

# A Method to Visualization Data Collection by Using Gamification

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**Abstract**—Using game design elements in non-game contexts is an established concept around the world. Gamification is all about improving actual user engagement with the system, making users contribute more time and resources for data collection. This study reviews an overview of gamification and user motivations for playing games, and the researchers discuss basic game design elements.

The game mechanics are included points, levels, leaderboards, badges and challenges. Gamification can be applied to behavioral data collection processes in terms of visualization. The findings show the reliability of a questionnaire that is designed to measure the investment risk. The visualization questionnaire can represent the behavioral data that will be applied to gamification design.

**Keywords**—Gamification, Visualization Data, Engagement, Data Validation, Game elements

## I. INTRODUCTION

The problem is that collecting people data can be costly in both time and money, but the benefits from owning completely behavior data are exponentially valuable. But, how are you going to get people to give you the data that you want? Many researchers turn to surveys, and rewards programs, which are proving to be more and more effective as gamification activity continues to challenge the bounds of privacy concerns in return for special promotions[1]. Gamification is a concept of applying game mechanics and game design elements to engage and motivate people to achieve their goals. Exactly this aspect will be explored in the scope of these projects, including visualization elements to present all the implementations of the user's behavior.

The question in this study is how to collect the behavior data of the user that it is understandable and readable? Then, this study will find out the visualization data can represent the correct data. This study reviews the gamification concept, investment instrument, human perception and gamify elements in terms of behavioral questionnaire.

## II. GAMIFICATION

Gamification is defined as the use of game elements and mechanics in non-game contexts [2]. Gaming as a highly pervasive activity can be seen as the intense training of several skills. Digital games are mediums of the entertainment. The essential aspects of gamification, which make the game (flu) experiences, are that they are immersed,

engaging and fun [2]. Knowledge and skills can be improved by using game-based learning. It is a self-contained unit with starting, gameplay and ending activities. Games can provide different types of learning content in different settings. As a game mechanics, action game requires users to use observation quick reflexes, accuracy and timing to overcome obstacles and make a story to motivate actions [3].

## III. GAMIFICATION SURVEYS

Gaming as a highly pervasive activity can be seen as the intense training of several skills. Digital games are a medium of entertainment. The essential aspects of gamification, which make the game (flu) experiences, are that they are immersed, engaging and fun [2]. Knowledge and skills can be improved by using game-based learning. A learning game is a self-contained unit with start, gameplay and ending activities. Games can provide different types of learning content in different settings. As a game mechanics, action game requires users to use observation quick reflexes, accuracy and timing to overcome obstacles and make a story to motivate actions [3]. Gamification has been the buzzword that is applied for a wide range of array anticipated to raise respondent engagement while answering the web survey. The research and game have the same purpose of solving as a problem with a playful attitude [4]. Using the game components in non-game contexts along with game thinking and game mechanics to engage users and solve a problem [5].

The gamified in the survey context as the procedure of involving the psychological and sociological factors that drive intense gameplay to player measurement [6]. The two major ways in which surveys can be gamified. Firstly, revising questions to be more like a game. Secondly, creating the way to reply questions more game-like and including motivational elements and goals in a game [7]. Some definitions of the research through gaming are divided into five types as avatar-based research games, gaming as intensive research games, a question as mini, social media-based research games and augmented reality research games [7].

Furthermore, some research assigns the five basic principles of survey gamified as: (1) illustrate rules and goals inform respondents what they should achieve and how it can be accomplished. Then reconstruct the questions into more game-like experiences which make them more entertaining to reply to respondents. (2) generate narrative themed works as a story of the gamified survey to motivate respondents to accomplish the set goals. (3) contesting missions or quests,

such as guessing or betting questions, need some components of skill, endeavor, and luck, to keep up a positive level of interest in the respondents. (4) steady feedback and rewards keep respondents engaged. (5) Moreover, an attractive and beautiful design, along with visual elements plus music and sound effects, makes a motivating and influencing the virtual environment [8, 9][7, 10]

A few research proposes their framework and illustrates the relationship between motivational affordances and psychological and behavioral outcomes, which is beneficial in classifying the excessive of goals that survey designers seem to follow when gamified a survey [11]. Despite, gamification necessary contributes respondents with a more challenging, relevant, involving, rewarding, and, therefore, more positive survey experience[12]. The gamification survey will apply to the investment risk for behavioral assessment.

#### IV. INVESTMENT RISK ASSESSMENT INSTRUMENT

The problem is that collecting people's data can be costly in both time and money; but the benefits from owning completely behavior data are exponentially valuable. But, how are you going to get people to give you the data that you want? Many researchers turn to surveys and rewards programs, which are proving to be more and more effective as gamification activity continues to challenge the bounds of privacy concerns in return for special promotions [1]. Investment risk assessment narrated as the ultimate amount of uncertainty that someone is ready to obtain when making an investment. The objective of measured Investment risk is self-assessment about investment suitability, financial risk tolerance is the meaningful factors of financial decisions[8].

The dilemma of measuring and assessing suitability, Investment risk assessment has alerted. The investment planners should focus on measurements of objective investment suitability, the financial risk tolerance of their clients [6]. Objective measure analysis emerges to offer high potential in the assessment of investment suitability, financial risk tolerance [3]. Essentially, Risk Tolerance Questionnaire scores were positively correlated with the riskiness of respondents' actual investment portfolios, meaning that investors with high risk-tolerance scores tend to have higher-risk portfolios. Otherwise, respondents with relatively more investment experience had more risk-tolerant responses and higher-risk portfolios than less experienced investors.

The Risk Tolerance Questionnaire is created to evaluate several of the factors in the financial domain, including (1) decreasing marginal utility in the domain of gains, (2) loss aversion (i.e., a larger impact for losses as compared to gains) and (3) a tendency to focus on potential losses rather than gains items [13]. The simplest techniques to assess individual investment suitability, financial risk tolerance is the questionnaire. As a result, objective measures 1) tend to be descriptive rather than predictive, 2) do not account for the multidimensional nature of risk, and (c) often fail to explain actual investor behavior [14].

#### V. HUMAN PERCEPTION

The perceptions are different according to the physical characteristics of the stimulus and they are interpreted in the function of the previous experiences associated with that stimulus, making the brain able to extract knowledge. This continuous flow of sensations generates what it is known as perception. Through the visual system, human perception has an important role in the visualization domain as it supports the cognitive associated process [15]. Thus, human factors can contribute significantly to the visualization process and they must have an important role in the design and development of computational tools suitable for data visualization and analysis. Visualization use in general, the term "Visualization" means the development of a visual image in the human mind.

However, that is more than simply a graphical representation of data or concepts, as visualization can work as a cognitive tool, and became a powerful strategy in the construction of knowledge using human percipient and cognitive capacities [15]. This study aims to review the visualization in terms of people's perception through gamify.

#### VI. RULES OF GAME DESIGN

Gamification for data collection is a designing methodology to make users play. These focuses on the intrinsic motivation in Self-Determination Theory (SDT)[3], that are competence. The user must be challenged to acquire some kind of mastery. Budes are powerful instruments for meaningful motivation[3]. This is a concept of competence that help people to take some action. Autonomy which make users can able to make choices that is an immediate feedback. The choices can increase intrinsic motivation as a provides surprise[3]. Finally, relatedness as a leaderboard is a competence points that enhances by budes. Sharing game-based achievement on social networks enhanced motivation[3]. The data collection applied to gather data by using gamification. Data visualization becomes fundamental to consider the behavior of the visual human. Tshudy, 2015 illustrated the basic examples of these game elements include [1]:

- Achievement: rewarding of a badge, level up, or points for reaching some accomplishment
- Leaderboards: ranking individuals to create competition and induce higher involvement
- Appointments: creating a certain time at which "players" must return and complete an action to receive a reward
- Countdown: having a limited time to complete a task
- Progress: showing the amount of progress in a certain activity

These game elements could encourage users to show the behavior collecting. The benefits from these gamification design can decrease time and cost. These researches design the method of measurement and find the results in the future work.

## VII. METHODOLOGY

Data are design to collect by using 2 questionnaires. The first one aim to collect the text investment risk. The second collect the main risk to visualization data.

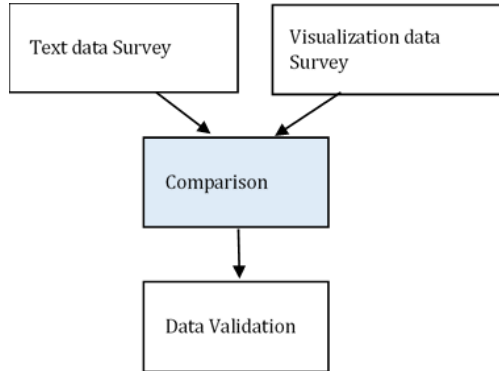


Fig. 1. Methodology for visualization and text comparison

The Figure 1 shows the method for data validation. First, the text data are designed to compare with the visualisation data. Then, the comparison data are analysed by using T-test.

### Participations

A This study surveys the investment risk in Thailand The mean 62 participants' age is around 35-44 (53.2% female). Normally the average risk of investment is level 3 out of 5.

## VIII. RESULTS

Table 1 given below is the Reliability Statistics Table which provides the value for Cronbach alpha which in this case is .744 and reflects high reliability of the measuring instrument. Furthermore, it indicates high level of internal consistency with respect to the specific sample.

TABLE 1: RELIABILITY STATISTICS

<i>Cronbach's Alpha</i>	<i>N of Items</i>
.744	13

As Table 2 shows above, that other than Question 1,2,3,4 if one delete any other question then the reliability will result lower Cronbach Alpha. However the Corrected Item-Total Correlation value for Question 1,2,3,4 are very low i.e. .147,.150,.142,.173 therefore low correlation indicates that we should consider removing the item from the overall questionnaire or edit the questionnaire.

TABLE 2: ITEM-TOTAL STATISTICS RESULTS

<i>Question</i>	<i>Scale Mean if Item Deleted</i>	<i>Scale Variance if Item Deleted</i>	<i>Item-Total Correlation</i>	<i>Cronbach's Alpha if Item Deleted</i>
1. Gender	30.56	34.381	.147	.747
2. Age	29.03	36.622	-.150	.766
3. FStatus	29.92	33.420	.142	.754
4. AsetC	29.68	33.402	.170	.749
5. InvestType	29.24	29.531	.427	.721
<i>Question</i>	<i>Scale Mean if Item Deleted</i>	<i>Scale Variance if Item Deleted</i>	<i>Item-Total Correlation</i>	<i>Cronbach's Alpha if Item Deleted</i>
6. InvestTime	29.39	32.143	.268	.740
7. InvestObjective	30.06	27.799	.661	.690
8. InvestRisk	29.71	28.341	.645	.694
9. InvestFeel	29.60	29.359	.638	.700
10. InvestValue	29.69	29.527	.518	.710
11. InvestDecision	29.44	30.479	.537	.712
12. PicAssetC	29.85	32.946	.214	.745
13. Pic Invest Type	29.18	28.247	.443	.720

The Paired Samples Correlation table adds the information that Data collection in text(AsetC) and Data collection in Picture (Pic AsetC) scores are significantly positively correlated ( $r = .505$ ). The Paired 2 Samples Correlation table adds the information that Data collection in text (InvestType) and Data collection in Picture (Pic InvestType) scores are significantly positively correlated ( $r = .584$ ).

TABLE 3 : THE PAIRED SAMPLES CORRELATION

	<i>N</i>	<i>Correlation</i>	<i>Sig.</i>
Pair 1	AsetC & PicAssetC	62	.505
Pair2	InvestType & Pic InvestType	62	.584

## IX. CONCLUSION

Reliability in this study shows the overall consistency of a questionnaire that designs to measure the investment risk. A measure is said to have a high reliability if it produces similar results under consistent conditions. In this case, deleting Question 1,2,3,4 would increase our Cronbach's alpha score, so deletion should be considered. The results shows the reliability of a questionnaire that designs to measure the investment risk. The visualization questionnaire can represent the behavioral data that will apply to gamification design.

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