

## The employment of gamification towards excellence in police services management

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### ABSTRACT

Gamification is a motivation and psychological-oriented approach which aims to boost user participation and engagement. It is commonly applied to business process and information systems which need outcomes improvement such as educational system, customer relationship management, human resource management system, health information system, so forth. The main purpose of gamification is using game elements to non-game purpose in order to motivate users. Unfortunately, building gamification system is not similar to build general software because developer needs to identify considerable psychology aspects and also engage other expertise. In this research, gamification framework and its implementation are proposed which took police department as research object. We present gamified-police management system development framework to build the gamified-police management system and its implementation in order to gain police engagement and public trust.

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## 1. INTRODUCTION

Studies on job satisfaction in enterprises have been established in recent years. Particularly, some of such studies addressed the issues of the efforts to increase profit and competitiveness of the enterprises. In contrary, lack employees satisfaction leads to low-performed inactive employees who are unable to help the enterprises achieving their expected results. According to the reason, their management and strategic levels needs to ensure that the needs of their employee are satisfied. Consequently, human resources are not merely elements to finish tasks but also an intangible resources which have set of skills and abilities to realize organizational goals.

As an enterprise, a police department is one of important services organized by all government in all countries. It also is known widely, the performance of the police department as criminal justice organization are monitored and assessed using performance indicators [1]. The reason is that the police department plays vital role and has responsibility to ensure public safety, public order protection, crimes detection and investigation, and justice activities [2]. Police officers as human resource of the police department are in charge to do investigation and other justice activities. They are required to execute critical government services [3] and structurally also arranged as important personnel in crime investigation justice system [4].

This means that they intend to accomplish a number of tasks and consequently, the tasks' pressure has increased. Moreover, such the pressure might contribute to the reduction of the employees' satisfaction, which in turn, gives a negative impact to the employees' welfare. Therefore, efforts to increase the employees' satisfaction could be required.

The imbalance of reward and effort in workplace might cause job stress [5]. It is generated by the deficiency of reciprocity among efforts to accomplish works and rewards received by an employee such as promotions, opportunity to improve skill, bonus, and so forth [6]. Consequently, this state impacts to negative emotions such as feeling of failure, sadness, and frustration which in turn leads to health and welfare problem [7]. Previous study using motivation-hygiene theory that took police cases stated that there exists a relationship between work stress and performance [8]. Other study recommended fair and clear reward system for police because each person could have different effort [9].

Problems of reward-versus-effort imbalance are also widely extended by the fact that mostly the employees in almost all companies are millennials, who are born between 1979-1994, which are familiar in using technology [10]. They also are known as "digital natives" who have a passion to spend time playing video games and using computers, video cams, mobile phones, and internet [11]. They tend to use technology to help daily activity. Communication among them has been performed using social media. Moreover, work collaborations can be executed using Github, google documents, and so forth. This pattern can be used to improve work efficiency and include work motivation.

Motivated by the mentioned imbalance problem and millennials' behavior, we propose an idea to design and implement gamification-based framework to improve work efficiency and employees motivation. Gamification is defined as the use of game elements in a non-game purpose [12], [13] in order to motivate while doing the task [14]. This approach will be interesting to consider in solving the reward-versus-imbalance problem since the process is closer to the behavior of the millennials. It is commonly used to boost motivation of users and build sense of challenge. Basically, embedding game elements to a non-game system is different to build general software because the developer and the system's organizer have to clearly define the motivation of users, type of player, choosing game elements in advance to implement and integrate the game elements to whole system. In this research, a conceptual framework for police and law enforcement game-based system and its implementation (gamified-law enforcement software) are proposed. The framework contains a set of process in order to initiate, analyze, design, implementing, and adopting police and law enforcement game-based system. Meanwhile, the implementation is done and evaluated using user engagement scale (UES).

## 2. METHODS

This section will describe the methods which are used to implement the gamified law enforcement system. The methods include gamification, user engagement scale for evaluation, also proposed framework to embed game elements into the law enforcement processes in order to gain the motivation of users. The framework contains two parts, the first part is how to develop the gamified-law enforcement and the second part is about system adoption-diffussion.

### 2.1. Gamification approach

Gamification aims to present the application of game elements to non-game contexts [12], [15]. This technique relates to research about human behavior during gaming activities. When human obtain rewards and feedback, endorphin system in their body produces dopamine which stimulates engagement and sense of satisfaction [16]. Naturally, human-like challenges such as games are perceived appeal because there are typically high uncertainty inside the challenges. Hence, players spend so much time to play games.

Gamification approach aims to bring the win-win situation among stakeholders/players. In this paper, the policemen are suggested to get rewarded while the government is able to understand the policemen's behavior and motivation and use towards law enforcement. In order to embed the gamification into an IT-based police system, the used of framework is needed. In this research, set of activities are adopted from [17].

### 2.2. Evaluation method using user engagement scale

User engagement is defined as the quality of a user's experience that confirm positive aspects during him/her interactions to system. User engagement is not about usability aspects, but also about emotion, attention, and motivation to invest time [18], [19]. User engagement directly relates user satisfaction [20]-[22] perceived value, and intention continuance engagement while perceived value is strongly related to satisfaction and intention continuance engagement; intention continuance engagement is positively satisfaction [23], [24].

In order to ensure successful gamified police and law enforcement system, user engagement measurement is needed during system diffusion. There are six user engagement attributes focused attention, aesthetic, novelty, perceived usability, durability, and felt involvement [18]. Table 1 shows the description of the six user engagement attributes.

Table 1. User engagement attributes

Attributes	Descriptions
Focused attention	The feeling of blended in the interaction and losing track of time
Aesthetic	The attraction towards visual interface
Novelty	A strong desire to know and interest in the interactive task
Perceived usability	A way to understand that the system existence is meaningful to users
Endurability	Extensive the successful of interaction between users and system. Also, the users' willingness to recommend the system to others
Felt involvement	The feeling of having fun during interaction to the system

**2.3. Gamification framework for law enforcement**

This section focuses on proposed framework of how to embed game elements into the law enforcement processes in order to gain the motivation of users (see Figure 1). Embedding the game elements into the system is not only about software deployment but also about the identification of problem which is related to motivation, defining gamification flow, user engagement variables, and executing gap analysis. A team of gamification experts would be needed to accomplish such the identification.

Moreover, development of gamified-police management system also engages law expert to ensure the proposed solution is aligned to policy because embedding gamification aims to motivate users, performing better experience for users, rewarding well-performed users, or even giving punishment without against its policy and standard operations.

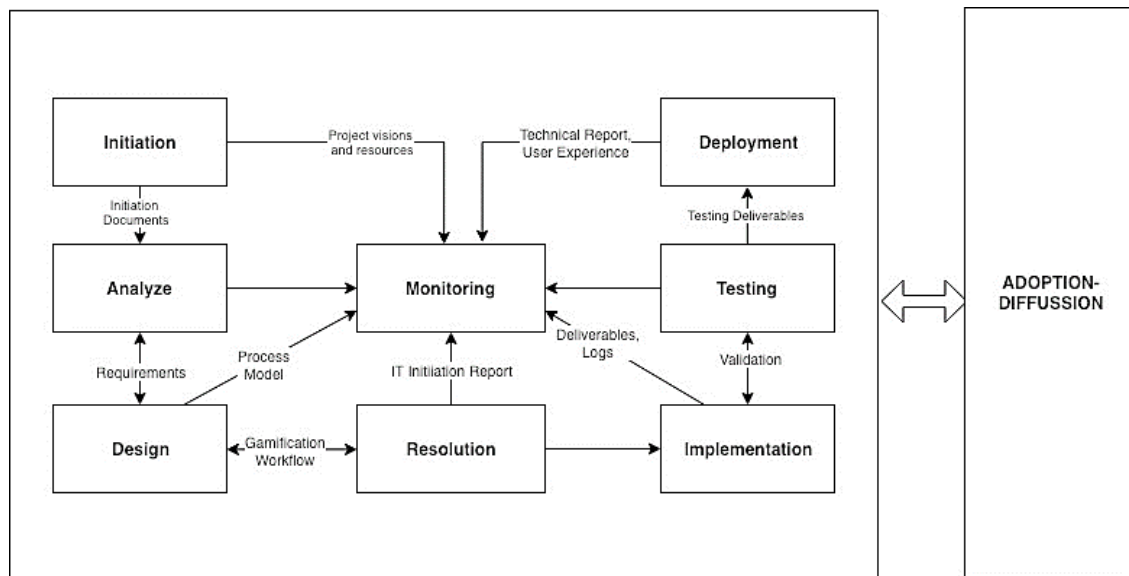


Figure 1. Gamification framework in law enforcement

Gamification framework in law enforcement is adapted from software development life cycle (SDLC). The implementation of gamification often engages software development. Traditionally, the implementation of gamification has been established long time ago such as when the parents rewarded children who achieved good scores in which scoring system is part of games or when soldiers rewarded honorable badges for successfully finish missions. The first phase in the proposed gamification framework is the initiation phase that aims to generate project initiation documents which contains project vision, stakeholders list, project team, and budget estimation. In this phase, the system's users will also join in a discussion group to share their stories in briefcase.

Secondly, the analyze phase is set of activities to analyze the current system, targeted system, the expected output, cost estimation and analysis, and user's requirements. In this phase, system's organizer discusses with a team of gamification experts to create user stories. The created user stories should include the definition of all users' motivation types which are also related to the types of players, user engagement criteria, the current level of engagement, and expected level of engagement. Determining type of player aims to model the gamified-process, defining game mechanics such as game elements and its rules.

In the third phase, i.e., design phase, the needs of users are converted into a model of gamified process which contains game mechanics and dynamics design. The design process of game mechanics includes determination for game rules, point and reward system, social elements, conversion system for every achievement in gamified-system to real-world achievement such as promotions and bonus, and list missions and checkpoints. After designing game mechanics, gamification expert design dynamics such as design emergent actions and gameplay behaviour towards game mechanics. In the beginning, every police officer with same job desk and level start equal. However, as every police officer has different dynamics, there will be achievement for every police officers. As a result, police department is able to notice well-performed and well-motivated police officers which lead to clearer and fairer reward system. After designing the game mechanics and dynamics, gamification expert design for aesthetics such as choosing color, composing sound effect and music, and animations. In this third phase, gamification expert continuously engage system owner in designing game mechanics, dynamics, and aesthetics. Along with the discussion, there will be number of design revisions. In order to validate the design as proof-of-concept, information technology (IT) expert group, and treasury managers are recommended to join the discussion.

In the fourth phase, i.e., resolution phase, the IT expert group is charged to convert the gamification workflow which has been approved in the design phase to an IT initiation report. The flowchart which is previously generated will be represented as an IT conceptual design such as unified modelling language (UML) diagrams, data flow diagram, and so on. These representations of IT conceptual design are included in a document and reported to the organization. In this phase, IT experts might engage third party team by recruiting junior programmers.

The fifth phase, in which the implementation holds, the design is coded by programmers and the progress of the implementation must be reported to IT project managers in order to ensure that the software is aligned to the previously accepted gamified-process. Moreover, IT experts are not only responsible to program and implement software but also integrate all information system components. The sixth phase, i.e., testing phase, aims to test the gamified system prototype. The test contains functional and non-functional tests which must be complied to the requirement analysis result in previous phase. Gamification expert, system owner, and end users are included in the testing activities. After the testing phase has been accomplished and the tested gamified system is ready to get installed, the IT experts prepare an IT infrastructure to fully install the system and grand the authority to all users. All phases are monitored by management and strategic level in order to ensure the system is aligned to organization needs.

After the system is deployed, getting used, and documented, the organization is responsible towards an IT adoption-diffusion. Adoption is the first stage towards the diffusion. It must be defined such that the gamified system is understandable, accepted, and fully-used by individual user. Meanwhile, gamified system diffusion is a multi-stage process which aims to spread and introduce usability of gamified system using communication channels such as mass media, society, electronic, and so on.

The multi-stage process is started with (1) sharing knowledge about gamified-system, (2) persuasion process, which invites users to use and involve in the gamified-system, (3) decision, which finds the organization acceptance level, will organization continue, append, or discontinue the used of gamified-system. (4) implementation, which ensures the gamified-system is well-implemented and in this stage, IT experts ensure the IT infrastructure, configuration, standard operations run properly. In this stage of diffusion, organization starts a support system for users; (5) confirmation, which review and monitor the impact of gamified-system using quick judgment by facilitating a group discussion, mathematic modelling, or using user engagement scale.

### 3. RESULT AND DISCUSSION

The first phase was done by generating initiation documents which contains the system scope, the system goals and its value to police management, team member in developing system, cost and its detail, also estimated budget. The initiation documents must be agreed by team leader and stakeholder representatives. After the first phase is done, the analyze phase is started by doing cost benefit analysis, system requirements analysis, and analyze the current police management system. In this phase the analysis documentation is generated. Cost benefit analysis is done to find the tangible benefits, non-tangible benefits, also the risk of gamified police management system. Meanwhile, the system requirements aim to analyze the requirement of

gamified service police management such as hardware, software requirement, and user requirement. Then, the current police service management analysis aims reveal the current situation in police service management which includes the employee perception towards the system, implementation of reward-punishment, and leader appreciation.

The implementation of third phase aims to produce system design draft. Started with designing flowchart, database design, and user interface design. The design then implemented in the implementation phase. In this page, the focus of research is the impact of gamified-service implementation.

Business processes that comply with law enforcement regulations are modified by adding game elements. These game elements allow police personnel to get rewards and punishments for each task given by the commander/higher leader. With the existence of clear rewards and punishments, it is hoped that this system can reduce bribery, improve performance and service quality. In the end, with the improvement of public services, it can provide increased reputation.

Figure 2 shows the administrator system page. It shows the implementation game element such as badge, point, and leaderboard. Not only, are game elements shown but also the task for every personnel. Once the task is done, the system automatically rewarding the police personnel. The virtual reward is aligned to real reward, the point is converted to the cash incentives, and badge is directly connected to police personnel reputation.

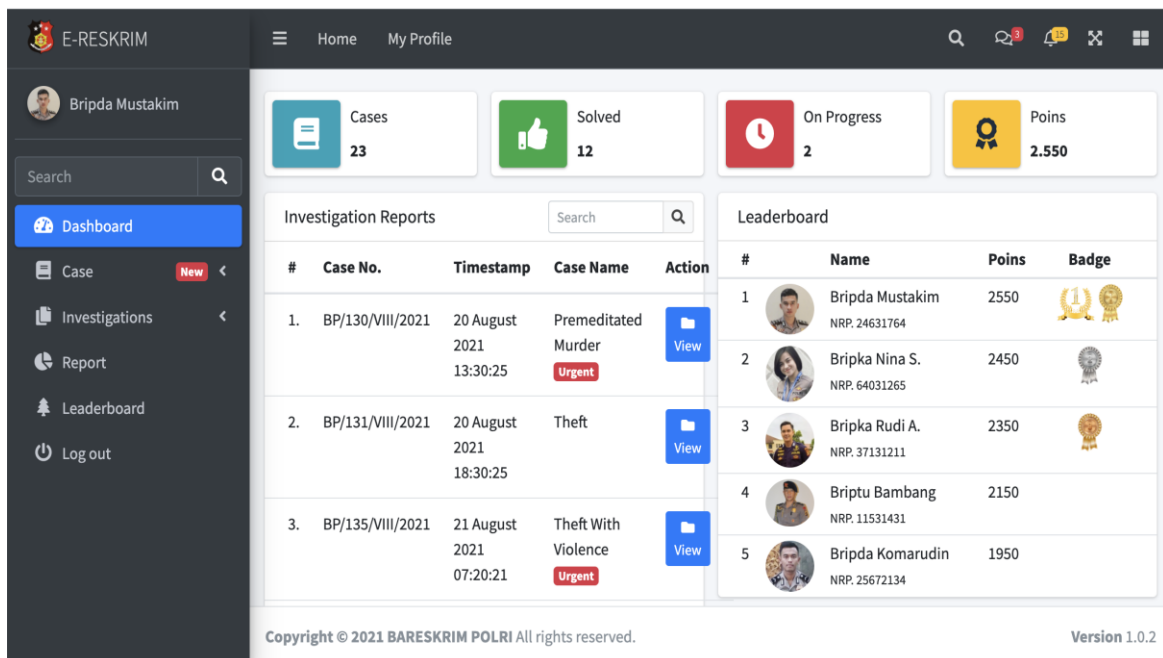


Figure 2. The implementation of game elements at administrator page

After the system is implemented, the phase is escalated to testing phase using UES to reveal the level of user engagement. Table 2 describes the attributes which are being asked to small group which consisted 30 personnel of police department in Palembang, South Sumatra, Indonesia after they used the system for two weeks and engaging the real cases. The attributes are adapted from previous findings [18], [25]. The user will give the value of Likert scale 1 to 5. One is defined as lowest score. In contrary value 5 is the highest score. Meanwhile, Table 3 describes the results.

From the police respondents who used the gamified-police management system, we can see the high level of user engagement towards the gamified system (see Table 3). The result reflects that the system reaches its goal to engage the police personnel which aligns with performance and services. In further research, we will evaluate the system by engaging larger scale of police officers. Our final goal of this research is to contribute a new way to better law enforcement and gain public trust to police personnel.

Table 2. Questionnaire attributes

Attributes	Statements
Focused attention (FA)	During the interaction, I am so focused on my work I feel focused on my work
Perceived usability (PU)	I enjoy the system and focus on my work The system having easy functions There is no confusion, I enjoy use the system
Aesthetics (AE)	I feel comfort doing my job in this system System design is appealing The system has good aesthetic aspect
Endurability (ED)	I like the user interface of system The system is useful I experience new things
Novelty (NV)	The system introduced me to new things I feel engaged and willing to keep using I have curiosity towards the game elements
Involvement (IV)	I want to know more about the system and how does it work I feel engaged and having role for this system I like how this system works I enjoy the work with the system

Table 3. User engagement evaluation result

Respondents	FA	PU	AE	ED	NV	IV	Total
1	4.6	5.0	5.0	4.6	4.3	5.0	4.7
2	4.3	4.6	5.0	5.0	4.6	5.0	4.7
3	4.6	5.0	5.0	4.6	5.0	4.6	4.84
4	4.6	5.0	4.3	4.6	4.3	5.0	4.56
5	4.6	4.3	4.6	5.0	5.0	5.0	4.7
6	4.6	5.0	5.0	4.6	5.0	4.6	4.84
7	4.6	5.0	5.0	4.6	4.6	4.3	4.76
8	5.0	5.0	5.0	4.6	5.0	4.6	4.92
9	4.6	5.0	5.0	4.6	5.0	5.0	4.84
10	4.6	4.3	4.3	4.3	4.6	4.6	4.42
11	4.3	4.6	5.0	4.6	5.0	4.6	4.7
12	4.6	4.6	5.0	4.6	4.6	4.3	4.68
13	4.6	4.3	4.3	4.3	4.6	4.6	4.42
14	4.6	5.0	5.0	4.6	5.0	4.6	4.84
15	5.0	5.0	4.6	4.3	5.0	4.3	4.78
16	4.6	4.3	4.3	4.3	4.6	4.6	4.42
17	4.6	5.0	5.0	4.6	5.0	4.6	4.84
18	5.0	5.0	4.6	4.6	5.0	5.0	4.84
19	4.6	4.6	5.0	4.3	4.3	4.3	4.56
20	4.6	5.0	5.0	5.0	5.0	5.0	4.92
21	4.6	5.0	4.3	5.0	5.0	4.6	4.78
22	5.0	5.0	5.0	4.3	4.3	5.0	4.72
23	4.6	4.3	5.0	4.3	4.6	5.0	4.56
24	5.0	4.6	5.0	4.6	5.0	5.0	4.84
25	5.0	5.0	4.6	5.0	5.0	5.0	4.92
26	5.0	5.0	5.0	4.6	5.0	4.6	4.92
27	4.6	5.0	4.6	5.0	5.0	5.0	4.84
28	4.6	5.0	5.0	4.3	4.6	4.6	4.7
29	5.0	5.0	4.6	5.0	5.0	4.6	4.92
30	4.6	4.6	5.0	5.0	4.6	5.0	4.76
Total							4.74





#### 4. CONCLUSION

In this paper, gamification framework to develop for police management system, which is called framework of “gamified-police management system”, has been introduced. The purpose of the framework is to support the development of gamified-service police management. The gamified police management aims to motivate users and expected to help police department obtain outcomes improvement. It is not only related to software development but also ensuring user engagement towards user satisfaction. The framework was used to build gamified-service police management system. Hence, we built the system and test it using User Engagement Scale at South Sumatra regional police. The result showed that police personnels were more engaging to do the task using the proposed system. Furthermore, the larger groups will be needed to ensure that by adding the game elements to the law enforcement processes, the police personnels who are millennials will be more engage which lead to positive motivation and better result.




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