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Research Article

The Role of Gamification Techniques in Swotting up the Effects of Problem Solving to Make Effective Decisions

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ABSTRACT

The usage of game design elements and game mechanics for the purpose of digital engagement and motivation of employees to achieve goals effectively is termed as gamification. Organizations use gamification effectively to achieve the best with their technicalities, but are less aware of the influence of gamification on the higher order cognitions of problem solving and decision making abilities of the millennial workforce who almost take over the organizations population. In this paper, the data collected through quantitative (Tower of London and Berg Card Sorting Test) and qualitative (semi-structured interview) phases of research carried out in the organizations using gamification in Bengaluru which is analysed through statistical package for social sciences and thematic analysis respectively. The main idea is to highlight the individual differences in employees' problem solving and decision making abilities with respect to gamification.

Keywords: Gamification; Problem solving; Decision making; Rewards; Technology; Motivation; Experiential learning

INTRODUCTION

The use of game design elements in non-game contexts is a working definition provided by Deterding. Problem solving involves a lot of lateral thinking, creative thinking and innovativeness to solve real world scenarios at workplace, but due to this kind of cognitive dissonance employees are not given space to think and explore their capacities to be efficient in making decisions. And moreover, according to the reports of world economic forum, problem solving skill is the top one skill and judgement and decision making is the top seven skills that will survive in 2020 and these skills would be the must for any employee who should be hired in a company. By narrowing the skills gap, there is usage of games in the manufacturing sector aiming to increase productivity. The three factors of gamification, problem solving and decision making are significant in the current trends where gamification induces a sense of competition and motivation among the employees leading them to solve real world problems through effective decision making using gamified techniques. Also, present day millennial employees encounter problems getting adapted to the traditionalists' point of views and their ways of accomplishing tasks, rather using innovative ideas and fun elements at work interests them and motivates them to solve problems and achieve goals effectively.

Problems confronted by the organization such as poor product quality, failure of leadership perspective, resistance to change, technical support problems, etc. across various industries require their employees to have problem solving and decision making abilities and managing change. As mentioned by Sweatt, speed of training could be accelerated through gamification and it also enables and train new personnel into new roles, new technologies and even basic competencies. According to predictions from Gartner, by 2015, more than 50 percent of organizations that manage innovation processes will gamify those processes. They mention the business opportunities of innovation through gamified tasks as enticing more engaged customers, crowdsourcing innovation and improving employee performance. The global gamification market will magnify at an astounding rate of 48 percent by 2019 as predicted by the market researcher, TechNavio. The acceleration of the usage of gamification in the business setting is to build a more flexible organization and make it more relevant and competitive in the global marketplace. Gamification is an approach to solve real world problems by making effective decision is an operative strategy at workplace.

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Millennials experiencing a cognitive dissonance of following a traditionalists' ways of task accomplishments and solving problems which is the typical most hindering aspect for motivation and their decision-making ability. Because the newer, innovative or creative ways of solving problems at work are the largest source of innovation and effectiveness in making feasible decision as opposed to traditionalist and out-dated mechanisms in the organization in the era of robotics, switching to gamification of work should have an impact on fighting this cognitive dissonance being the psychological problem among millennial employees [1].

In the long run, problem solving skills will generate revenue to the organization through the identification, definition and different types of management strategies and decision making in solving problems, which also contribute towards personal growth of the individual by giving them different approach to the problem itself and solve problems effectively through operative and appropriate decisions. This means, a decision to switch between gamification instead of traditional training methods to make decisions to solve problems will make a long-term impact on the organizational growth as well as problem solving and decision making abilities of employees. Gamification combines brain training, fun and learning of tasks since it is both psychology oriented and technology oriented which creates effective learning of tasks and skills through experiential learning. Learning effectiveness through game mechanics creates high motivation and higher commitment leading to lower attrition. As per the Marketst and Market report, the worldwide gamification industry is likely to be valued at around $11.1 billion by the end of 2020, which can be helpful in problem solving through experiential learning and effective decision making. The organizations could also focus more on building and encouraging employee engagement activities with the sequence of learning tasks through rewards, competition, through simple fun activities which in turn might enhance employees problem solving and decision making abilities and creative thinking. While employee engagement activities through gamification is a technically sound idea that should be encouraged, however, it might not feasible to many of the start-ups and low revenue generating or some of the small scale industries who cannot afford high budget for technical gamification or for the organizations who must work in an established fashion [2].

There is multitude of effects of gamification at work. Firstly, it increases employee motivation which is intrinsically driven. This motivation in terms of rewards and reinforcements in turn will help the employees to achieve the desired outcome by solving business/organizational problems through effective decision making strategies, since decision making play a critical role in employee's ability of problem solving. This creates a very positive and engaging environment to the employees where they try to come out of any chaos at workplace. Thus, gamification process acts as an experiential learning which helps employees solve realistic organizational problems through effective decision making process.

Gamification is rapidly growing application/technology in psychology and hence it could be treated as cognitive training and testing tools to improve problem solving skills among the employees.

Moreover, problem solving skills can be acquired through gamification where the individual goes into immediate immersion of assuming the role of the person who needs to solve the problem. This way, if problem solving skills are enhanced through gamification, an employee is likely to solve the real world problems through experiential learning gained playing games [3].

Gamification has positively affected workforce functioning by enhancing motivation among the employees and helping them achieve the desired outcomes where reinforcements as a part of gamification process also play a critical role in enhancing employee performance. A study named 'A theoretical perspective on the inner workings of gamification in the workplace' by Brouwer and Conboy was carried out to propose a theoretical perspective towards examining and explaining the inner workings of gamification at workplace. This specifically aims to explain how gamifying activities affects the motivation towards achieving desired behaviour and the experience of gamefulness. Also, the model proposed in the study is a two-directional effect that the gamification design elements have on employees. Also, the model facilitates the motivation for the employees to perform desired task to get the desired outcome and on the other hand the design influences the gameful experiences that the employee perceives.

The findings of the study named 'Does gamification work? a literature review' by Hamari and Sarsa suggest that there are positive effects provided by gamification. But it also indicates that the effects are greatly dependent on the context in which the gamification process is being implemented. The findings of the study named 'Role of reinforcements in gamification' by Sathianathan and Rajan in 2017 suggest that regular and continued reinforcements play a critical role in work motivation and employee performance. The study indicated that reinforcements in gamification play a role in improving work motivation and employee performance. Also, the main objective of this study was to find out the role of token reinforcement in gamification to enhance employee performance. Thus, a common understanding of the role of gamification at workplace is positive and it enhances motivation among the employees to achieve goals effectively [4].

By enhancing motivation among the employees through reinforcements to achieve the desired outcomes, it also enriches problem solving abilities among the employees in the form of rewards to increase their intrinsic motivation to solve business problems. Experiential learning also contributes to the problem solving abilities to find out potential solutions and provide positive environment for the employees. Gamification is not just the activities of playful interactions, but it uses gamified designs in regular tasks involving problem solving. This enriches the outcome in the form of rewards and achievements, where the employees engage in tasks through self-motivation. Therefore, real world organizational problems can be solved through game design elements, where there is effective attainment of goals through user engagement and the user can be the stakeholder from within the organization, a consumer of the product or service, either individual or group [5].

Gamification is intended to solve problems through experiential learning which facilitates to find out potential solutions by making tasks more realistic, where these tasks would be gamified with 3D graphics, sounds and narratives. Also, some of the studies also tested cognition through gamification in an engaging close-to-life environment and the transferability of learned skills which can be the experiential learning. As Dunbar explains in the study, games are uniquely suited to some forms of cognitive training as they give the player freedom to make choices and experience feedback on the effects of those choices; in other words, they provide opportunities for experiential learning which in turn will help solve the real world organizational problems through experiential learning.

The aim of the study named 'Gamification in business: Designing motivating solutions to problem situations' by Gears and Braun was to introduce a gamification design model which aims at the improvement of staffing in business. This also designed a gamified solution to some of the difficult business problems which requires for an understanding of a unique corporate environment. This research study was an innovative attempt which proposed a gamified system framework that is designed to improve problematic situations in business and enhanced problem solving abilities of the employees considering the 16 basic human desires. Along with the human need for autonomy, relatedness and competence which was influenced by the corporate dynamics. The proposed game design patterns were customised to facilitate positive and engaging experience for the employees, where the methods clearly achieves by solving peoples' planning problems and helps restructuring their incentives accordingly. Thus, gamification acts as a brain training where it helps employees solve realistic organizational problems effectively [6].

Problem solving is also associated with decision making abilities where gamification also helps people make better decisions to contribute to find out potential solutions for the problems encountered in the organization. The study named "Helping people make better decisions using optimal gamification" by Lieder and Griffiths suggest that game like elements are qualified as a popular tool to nudge and engage students and customers at workplace. Here, the gamification and the theory of reward shaping in the reinforcement learning is connected, for which a method for designing effective incentive structures were developed, by this delineating the existing problem of when gamification will fail and when will it succeed. They also evaluated their method in two behavioural experiments. And the findings of this study suggest that, the first experiment resulted positively where the incentive structures in that method helped people make better, less short-sighted decisions and also avoid the pitfalls and less principled approaches. And the results of the second method/experiment exemplified that the incentive structures can be implemented effectively using game design elements such as badges and points. However, the overall outcomes of the study suggested that their method accentuates that overall upright influence of gamification to help people make better decisions. Thus, the above study accentuates the thought that gamification influences decision making abilities which is a major part of problem solving process [7]. Both problem solving and decision making fall under one principle process and they contribute to reduce conflicts and chaos together and have better clarity about the problematic situation.

The study named 'The effect of problem solving and decision making skills on tendency to depression and anxiety in patients with type 2 diabetes' by Abazarian, Baboli and Ghashghaei is a quasi-experimental study which aims to study the effect of problem solving and decision making skill on the rate of the tendency to depression and anxiety. The findings of the study suggest that, when both the control and the experimental groups passed the post tests, the analysis showed that, teaching problem solving and decision making skills played a very effective role in reducing diabetic patients' depression and anxiety and reduced the same. Here, both of them are studied together because people learn to first define the problem accurately and then make a decision and these principles in a new combination has an important effect on human tranquillity. Thus, both problem solving and decision making abilities are interconnected and both together act as an effective strategy to come out of a problematic situation.

MATERIALS AND METHODS

Explanatory sequential design will be used to further the research, where quantitative study is given the first importance through the administration of gamified problem solving and decision making test and then further the study with qualitative study to validate the quantitative analysis. Correlational research design will be used to carry out the research study. This design determines if there is a positive or negative relationship that exists between two or more variables and if so, to what degree the relationship exists. Millennial employees working in any gamified industry in Bengaluru, India will be the sample population and the size would be 120 in number. The sampling technique used in the study will be convenience sampling which comes under the category of non-probability sampling, where all the samples in the population do not get equal chances of being selected in the study. Convenience sampling is a method used to select a naturally occurring group of people within the population of study along with inclusion and exclusion criteria. Purposive sampling, which is a non-representative subset of some larger population and is constructed to serve a very specific need or purpose, will also be used because the study clearly requires employees who fall under the category of millennials working in any organization that uses gamification. The age group (22-36 years) of millennial population at work both males and females, employees working in the organization that uses gamification will be included in the study. Employees under medication, employees with mental health issues will not be taken into consideration while selecting the subjects for the study. Gamified tests of tower of London and Berg Card sorting test will be used to assess problem solving and decision making abilities of the employees using PEBL software (Figure 1) [8].

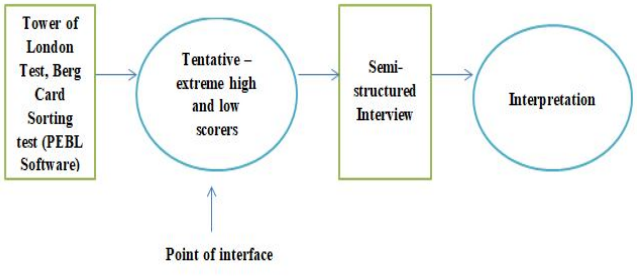

Figure 1: Research design.

Procedure

The study was conducted in two phases.

Phase one-quantitative study: The sample was identified and administered with a Berg Card sorting test using PEBL Software, followed by the interpretation and analysis of the data collected. In the phase of quantitative study, the tower of London test and Berg Card sorting test was firstly be administered to 30 sample population out of the universe sample as a pilot study in order to establish norms for the high and low range. Then, proceeded with further data collection for the actual study where the instruments used for the study was administered by the researcher, personally for the respondents, after a consent form and demographic sheet which was collected from the participants. The researcher then went ahead to establish a rapport with the respondents which helped in having high response rate. Data was collected by the researcher manually from the participants. The instructions given to the respondents were thorough and were carefully followed. Also the researcher will contact each of the individuals who fulfil the criteria of the study and collect data from them through the PEBL Software. From the start, the participants were informed about the possibility of second data collection through the semi-structured interview [9].

Phase two-qualitative study: In the qualitative phase of the research study which began after the interpretations and analysis of the quantitative data, the extreme high scorers and the extreme low scorers of the tests were identified and recruited for the semi-structured interview which was the qualitative study, to validate and understand the employees' perception of the effect of their problem solving on decision making abilities using gamification and its influence on the same. They will act as the representatives of different groups. The interview was conducted by the researcher personally for the respondents, after a consent form and demographic sheet which collected from the participants. The researchers then went ahead to establish a rapport with the respondents before the interview process, which helped in having high response rate.

RESULTS AND DISCUSSION

Normality tests

According to Table 1, Shapiro-Wilk value indicates that, it is not statistically significant at the level of 0.05 (value=0.000). This indicates that the data is not normally distributed. According to Table 2, Shapiro-Wilk value indicates that, it is not statistically significant at the level of 0.05 (value=0.000). This indicates that the data is not normally distributed.

Table 1: Table indicating the normality of TOL test.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
NoofmovesTOL	0.227	120	0	0.763	120	0
TimetakenTOL	0.253	120	0	0.729	120	0

Table 2: Table indicating the normality of BCST test.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
BCSTerrors	0.132	120	0	0.876	120	0
BCSTcorrect	0.169	120	0	0.836	120	0

According to Table 3, the descriptive statistics indicates that the total number of TOL and BCST scores is equal to 120; the mean values are 64.66 and 76.62 respectively; the standard deviation values are 15.49 and 10.93 respectively [10].

Table 3: Table indicating the descriptive statistics of BCST and TOL tests.

	N	Minimum	Maximum	Mean	Std. deviation
TimetakenTOL	120	37231	366310	99510.48	69946.78
BCSTcorrect	120	39.84	92.19	76.6276	10.93741

Correlation

According to Table 4, the Spearman correlation coefficient sig. (2-tailed) values of 0.149 indicate that there is no statistically significant correlation between the time taken to solve the tower of London test or puzzle and the correct responses of Berg Card Sorting Test (BCST).

Table 4: Table indicating the correlation between BCST and TOL tests.

Spearman's rho		TimetakenTOL	BCSTcorrect
TimetakenTOL	Correlation coefficient	1	0.133
	Sig. (2-tailed)	0	0.149
	N	120	120
BCSTcorrect	Correlation coefficient	0.133	1
	Sig. (2-tailed)	0.149	0
	N	120	120

Linear regression analysis

The Table 5 represents the descriptive statistics which indicates that the total time taken to complete TOL and BCST correct responses is equal to 120; the mean values are 99510.47 and 76.62 respectively; the standard deviation values are 69946.78 and 10.93 respectively.

Table 5: The effect of problem solving on decision making abilities.

	Mean	Std. deviation	N
BCSTcorrect	76.6276	10.93741	120
TimetakenTOL	99510.48	69946.78	120

Correlations

According to the Table 6, the Pearson correlation coefficient sig. (2-tailed) values of 0.056 indicate that there is statistically significant correlation between the correct responses of Berg Card Sorting Test (BCST) and the time taken to solve the tower of London test or puzzle [11].

Table 6: The correlation between BCST and TOL tests.

Variables		BCSTcorrect	TimetakenTOL
Pearson correlation	BCSTcorrect	1	0.146
	TimetakenTOL	0.146	1
Sig. (1-tailed)	BCSTcorrect	0	0.056
	TimetakenTOL	0.056	0
N	BCSTcorrect	120	120
	TimetakenTOL	120	120

ANOVA

The Table 7 of ANOVA and the coefficients table indicates that the significance value is 0.113 and it is not statistically significant at the 0.05 level, which indicates that there is no significant effect of variance and effect of time taken in a problem solving test and the correct responses given in a decision making test (Table 7).

Table 7: The analysis of the relationship between the variables.

Model	Sum of squares	df	Mean square	F	Sig.
Regression	301.518	1	301.518	2.553	0.113[b]
Residual	13934.08	118	118.085		
Total	14235.598	119			

DISCUSSION

The initial data illustrates that the distributions of scores satisfied the assumptions underlying the analysis procedures. All the effects were assessed at the 0.05 significance level. As the effects were studied, tests of normality was used to find out the distribution of data, correlations was used to study if significant relationship exists between the variables of problem solving and decision making and linear regression analysis was used to study the effect of independent variable on the dependent variables of problem solving and decision making effectively. Considering the above illustrated results, it can be accentuated that there is significant relationship between the variables; however they do not hold any positive or negative effects on each other which was indicated at the significance level of 0.05 [12].

Spearman correlation was used to determine whether there exists significant relationship among the variables of total number of time taken to finish the tower of London puzzle and the number of correct responses in the berg card sorting test which were used to determine the employees' problem solving and decision making abilities respectively. Linear regression analysis was used to determine the effect of problem solving during the gameplay on the decision that they made during the next game played, which essentially verified their abilities of cognitive structures and how they had an effect on each other.

The importance of cognitive structure (*i.e.*, problem representation) for complex problem solving is undeniable. However, this study only partially agrees that cognitive structures explain everything about problem-solving during the game based learning. Problem solver's motivation plays an important role in successful problem solving. In the study by Singh S, it is stated that motivation literature accentuates that the emphasis of self-efficacy and self-determination influences the quality and outcome of problem solving in the context of game based learning. Therefore, this study was conducted to better understand the influence of gamification on problem solving and decision making on the learner's effectiveness in the context of game-based learning and their higher order cognitions.

Considering the qualitative phase of study, wit was found that the major and sub themes through thematic analysis were inclining towards how the hypothesis holds good in the recent trends. Few of the major themes and sub themes such as cognition, engagement, positive outcomes, motivation, user interface and technology, digital convenience, experiential learning etc. were all considered to be the most repeated phrases by the participants while they were interviewed.

One of the interviewees reported that, "I felt I have a real life task to achieve and felt motivated to reach the goal especially in the tower of London task where I had to complete the task with minimum moves" and "this helps one to learn things quickly and gives an experience of real gamer" Also, a participant reported that "this creates a very relaxing and positive environment and keeps mind calm" and "online gaming or games on screen makes in convenient for us than paper pencil tests unlike other psychology experimental tests because we all almost sit for 9 long hours in front of the system" One of the participants said that "these games try to boost my concentration and thinking capacity and paying attention is very important in these games and also problem solving has some sort of effect on my decisions made because solving problems through different perspectives gives many choices and decide amongst the best" and "playing games and getting points are very fascinating and exciting since childhood for anybody and when it comes to points in the corporate sector, it acts as non-monetary rewards in order to enhance one's motivation to achieve and solve problems by making decisions through precise thinking" All these verbatim from the semi-structured interview accentuates that fact that gamification has an influence on one's motivation, problem solving, decision making abilities and is a method to enhance higher order cognitions as they also have effect on one another [13].

Considering the entire hypothesis that were tested, it was assumed that there is significant relationship between the problem solving and decision making abilities among the millennial workforce which would be influenced by gamification and that there is significant relationship between each higher order cognitions and gamification and there is an effect of problem solving on decision making abilities among the millennial employees. Gamification is intended to solve problems through experiential learning which facilitates to find out potential solutions by making tasks more realistic, where these tasks would be gamified with 3D graphics, sounds and narratives. Also, some of the studies also tested cognition through gamification in an engaging close-to-life environment and the transferability of learned skills which can be the experiential learning. This is what the employees indulged in while playing the prescribed games and as they did, most of them immersed themselves in solving the puzzles. As Dunbar explains in the study, games are uniquely suited to some forms of cognitive training as they give the player freedom to make choices and experience feedback on the effects of those choices; in other words, they provide opportunities for experiential learning which in turn will help solve the real world organizational problems through experiential learning.

Most of the participants when interviewed also mentioned that their thinking capacity was not bound by any limits and they were acting according to their free will. However, there exists significant relationship between these variables but there is no individual effect of the time taken to solve the problematic puzzle which tested their problem solving abilities and the right decisions made while sorting the cards in the Berg Card Sorting Test which tested their decision making abilities.

This study is one of a kind and stands out as a research as it explores the correlation between the higher order cognitions that are complementary to each other and are in sync with gamified applications as it is mentioned in the study by 'The effect of problem solving and decision making skills on tendency to depression and anxiety in patients with type 2 diabetes' by Abazarian, Baboli, and Ghashghaei. All these indicates that the mode in which the higher order cognitions which were tested through gamified tests had an important role to play in order to determine the relationship, effect and influence of gamification on the higher order cognitions of millennial workforce.

Future implications

This study explored the complex relationships between gamification and higher order cognitions in the context of digital game-based learning. There are many further questions to be explored in the future; for example, how to design optimal workplace games that have the appeal of a commercial game; how to directly capture the data of employees' activities and emotions during gameplay; and how to measure and assess employees' mental effort, cognitive load, decision-making and other self-regulation processes. Scientific inquiries along these lines will help us to advance research on complex problem solving and decision making in the digital age which are the two top skills required in a corporate setting especially in the field of human resources.

CONCLUSION

This study shows that problem solving and decision-making abilities in a game-based learning environment have an impact on the employees' problem solving and decision-making abilities. Thus, it is essential to design game-based testing and learning environment to scaffold employees' problem solving and decision making which were influenced through gamification, however not significantly on each other as different variables. Not all the games are necessarily designed as complex to engage employees in problem solving tasks and the time taken depends on their level of complexity and the employees' understanding of the rules, therefore gamification or game-based testing is not the only variable that enhances employees' higher order cognitions, but is challenged. The study reveals that 1) there are complex interplay between gamification and higher order cognitions, 2) the gamified tests can enhance or limit the employees' choices or decisions made while understanding and solving of complex problems, 3) there exists some amount of effect of problem solving on decision making because of the order or gamified tests that were administered and however, there exists individual differences and other factors that play a role in determining the relationship between all the three variables.

Therefore, in order to foster employees problem and decision making abilities of the millennial employees, gamified tasks and real life simulations should be designed in a way that provides complexity for employees to go up the ladder and learn through their experiences of engaging in tasks that teach them problem solving and decision making through games, with sufficient autonomy for employees to make choices and attainable challenges to help them move closer to their intended goals.

LIMITATIONS

One of the limitations of this study is the requirement of a narrow scope. Since gamification is a rampantly growing field in psychology and human resources as a cognitive testing and training mode and the higher order cognitions such as problem solving and decision making are the top 10 skills that will survive in the 2020's, these three variables became the major focus of study. This has resulted in excluding other variables on the subjective basis that might have an influence on the testing of higher order cognitions through gamification. Nevertheless, to offset this possible subjectivity, there are literature evidences that only talks about the influence of problem solving on decision making and gamification on both of these variables. Also, higher order cognitions is not just both of these above considered variables but many others that are excluded from the study which could have possible relationship with gamification. And lastly, gamification is not just bound to be digital convenience or user interface and technology, but could be any sort of reinforcements, rewards, points, leader boards etc. which has a very good scope to study and explore.

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