a positive and significant effect on the attitude toward usage of GLMS. If student consider the system enjoyable they will motivate and engage toward GLMS. It has been confirmed that perceived enjoyment has played an important and vital roles in user technology acceptance and has an excessive implication particularly for hedonic (considered in term of pleasant or un-pleasant) systems (Heijden, 2004).

5.4 Perceived Usefulness:

As seen from table 14, for hypothesis (**H4-a**) the calculated (p = 0.000) from PU to ATU of GLMS indicate significant relationship. Adjusted R square = .651 its mean the dependent variable is just 65 percent explain to the independent variable which is good according to the prior literature. Beta value =.421 shows that there is a positive effect of perceived enjoyment on ATU of GLMS

because.421 is the positive value. Hence there (**H4-a)** is accepted. Its mean that Students PU has a positive and significant effect on the attitude toward usage of GLMS. Its mean if student consider that the system is useful for then there attitude will be positive to use the system.

As seen from table 14, for hypothesis (**H4-b**) the calculated (p = 0.000) from PU to perceived enjoyment indicate significant relationship. Adjusted R square = .420 its mean the dependent variable is just 42 percent explain to the independent variable which is good according to the prior literature. Beta value =.172 shows that there is a positive effect of PU on perceived enjoyment because.172 is the positive value. Hence there (**H4-b)** is accepted. It's mean that Students PU has a positive and significant effect on the Perceived enjoyment. Its mean if student consider that the system is useful for them, they will enjoy a lot.

We see that there exists a direct effect from PU to Actual Use also there exists a direct effect from PEOU to Actual Use, but the mediation effect from Behavioral Intention towards Actual Use does not exist.

Hypothesis #	**Factors**	**Hypothesis Statements**	**Hypothesis Outcomes**
H1-a	**Learning Performance**	Learning performance has a positive significant effect on PU	**Rejected**
H1-b		Learning performance has a positive significant effect on PE	**Failed to Reject**
H1-c		Learning performance has a positive significant effect on PU	**Failed to Reject**
H1-d		Learning Performance has a positive significant effect on ATU	**Failed to Reject**
H2-a	**Perceived ease of use**	PEOU has a positive significant effect on ATU	**Failed to Reject**
H2-b		PEOU has a positive significant effect on PE	**Failed to Reject**
H2-c		PEOU has a positive significant effect on PU	**Failed to Reject**
H3	**Perceived enjoyment**	PE has a positive significant effect on ATU	**Failed to Reject**
H4-a	**Perceived usefulness**	PU has a positive effect ATU	**Failed to Reject**
H4-b		PU has a positive significant effect on Perceived Enjoyment	**Failed to Reject**
H5		Learning performance and PEOU has a positive significant effect on ATU	**Rejected**

H6	**Learning performance (mediation)**	Learning Performance and PE has a positive significant effect on ATU	**Failed to Reject**
H7		Learning performance and PU has a positive significant effect on ATU	**Failed to Reject**

Table 15 Summary Table of Hypothesis Testing

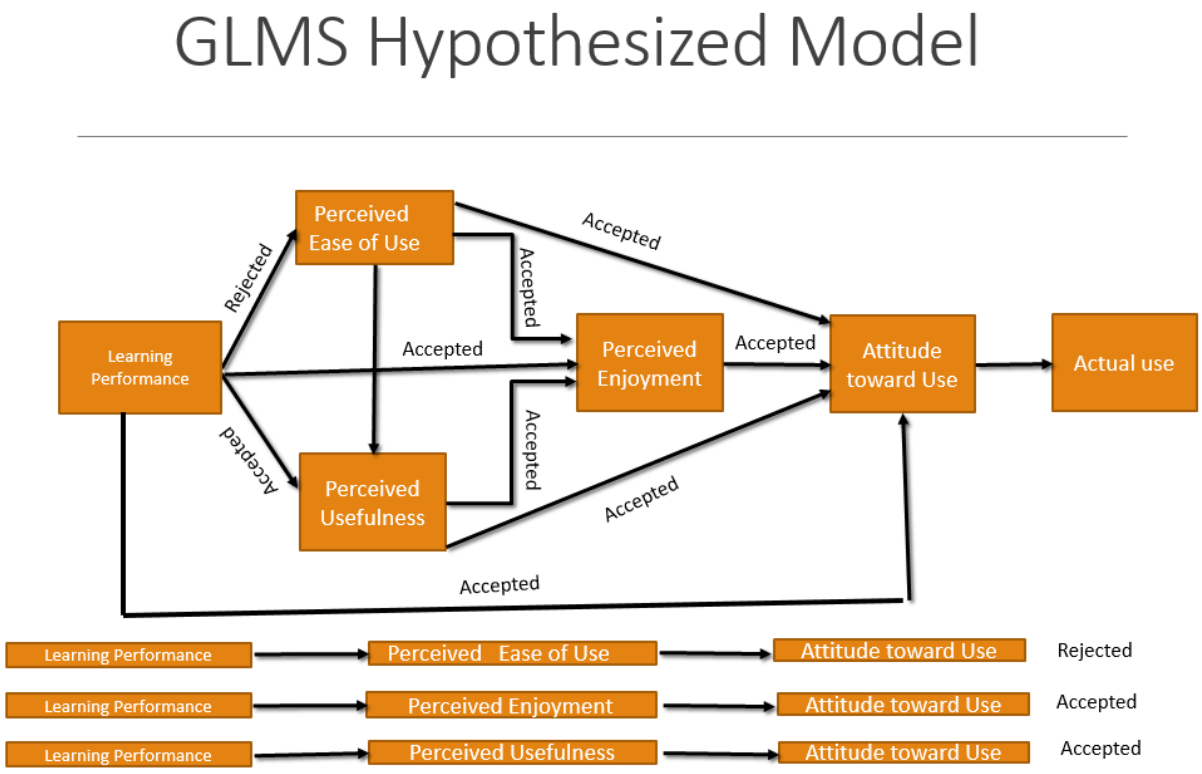

Figure 27: Hypotheses Outcome

Chapter 6:

CONCLUSION

This chapter will include the discussion on GLMS Acceptance Model along with the effects associated with theoretical, practical and methodological context. The limitations of the study, suggestions and implications for future research will also be part of this chapter.

In according to the research purposes the study is expressed as follows:

- To understand the theories and related models the literature review was made. These models are discussed already in detail in 2nd chapter, such as: Theory of Reasoned Action TRA, DTPB, MM, TPB, (TAM), TAM2, UTAUT, and TAM & TPB C-TAM-TPB
- Previous literature was reviewed in relation to E-learning and LMS acceptance, its acceptance and usage. This review is offered in 2nd chapter, which discusses in contexts of LMS and E-Learning technology, individual Acceptance and use.
- Study was further extended to articulate a model of technology acceptance for GLMS usage and the critical factors or constructs involved. Its details and the suggested research model are mention in 3rd chapter.
- The discussion on the methodology that is used, the data collection approach, the data cleaning process is mention in 4th chapter.
- We have created as well as validated a study or research model that best defines GLMS usage within Pakistan.
- The Data analysis and hypotheses testing was done in 5th chapter and the outcomes are discussed in detail. The results, acceptance ranges, software tools and algorithms used along with output graphics and tabulated results or outcomes are given in this chapter. In this the demographic info is also presented.
- Finally in this chapter (i.e. 6th chapter), we present a discussion along with conclusion on the results or findings. Appendix denotes the formulated questionnaire for conducting the survey. For data collection phase coding sheet was used which is also a part of appendix. Also, enlists the backgrounds of different survey questions that were used and well thought-out from literature in the survey formulating phase.

6.2 CONCLUSION:

There are several critical inferences that are made in this study. One major finding of this research is that it confirms a constructive use of GLMS within Pakistani Universities and shows a positive trend towards the acceptance of GLMS among students. Moreover the proposed research model which is made by extending Technology Acceptance Model in context of GLMS usage, proved to be a relevant and an effective model for studying GLMS acceptance among students. The research model and its construct measures were verified for internal consistency as well as validity. The research model proved to be reliable and valid. Although not all but most of the hypotheses in the research model were accepted.

Research proved and revealed different factors that affect the acceptance of a GLMS in Pakistani Universities. This research model can be useful for examining the acceptance of GLMS in different demographics and can also be utilized for other emerging technologies that share similar characteristics.

There are eleven hypotheses that were significantly accepted from the GLMS acceptance research model. Other one hypothesis was rejected. We also conclude that there are some important factors that have a positive as well as significant effect on GLMS acceptance within individuals. The factors that exist include: LP, significantly increases the (PU), (PE) and ATU of GLMS. PE plays a significant positive role towards (ATU). The Factor such as learning performance and PU increases positive influence (ATU) of a GLMS. Therefore, the factor of learning performance and perceived enjoyment can significantly effect on GLMS usage on the basis of game elements and gamification features. The research proved that PE, PEOU and PU significantly affect the ATU of a GLMS. In addition to this PEOU and PU significantly affects PE directly.

6.3 RESEARCH IMPLICATIONS:

This research on GLMS acceptance has revealed several implications that include:

1. <u>Theoretical Implications:</u>

The theoretical implications associated with GLMS acceptance research is that it contributes towards the understanding of different relationships of determinants and constructs. The

methodology adopted for conducting this research provides guidelines to facilitate further research in the area of study.

The contribution in the literature would be of analyzing and understanding GLMS adoption.

The research will result into a framework for exploration of GLMS acceptance and adaptation with respect to the demographic.

Wide scale variability is observed in the case of technology as a result of fast evolution and different possible circumstances under which groups adopt particular technology for use (Byrne, 2010).users attitudes are directed to meet different objectives. Consumer attitudes are dependent and based on analytical assessment of risk and benefits along with communication of analysis (Tabachnick & Fidell, 2007). User's acceptance or rejection of technology and it has determinants such as effects of use (Tabachnick & Fidell, 2007).

2. <u>Practical Implications:</u>

There are many practical implications are related with this Study including the idea of promoting academics to utilize GLMS in their daily tasks. For example using Wireless Internet connectivity in GLMS to improved professional practice, student development, increase accessibility and improve quality of work. This will help individuals in a university setup to improve and achieve their educational goals. The research provides mechanisms and a systematic process for conducting surveys on individual professionals in higher education along with the method of data analysis.

The study not only contributes to literature of GLMS adoption but also incorporates social influences on device acceptance as a determinant of behavioral intention. The research broadens the scope of GLMS adoption research beyond professional environment towards student's acceptance. The ubiquitous feature of GLMS can be utilized effectively to produce and exploit numerous useful functionalities associated with its acceptance. Information retrieval and the use of advanced GLMS features can empower individuals to search content quickly, do collaboration and perform tasks more efficiently. The findings of this study revealed many crucial effects caused by new technology on student intentions, behaviors and most importantly its usage.

As in Pakistan no data relating to GLMS is available therefore we will be collecting data by adopting a survey-questionnaire approach. Target population will be the students of SEECS and data collection objectives include GLMS user interaction, application usage etc.

6.4 LIMITATIONS:

Although university students from undergraduate BSCS program, along with faculty members are considered as the major users of GLMS there is a possibility that their perception might be different with respect to other GLMS Users.

The results may prove helpful in terms of research on other similar new devices and its adoption. For example, to investigate or evaluate other Gamified or non-Gamified applications or websites, this research model could be used.

This research can prove beneficial for E-Learning, Learning Management Systems, and related strategies that are considered by GLMS Developers.

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Appendix:

A. Survey Questionnaire

Male **Female**

Sr. #	Constructs	Questions	Derived From
1	ATU1	I believe that badges/levels motivated me to improve quality of tasks (Assignment and Quizzes) Strongly agree Agree Neutral Disagree Strongly disagree	
2	ATU2	I believe that leaderboard motivated me to improve quality of tasks (Assignment and Quizzes). Agree Neutral Disagree Strongly disagree	
3	ATU3	I believe that game elements motivated me to improve my learning. Agree Neutral Disagree Strongly disagree	
4	ATU4	I often become confused when I use GLMS. Agree Neutral Disagree Strongly disagree	(V Venkatesh et al., 2003)
5	ATU5	The reward base GLMS made me happy. Agree Neutral Disagree Strongly disagree	
6	ATU6	I was much excited to use GLMS. Agree Neutral Disagree Strongly disagree	
7	ATU7	I felt very confident using the GLMS. Agree Neutral Disagree Strongly disagree	
8	LP1	By Using GLMS my Quality of tasks (Assignments, Quizzes) has improved. Agree Neutral Disagree Strongly disagree	
9	LP2	Using GLMS my course performance has improved Agree Neutral Disagree Strongly disagree	(Farah., H 2013, Alfie Chacko, 2012)
10	LP3	The feature "Understanding of Lectures Slide" enabled me to understand the lectures. Agree Neutral Disagree Strongly disagree	

11	LP4	The GLMS encouraged me to be more engaged with my course activities. Agree Neutral Disagree Strongly disagree	
12	LP5	The personalized, constructive written feedback encouraged me to increase my engagement in discussion forum with peers and instructor. Agree Neutral Disagree Strongly disagree	
13	LP6	It would make more sense if my performance is shared with my peer. Agree Neutral Disagree Strongly disagree	
14	LP7	It make sense that my performance is not shared with my peers. Agree Neutral Disagree Strongly disagree	
15	PE1	I enjoyed learning by using this GLMS. Agree Neutral Disagree Strongly disagree	(Liu et al., 2010)
16	PE2	Using GLMS was a pleasant experience Agree Neutral Disagree Strongly disagree	
17	PE3	Using the GLMS was unpleasant experience. Agree Neutral Disagree Strongly disagree	
18	PE4	I enjoyed to spend my time in exploring GLMS. Agree Neutral Disagree Strongly disagree	
19	PE5	I enjoyed myself when I was using the features of GLMS. Agree Neutral Disagree Strongly disagree	
20	PU1	The GLMS encouraged me to be more engaged with it and increased my activities to outperform my classmates. Agree Neutral Disagree Strongly disagree	(Davis, 1989)
21	PU2	The discussion forum helped me to discuss course related queries with classmates and instructor anytime anywhere. Agree Neutral Disagree Strongly disagree	
22	PU3	Leaderboard helped me to be aware of my performance and online activities in GLMS comparison with those of my classmates. Agree Neutral Disagree Strongly disagree	

23	PU4	I found GLMS as a helpful educational tool for improving learning experience. Agree Neutral Disagree Strongly disagree	
24	PEOU1	I studied the Lectures as early as it was uploaded through the feature "Understanding of Lecture Slides. Agree Neutral Disagree Strongly disagree	(Viswanath Venkatesh & Davis, 2000)
25	PEOU2	Overall, I find GLMS easy to use. Agree Neutral Disagree Strongly disagree	
26	PEOU3	My interaction with the system was clear and understandable. Agree Neutral Disagree Strongly disagree	