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## Utilising Urban Gamification for Sustainable Crime Prevention in Public Spaces: A Citizen Participation Model for Designing Against Vandalism

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### ABSTRACT

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*gamification, crime prevention, crime deterrence, citizen participation, graffiti*

In order to create secured urban spaces, public safety need to be considered as the duty of citizens as well as official authorities. Therefore, this research focuses on the social environment of public spaces and how to encourage citizens to take prompt actions to detect, report and deter any illegal activities. Moreover, graffiti is considered as the most common type of vandalism worldwide that threatens not only our public and private properties, but also our social environment. In order to resolve the problem of graffiti, this research examines current citizen participation model applied by different stakeholders in Fukuoka City in Japan. Current model has been illustrated based on several in-depth interviews conducted with different stakeholders and citizens in Fukuoka City. Then, a new model has been proposed based on urban gamification to encourage more citizens to act as passive observers in public spaces. Proposed model has been evaluated by local communities and city hall to understand its potentials. This research found out that proposed model has the potentials to encourage more citizens to be part of the solution by being more active in public spaces. However, few obstacles regarding budget and administration might stand in the way of achieving such a concept.

## 1. INTRODUCTION

Safety in public spaces has three different aspects: physical, social and mental [1]. Physical safety can be defined as the safety of properties and people from any threats or violence that could exist in public spaces. In order to achieve physical safety in public spaces, crime prevention strategies need to be implemented to ensure more security. Crime prevention design approaches varies between situational and community-led approaches [2]. Both types of crime prevention approaches don't exist separately, but they complement each other in order to maintain a balance between police enforcement and physical and social aspects of the space.

In order to achieve the highest possible outcome, crime prevention strategies need to be focused and implemented to fight against certain types of crimes in public spaces. Therefore, this research paper focuses on the crime of drawing illegal graffiti, as graffiti is considered as one of the main threats of physical safety in public spaces in Japan [3]. Furthermore, graffiti has also proven to be a threat on the social environment, as it encourages other types of crimes and disorder in public spaces [4]. Graffiti has also proven to encourage more different types of vandalism as it is considered as a 'broken window' that encourages more disorder in the space and an overall unsafe environment [5]. Thus, this research focuses on graffiti as the most common type of vandalism that destroys public and private properties [6].

Moreover, graffiti is considered as one of the most unreported crimes, as it usually takes place in no-man island spaces with limited surveillance which makes it difficult to

detect or to monitor. Thus, to maintain a sustainable crime prevention strategy against graffiti, this research focuses on the effectiveness of using citizen participation as a central factor that improves the social environment of public spaces. Citizen participation could be defined as giving citizens and private individuals the option to engage and influence public decisions that affect them directly and indirectly [7]. Citizen participation is considered as one of the base notions of the democratic process that could be traced as far back as ancient Greece [8].

Citizen participation in urban design can be achieved through different means, as citizen participation can be divided in to two different types: traditional citizen participation and digital citizen participation. Traditional citizen participation can be achieved through public hearings, focus groups or community events. On the other hand, digital citizen participation or what is referred as e-participation (electronic participation) can be defined as using information and communication technologies (ICTs) to engage citizens in decision-making and public service delivery [9-11]. E-participation include various online tools such as virtual reality (VR), augmented reality (AR), gamified platforms...etc.

Nowadays there is a shift from traditional citizen participation to e-participation due to various reasons that can be summarized as follows:

- 1) Traditional citizen participation is usually limited to public hearings and focus groups which are conducted in specific locations at a specific time, so citizens may end up unengaged. However, digital

participation has proven to be more accessible whenever and wherever citizens want [12].

- 2) Traditional citizen participation requires many participants to join which involves a lot of arrangement to invite different people from different places to a one table. Compared to digital participation, arrangement is not a requirement as participants can engage in the process individually or in groups in a more convenient way [7].
- 3) Moreover, what makes digital participation more tempting than traditional participation is synchronization and transparency attribute. An example for that is e-voting (electronic voting) which is considered as a more convenient way to vote compared to traditional ballots [13].

All these reasons make digital participation tools such as gamification a relevant topic to be chosen as a central approach for this research. Moreover, Gamification is considered as a relatively new concept that has been developed to encourage people and increase their productivity in everyday life. Moreover, Gamification has first been implemented in the business sector as a game-like user interface to enhance users' experience; then, gamification applications have been deployed in many other fields such as: education, sports, urban planning, training pilots, etc. [14, 15]. One definition of gamification is to bring game elements to non-game contexts in order to motivate users into certain behaviours [16]. Another definition is that gamification is design that places the most emphasis on human motivation in the process [17]. However, urban gamification refers to the type of gamification that takes place in urban spaces. Urban gamification is believed to be a motivating citizen participation strategy that let individuals and citizens participate wherever they are and whenever they have time, which makes it convenient for more citizens to participate [7, 13].



**Figure 1.** Graffiti in Fukuoka City

### 1.1 Research purpose

The aim of this research is to find the credibility of utilising urban gamification, to encourage citizens to be more active against graffiti and vandalism in public spaces, in comparison with current citizen participation approaches applied by city hall, NPOs and local communities in Fukuoka City.

### 1.2 Research field

Fukuoka City has been chosen as the location of the field research, as lately local communities, NPOs and city municipalities in Fukuoka City have shown their concern about graffiti in public spaces. Graffiti is also widely spread in

many places and locations in Fukuoka City (Figure 1).

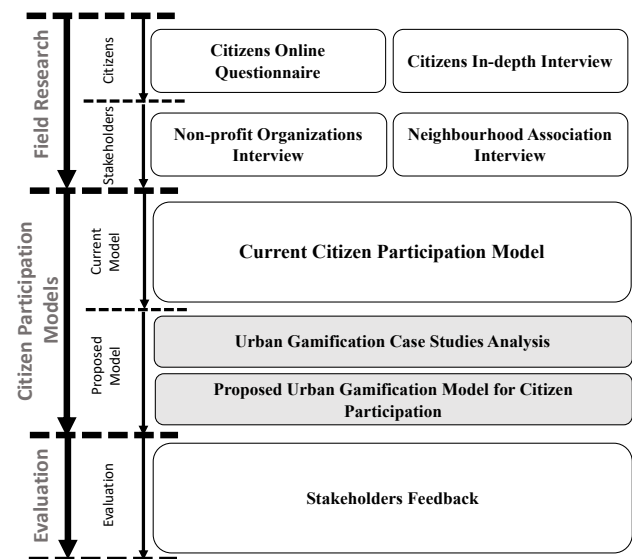
### 1.3 Research questions

Based on research purpose, three different research questions need to be settled:

- 1) What is the current situation of citizen participation against graffiti in Fukuoka City?
- 2) How urban gamification could be a potential solution to motivate citizens to be part of the solution?
- 3) What are differences between current and proposed citizen participation model?

### 1.4 Research methodology

Research method consists of three main parts (Figure 2). First part of methodology consists of a field research done on stakeholders' efforts to fight against graffiti in Fukuoka City. In addition to interviews and questionnaires with Fukuoka City citizens to understand their motives and desires in order to be more active against crimes in public spaces. Second part of methodology is a proposal of a new citizen participation model based on literature survey and field research. Final part of methodology is an evaluation for the efficiency and credibility of the proposed model by getting feedback from stakeholders.



**Figure 2.** Research methodology

## 2. LITERATURE SURVEY

Literature survey is done in order to highlight different factors of committing crimes in public spaces and the role of citizens' involvement in preventing crime occurrence as passive observers. Literature review is also done to reach an understanding of effects of graffiti on the physical and social environment, then basic knowledge of urban gamification design process was retrieved from urban gamification case studies analysis.

### 2.1 Crime prevention design approaches

According to Davey, there are four different approaches for crime prevention: Police-led approaches, planning-led approaches, spatial analysis-led approaches and community-

led approaches [18]. Community-led approaches are focused on solving the real cause of the problem or so called the core problem by alleviating the social cause of the problem such as poverty, injustice, unemployment, ...etc or by introducing new social values to the community such as social cohesion or citizen empowerment. Other crime prevention design approaches deal with the symptoms of the problem by focusing on how to reduce the opportunity for criminals and offenders to commit crimes, that is why these approaches are referred as 'situational crime prevention' approaches. Police-led approaches are developed by the work of urban theorists, criminologists and policemen in order to reduce crime occurrence in public spaces. Planning-led approaches are where planning theories are used to improve the quality of the urban environment which increase the overall safety of the space. Spatial analysis-led approaches where 'space syntax' and geographic information systems (GIS) are used to analyse urban spaces characteristics and its implications for crime prevention. The scope of this research is on community-led approaches as a social crime prevention strategy.

Situational crime prevention approaches are all about reducing crime opportunities in public spaces which could be done by dealing with the physical aspects of the urban environment including planning, street furniture, location and orientation among other different aspects. Situational crime prevention approaches include many different practices such as: Crime Prevention Through Environmental Design (CPTED) 1st Generation, Design Against Crime (DAC) and Designing out Crime (DOC).

DAC and DOC are new-borns from CPTED which makes them share the main concept of reducing the opportunity and fear of crime, but each in a different way. CPTED is more focused in dealing with the physical aspects of the environment in terms of urban design [19]. DAC also focuses on the physical characteristics of the environment, but DAC's practices are more related to product design or service design rather than urban design [2]. Likewise, DOC focuses on both sides the urban design field and the product design field, but in a co-design manner [20].

If situational crime prevention approaches reduce crime occurrence opportunities by dealing with the physical environment, then community-led approaches also reduce crime opportunities, but by dealing with the social aspect of the environment. The main goal of community-led crime prevention approaches is to introduce new values to the community such as sense of ownership, social cohesion, citizen participation and connectivity. Second-Generation CPTED and Creative Placemaking are considered as the main community-led crime prevention design approaches. Second-Generation CPTED improves the social environment of a community by implementing some activity-based solutions like events, festivals, government public hearings or community policing [21, 22]. On the other hand, Creative Placemaking improves the social environment by adapting art-based interventions that brings mutual senses between community members [23]. In easy words, Second-Generation CPTED is a functional driven community-led approach and Creative Placemaking is an emotional driven community-led approach. This research tries to investigate the possibility of adapting gamification as a community-led crime prevention strategy.

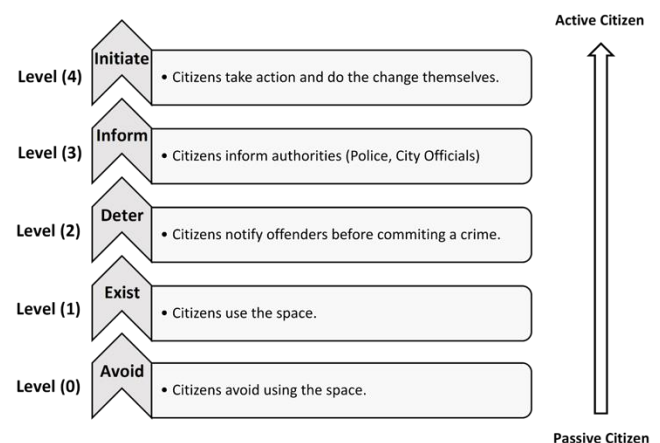
## 2.2 Citizen participation

One of the main social values that community-led

approaches try to introduce is citizen empowerment or as known as citizen participation. Citizen participation could be realised when talking about designing new projects or planning new developments, but when it comes to crime prevention, it is a little bit hazy. Although some community-led crime prevention approaches show strong case studies of how citizen participation could be used as a deterrent for offenses and crimes in neighbourhoods and public space, still private individuals' role in the process is not clear. Thus, in this part citizens' role in the crime prevention process will be discussed in detail in order to reach a better understanding of citizens' levels of involvement in the participation process.

According to Davey and Wotton, there are two different types of observers in public spaces: active observers and passive observers [2]. Active observers could be policemen, security guards or anyone whose job is to keep order in the space. Passive observers could be normal users of the space, citizens, passers-by or anyone who happens to be in the space. In order to achieve successful citizen participation against crimes, design outcome should include citizens as passive observers of the space.

According to the natural surveillance concept that was first identified in the 'Defensible Space' strategy [24], citizen or user's existence in the space ensures more eyes watching the space for any illegal activity. Moreover, according to the crime life cycle model [2, 25], in the pre-crime part of the model, behaviours of other who exist in the spaces affect the occurrence of the crime which can deter crimes before it happens. In the post crime part of the model, immediate impact and response from officials or police has an impact on preventing worse consequences of crimes.



**Figure 3.** Citizen participation in crime prevention in public spaces

From previous analysis, we can conclude that the natural surveillance strategy is considered as the first level of citizens' contribution or participation they can do to prevent crime occurrence in public spaces. Some users 'avoid' using spaces due to lack of appropriate physical characteristics that make the space unwelcoming for many, but if they decide to 'exist' in the space that usually keeps bad people away. Some citizens are active and go further to 'deter' any offender who is about to commit a crime, so they notify him or her that they are breaking the law. If offenders listen to lawful citizens that deters crime, but if not, active citizens 'inform' authorities like policemen, city officials, security guards or anyone who has the authority by law to stop criminals. The final level is when citizens decide to do something by themselves and 'initiate' the change they want to see in their space or neighbourhood,

or they may participate using different forms of participation.

Figure 3 shows different levels of involvement of citizens as passive observers to prevent crime occurrence in public spaces. The more you go up, the more active citizens are. This research aim is to promote citizens one level further or to take them to the full extent and ‘initiate’ the change by themselves.

Furthermore, in order to engage citizens in the design process both physical and social solutions should be presented. First physical issues of the space are dealt with, so citizens become more encouraged to use the space. Then, citizens start to join, participate or interact. This helps citizens to act as passive observers. Moreover, from previous literature, we can sum up that situational crime prevention approaches such as first-generation CPTED, DAC and DOC are more focused on the physical environment which is considered as a mean to deter crimes (form – to 0). In comparison, community-led crime prevention approaches such as second-generation CPTED and Creative Placemaking are more focused on the social environment which in turn achieves higher level of sustainability, as this achieves a higher level of crime prevention (form 0 to +). This research aims to examine gamification strategies to be utilised as a community-led crime prevention approach in order to achieve a higher level of sustainability of design intervention (Figure 4).

### 2.3 Graffiti effects on the environment

There are three main negative effects of graffiti on the physical environment: first, the high cost of dealing with it making it a very expensive threat that swallows money from people’s pockets every year [26]. Secondly, based on the broken window theory [5], graffiti brings more crimes and offenses to the neighbourhood making the overall environment unsafe. Thirdly, graffiti affects the image of the

neighbourhood making neighbours in discord with their surrounding environment [24].

Moreover, graffiti affects the social environment in two different ways: first, it affects people’s behaviour negatively as they might be encouraged towards more social disorder. Kee Keizer and his colleagues in the University of Groningen in the Netherlands set up different situations to see how graffiti can lure passers-by to change their behaviour. One of those situations, they put some brochures for advertisements in bicycles near to a wall without graffiti to measure how many people would drop the paper on the ground. Then, they repeated the same experiment after drawing some graffiti on the wall. They found out that without graffiti, the percentage of people who littered was 33%, but with graffiti the percentage increased up to 69%. Another situation was set up, Keizer left a €5 note sticking out of an envelope poking out of a mailbox. At first the mailbox was without graffiti, then it was covered by graffiti. Twice as many passers-by stole the money if the mailbox was daubed with graffiti or surrounded with litter. “Even little old ladies succumbed,” said Keizer “I was amazed.” [4]. That shows how graffiti can change people’s behaviour in public spaces. As any sort of disorder would encourage more offenses to happen affecting not only the physical environment, but also the social behaviour of passers-by and users.

Another social impact is the graffiti itself, as graffiti has many different bold wild styles and techniques. That makes graffiti aggressive not only in the way drawn or written, but also the content of it. As it may contain bad words or inappropriate writings. Style and content affect passers-by and users in a direct and indirect way as it may hurt their feelings or make them upset or even annoyed especially if they are exposed to it on a daily basis.

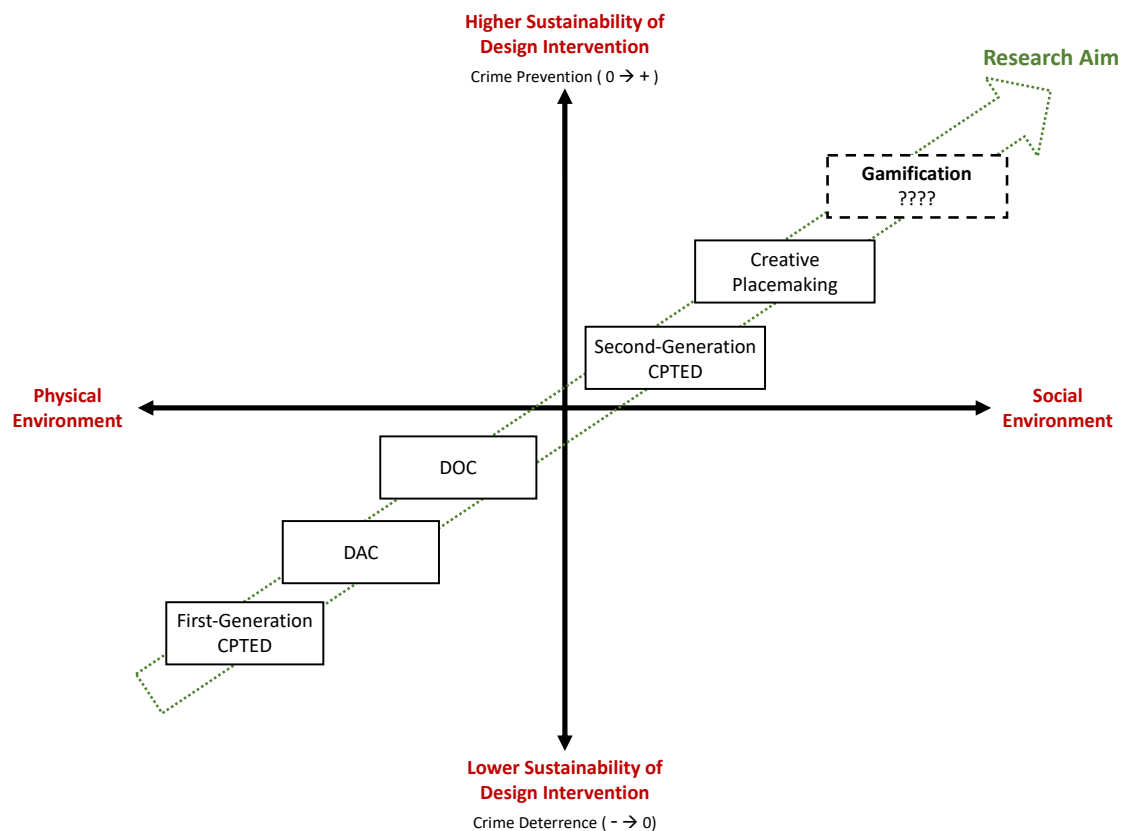


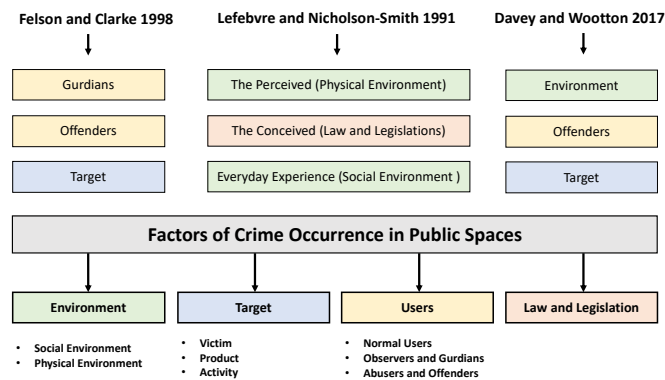
Figure 4. Crime prevention design approaches

## 2.4 Factors of crime occurrence in public spaces

In order to understand the current situation in Fukuoka City through interviews and questionnaires, criteria for designing interview questions are needed. Therefore, factors of committing crimes in public spaces have been investigated through literature review to design questionnaires and interviews based on them.

According to the basic crime triangle, three main factors lead to crime occurrence: lack of capable guardian, motivated offender and target. This target could be a victim, product or an activity [27]. Guardians, victims and offenders can be referred as users and abusers respectively. Moreover, Davey and Wotton in their book added another factor for committing crimes in public spaces which is the environment, as a poor physical environment or a fragile social environment could increase the opportunity for crimes to occur [2].

Furthermore, when it comes to the production of public spaces, there are more than crime prevention factors. Therefore, the French philosopher Henri Lefebvre explained that ‘production of space’ requires three main elements: the perceived which is the physical environment, the conceived which is law and legislations and everyday lived experience which is the social aspect of the environment [28]. Therefore, a must added factor is law and legislation, as it is considered as a conditional factor, that works in the shadow. Laws and legislations are the maestro who coordinates how the physical and social environment should be conceived and managed according to the law.



**Figure 5.** Factors of crime occurrence in public spaces

From the previous literature survey, we can conclude that there are four different factors that affects crime occurrence in

public spaces which are the target, law and legislations, environment with its both dimensions social and physical and users (Figure 5). Interviews and questionnaires were designed based on those factors to ensure similar reflection and concrete feedback.

## 3. FIELD RESEARCH

Different types of interviewees have been interviewed to get useful insights from each one of them and to make sure that research problem has been investigated from different angles. Interviewees include households, citizens who live alone, university students, high school students, a non-profit organization and a local neighbourhood association. Beside these interviews, an online questionnaire has been conducted to ask Fukuoka City citizens about the current situation of graffiti and to understand their opinions and desires (Table 1).

### 3.1 Citizens’ online questionnaire

An online questionnaire has been conducted using Google Forms and 103 responses have been collected. Questionnaire were divided into seven different sections. First section was an introduction about the research and the importance of the questionnaire. Second section was questions about personal details. Third section was about the situation in respondent’s neighbourhood (Target). Fourth section was about respondent’s awareness of laws regarding graffiti (Laws and Legislations). Fifth section was about the physical and social environment in respondent’s neighbourhood (Environment). Sixth section was about respondent’s role in fighting against graffiti (Users). Last section was an open question to let respondents write their own opinion and what they think of this matter.

Questionnaire data analysis has shown that many citizens in Fukuoka City are not aware of the consequences of graffiti occurrence. Data has shown that 60 out of 103 have seen graffiti in their neighbourhoods and 67 out of 103 have seen other types of vandalism rather than graffiti. A quick comparison of two previous responses can show us that 43 out of 60 citizens who said ‘Yes’ they have seen graffiti in their neighbourhoods have also said ‘Yes’ they have seen other types of vandalism rather than graffiti in their neighbourhood. This confirms the broken window theory [29]. Questionnaire data analysis has also shown that only 15 out of 103 citizens know graffiti penalties which could be a reason why graffiti is common in Fukuoka City.

**Table 1.** Interviews and questionnaires

Interviewee	Interview Method	Interviewee Type/Name	Number of Interviews	Time
Citizens	Online Questionnaire	Fukuoka City Citizens	103	Conducted over June 2020
	Online in-depth semi-structured Interview	Households	3	Conducted over June and July 2020
		People who live alone	2	
		Females	1	
		Males	1	
Stakeholders	In person in-depth semi-structured Interview	University Students	2	Conducted in July 2020
		High School Students	1	
	In person in-depth semi-structured Interview	(Interviewee A) Former Leader of Normalization Lions Club at Lions Club International	1	Conducted in July 2020
	In person in-depth semi-structured Interview	(Interviewee B) Chairman of Tenjin 2nd District Neighborhood Association	1	Conducted in August 2020

Questionnaire also found out that only 9 out of 103 citizens know about 'Fukuoka City Graffiti Removal Initiative' and only 27 out of 103 citizens have had the experience in participating with their neighbours in similar activities. This shows that even if citizens want to take any action against graffiti, they do not know what to do.

Questionnaire data analysis has shown that a high percentage of citizens have a fear of crime which can be translated to a lack of response in case of crime. 28 out of 103 citizens are willing to talk to graffiti offenders to stop them if they saw them in public and the rest won't. Citizens who answered 'No' they won't stop offender were asked why they said so, 52 out of 103 citizens responded that graffiti artists could be dangerous which could be risky to do so.

Questionnaire has also shown a lack of involvement when it comes to citizens to do something about graffiti. 71 out of 103 respondents reported that they would not do anything about graffiti when they were asked whether they would report graffiti or not. Furthermore, 20 out of 103 respondents would inform the police or city officials. Beside 46 out of 103 respondents would not use spaces with graffiti and prefer to find other ways.

This questionnaire has shown different issues that could be part of the core problem of why graffiti exists. These issues are relevant to each other. If we have a closer look, we will realise that citizens are not willing to get involved because their fear of crime or lack of awareness or because there are no motives to be involved in the first place. In order to come over this and encourage citizens to act as passive observer, a comprehensive solution is needed.

### 3.2 Citizens interviews

Nine different in-depth interviews have been conducted with different types of citizens in Fukuoka City. Households, school students, university students and people who live alone have been interviewed to ensure variety of aspirations from different perspectives. In-depth interviews were conducted to get more fruitful conversation and insights about graffiti from citizens. Interview questions were divided into five different sections. First section was about personal information. Second section was about interviewee's feeling about graffiti. Third section was about interviewee's response after noticing graffiti occurrence in their neighbourhood. Fourth section was about interviewee experience in participating in any volunteering activities in their neighbourhoods. Fifth and last section was about possible solutions to encourage citizens to be involved. Many useful insights have been concluded from these interviews. These insights can be summarized as follows:

- 1) Families and households would be more active in public spaces if public spaces' activities are designed in a way that let them have fun with their children. One of the interviewees who is a mother of two children said: 'Drawing on walls would be enjoyable even if it includes removing graffiti first. If my children are happy, I am happy'
- 2) People who live alone would act as passive observers, if provided citizen participation activities are designed to let them get engaged anonymously or in an indirect way, so they can participate without being socially anxious. As one of the interviewees said: 'I think it would be a little bit dangerous to participate in any public crime prevention activities, as I am

living alone, so someone who lives around me may have bad intents to women who live alone.'

- 3) Students are already participating in their schools in various club activities with their friend and classmates, so they don't mind being active in public spaces, if provided activities allow them to participate with their colleagues.

Collected insights show that citizens are willing to participate in public crime prevention activities if those activities satisfy their needs which verifies the need for a more sustainable solution that let citizens participate in an enjoyable way with respect to their desires and insecurities.

### 3.3 Citizens' online questionnaire and interviews reflection

Questionnaire and in-depth interviews with citizens have shown why citizens of Fukuoka city might not be willing to be part of the solution against vandalism and graffiti in public spaces. Questionnaire has shown a lack of involvement with 71 out of 103 respondents who are not willing to do anything about graffiti when they were asked whether they would report graffiti or not. The reason behind this lack of involvement could be explained according to insights collected from in-depth interviews, as interviewed families explained that current graffiti removal activities are not designed to include families with children. That is why families end up not participating in such activities. Another reason could be social anxiety that has been reported from interviews with people who live alone and their fear of getting engaged in public activities.

Besides lack of involvement, other problems have been reported from questionnaires such as lack of awareness of graffiti consequences and countermeasures and lack of awareness of graffiti penalties. Moreover, fear of crime has been reported from questionnaires and interviews especially interviews with people who live alone. However, the focus of this research will be on the lack of involvement, as the goal of this research is to encourage citizens to be more active against graffiti and vandalism in public spaces. Therefore, gamification has been proposed as a strategy to make citizens more active to be part of the solution.

### 3.4 Stakeholders interview

Two different interviews have been conducted with Lions Club International (NPO) and Tenjin 2<sup>nd</sup> District Neighbourhood Association.

#### 3.4.1 Lions club international interview

An active non-profit organization (NPO) in Fukuoka City named Lions Club International (LCI) has been interviewed to understand their role in standing against graffiti. In-person in-depth semi-structured interview has been conducted with a LCI member who is the former chairman of LCI Normalization Sector. Interview questions were chosen to ask about LCI activities against graffiti and vandalism in Fukuoka City in consistence with factors of crime occurrence in public spaces explained earlier.

Interviewee explained that every year LCI conduct a graffiti removal activity in Oyafukudori in Tenjin area. This activity is conducted in collaboration with city officials, policemen, students, neighbours and neighbourhood association members. Preparation for the event is a time-consuming process that requires arrangements with property owners to ask for their

permission to remove graffiti. In addition to arrangement with the police to ensure everyone's safety and coordinating with city officials to prepare the required materials for free as part of Fukuoka City Graffiti Removal Initiative [30].

This activity has many different physical and social impacts. Regarding physical impact, Interviewee explained that Graffiti is less likely to happen after those removal activities. And these activities also help to Improve the image of the neighbourhood. On the other hand, social impact can be seen when LCI started building stronger connections with many different sections of the community which is essential for social cohesion in the neighbourhood.

#### 3.4.2 Tenjin 2nd district neighbourhood association in-depth interview

With the intention of understanding how neighbourhood associations in Fukuoka City works, the chairman of Tenjin 2<sup>nd</sup> District Neighbourhood Association has been interviewed. In Japan, there are different neighbourhood associations assigned for each area on many different levels. Some neighbourhood associations are for local communities, school districts, wards or for the whole city. Neighbourhood associations work under the supervision of the city and their job is to serve the neighbourhood including keeping order and safety in the space. Neighbourhood associations conduct many different types of activities such as crime prevention activities, disaster prevention activities, cultural activities, environmental activities, welfare activities and fundraising and public relation (PR) activities. In order to conduct these activities, neighbourhood associations collect monthly fee from each household beside a fee collected from surrounding stores and businesses, but some neighbourhoods are in countryside areas with few surrounding businesses, which makes some neighbourhood associations have more money than others. An in-person in-depth semi-structured interview has been conducted with the chairman of Tenjin 2nd District Neighbourhood Association. Interview questions were chosen to ask about Tenjin 2nd District Neighbourhood Association's effort against graffiti in consistence with factors of crime occurrence in public spaces explained earlier.

Interviewee has explained that his neighbourhood association conduct a monthly activity to remove graffiti beside some special activities that could be held once a year depending on the need. Many volunteers, neighbours, policemen and city officials take part in those activities. The process and preparation of these activities is similar to LCI activity. Interviewee and other members in the neighbourhood association have to take permission from owners first, buy essential materials and prepare required uniform.

Different social and physical impacts result from these activities. Regarding physical impact, graffiti removal activities are conducted all year long which is considered as a more sustainable solution than LCI activities. In Tenjin 2<sup>nd</sup> District Neighbourhood Association, members do not remove graffiti at once, they remove it gradually little by little which is, according to the interviewee, found to be more deterrent than removing graffiti at once. On the other hand, participants in those activities receive a lot of appreciation from neighbours which is considered as a motivating feedback for members to keep up their effort.

Lastly, we can conclude from previous interviews that Tenjin 2nd District Neighbourhood Association conduct more sustainable activities compared to LCI. However, Tenjin area

has many successful surrounding businesses to pay for those activities, so that helps Tenjin 2<sup>nd</sup> District Neighbourhood Association to conduct activities all year long on a regular basis compared to other neighbourhoods with less surrounding businesses and lower source of income. Besides that, another issue comes with these types of activities is graffiti displacement to another area with less or no removal activities at all. Therefore, a city level activity is necessary to prevent such a displacement.

## 4. CURRENT CITIZEN PARTICIPATION MODEL

Current citizen participation model has been retrieved from previous field research and in-depth interviews done with different stakeholders in Fukuoka City. Figure 6 shows nine different phases that illustrate how current citizen participation model works. These phases have been illustrated using IPO (Input-Process-Output) model to realize how the process works and what are inputs & outputs for each phase. Current model phases can be explained as follows:

- 1) Planning: Interviewees explained that any public crime prevention activity requires enough fund that can be secured through fee collected from stakeholders' organization or donations in form of tools and materials from the city.
- 2) Examination: After collecting required recourses, organizers of the activity start examining the area to decide on where the activity will be held.
- 3) Coordination: Then, organizers start coordinating with other stakeholders such as police, city hall or other neighbourhood associations to make sure that the activity will go as planned.
- 4) Permission: Interviewees also explained that in Japan it is essential to get owners' permission to remove graffiti from their property, as organizers can't do anything without owners' consent.
- 5) Preparation: Then, organizers of the activity start preparing for the day of the activity by making posters to invite volunteers or by buying essential tools and materials if not provided from the city.
- 6) Invitation: Volunteers and participants are invited through posters or social media posts to make sure that organizers have the required number of participants to cover the targeted area of the activity.
- 7) Action: Then, participants start taking part in the activities to remove graffiti or repaint walls voluntarily.
- 8) Reward: After removing graffiti, citizens receive gratitude and acknowledgment from property owners which is considered as a sensory reward for their effort and time. Interviewees also explained that, in some cases, a certificate of appreciation is given to active participants as a reward.
- 9) Feedback: Received reward is considered as motive that keeps participants encouraged to participate in future activities.

We can conclude that current model requires lots of arrangement and coordination between different parties to make it happen. Although interviewees consider it effective to some extent to fight against graffiti, but it is not considered as sustainable solution. Therefore, a more sustainable solution is needed.

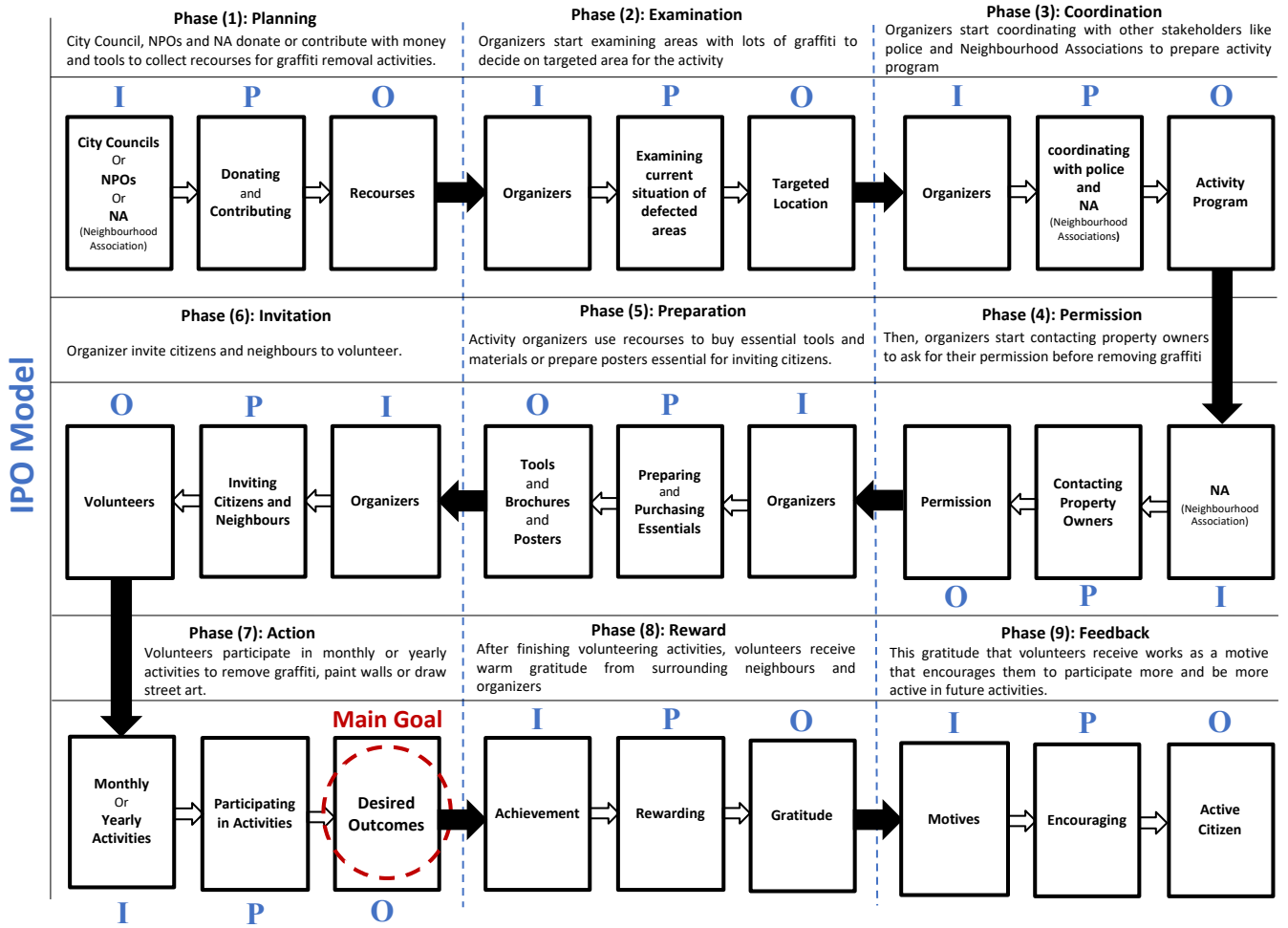


Figure 6. Current citizen participation model

## 5. PROPOSED URBAN GAMIFICATION MODEL FOR CITIZEN PARTICIPATION

In order to propose a citizen participation model based on gamification, five different case studies of urban gamification have been collected and analysed to reach a better understanding of gamification and how it works in urban spaces.

Table 2. Urban gamification case studies categorization

Citizen Participation Level		Gamification Purpose	
		Problem Solving	Feedback Tool
	Citizen Participatory	Adopt A Hydrant	Hello Lamp Post
		The Tweeting Pothole	Urbingo
	Non-Citizen Participatory		Mural Triggers

### 5.1 Urban gamification framework

Collected case studies varies between citizen participatory

games and non-citizen participatory games (Table 2). Collected case studies are as follows:

- 1) Adopt A Hydrant: is a program that let citizens with their children choose hydrants to adopt and take care of, so they can remove snow form adopted hydrants to help firefighters and save city's budget for such an issue. This program became a hide and seek game for children and their parents [31, 32].
- 2) Hello Lamp Post: is communication tool between citizens and street furniture as citizens can interact and talk to different objects in public spaces. This game aims to make the planning of cities more centred around citizens' needs and ideas to enable the true co-creation of urban environments [32].
- 3) The Tweeting Pothole: is a game that helps citizens report any potholes that may exist in streets. When drivers step with their vehicles on the tweeting button by accident, a tweet will be posted on Twitter with a mention to the Ministry of Public Works in the tweet to grab their attention [33].
- 4) Urbingo: is a tool made to record changes happening in cities in a playful way. The game contains a map and visual cards, so players can explore neighbourhoods to find scenes that match photos in cards to fill in the map [34, 35].
- 5) Mural Triggers: is an Augmented Reality interaction app that let citizens interact with murals and street art in an entertaining way to encourage citizens to travel and explore the city [36].

Different phases of the gamification process have been examined in collected case studies using IPO model (Figure 7). These phases can be explained as follows:

### 5.1.1 Phase One: Interaction

In phase one, users, citizens or passers-by notice an advertisement of the game, a sign here or there or a recommendation from a friend, so they get motivated to try the game. They start setting up the game, so they end up being players instead of just passers-by. Similar to ‘Hello Lamp Post’ game, where citizens notice yellow signs on street furniture in public spaces, so they turn on their phones to start communicating with different objects in streets. Therefore, to grab user’s attention in order to make him or her try the game or to behave in a certain way, different interface design strategies are used. For example, in ‘Urbingo’, maps and game materials are designed in a sketchy way making it attractive and easier to be read. In ‘Adopt a Hydrant’ as well, different messages pop-up once user opens the website like ‘Adopt me, please’. These messages and illustrations have their role in urging users to give it a try.

Once users decide to give it a try, game design needs to establish a good communication to maintain the first impression that was achieved by the interface design. This communication is established by using different strategies such as in ‘Adopt a Hydrant’; once users fill in application form, they receive personalised e-mails asking about their adopted hydrant using the name they choose for it; users may also receive a ‘Thanks for adoption’ e-mail. By doing this, users are motivated to go for the following phase which is action.

Because of the hue of this phase and what it requires of establishing a well-maintained interface and communication

design, this phase is usually done online (off-site) through apps, websites or printed game material. In addition to some elements that may exist offline (on-site).

### 5.1.2 Phase Two: Action

In phase two, the main input is available options, themes or levels of the game. For example, ‘Hello Lamp Post’ can be experienced through different types of objects in different locations or by talking about different topics, so users with different levels of interests choose what may be suitable for them. Once users select desired option, they are required to do a certain activity that may be physical or social depending on the type of the game and targeted behaviour. For example, ‘The Tweeting Pothole’ is considered as a social activity that urges authorities to take action, but ‘Adopt a Hydrant’ is a physical one that requires users to remove snow by themselves.

Once players reach the finish line and achieve what they are asked for, they achieve the game objectives and gain a new added value. This added value could be by learning a new thing as in ‘Mural Triggers’ or by exploring a new neighbourhood as in ‘Urbingo’. On the other hand, by the end of this phase, players would be achieving what matters to the game developers which is the main goal of designing an urban game in the first place like removing snow as in ‘Adopt a Hydrant’ or reporting authorities as in ‘The Tweeting Pothole’.

In the case of urban games, this phase is usually done on-site (offline), as urban games are made to encourage citizen to change their behaviour in public spaces in a certain way, so action phase has to be in the location of targeted behaviour. By the end of this phase, the game could finish successfully, but user may not come again. That is why there is a reward phase which makes users encouraged to come back again and again.

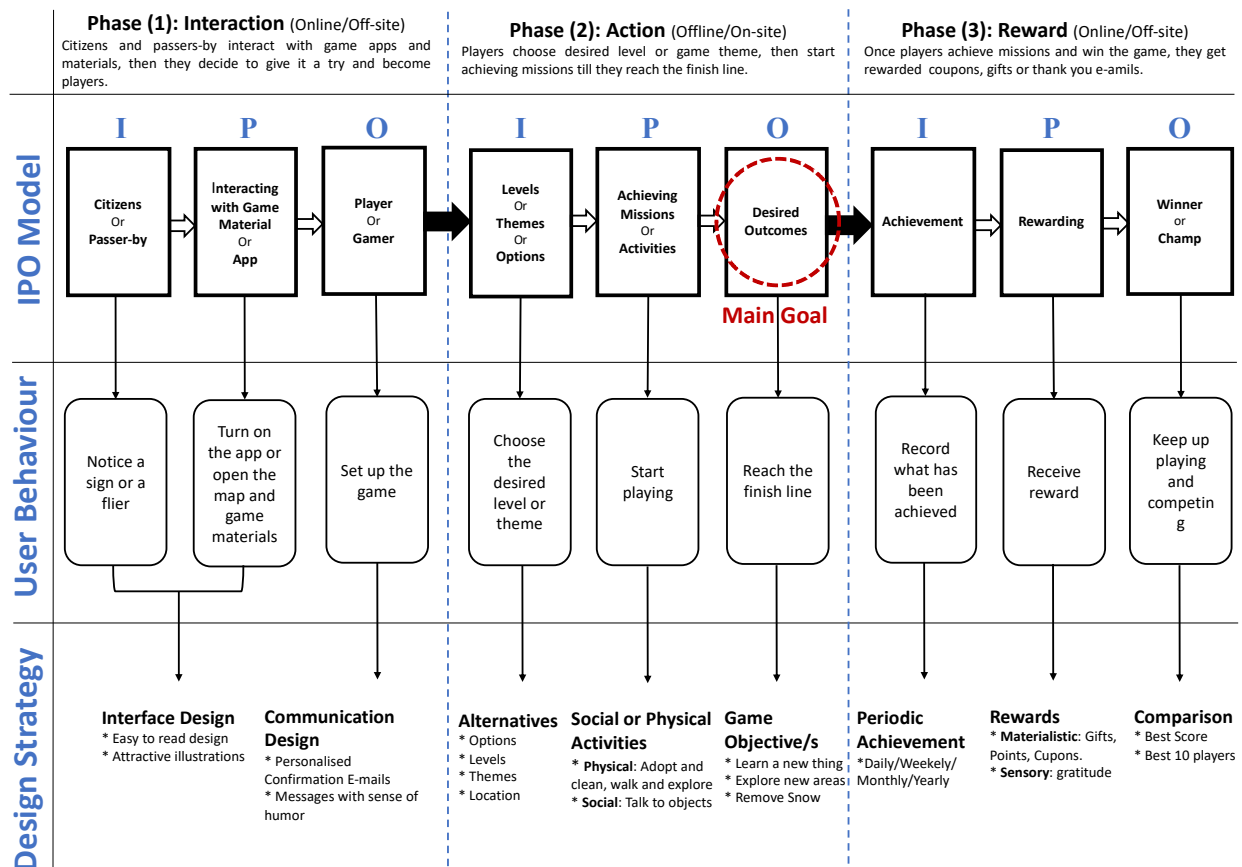


Figure 7. Urban gamification framework

### 5.1.3 Phase Three: Reward

In this phase, players are rewarded on what they have achieved to make sure that they are encouraged not only to keep playing, but also to invite others to join. Once players achieve certain number of achievements, the game rewards them back by either sensory rewards or materialistic reward. Sensory reward is in form of 'Thank You' e-mails or certificate of appreciation, but materialistic reward is in form of coupons or prizes.

Players who win are considered as winners or champs which is considered as a motive to keep up playing. Moreover, to ensure that players are considered as winners, game platform rank winners using scores and best players boards. Due to the nature of this phase, it is usually done online (off-site) by sending online gift cards or gratitude e-mails. This phase is considered as the final essential phase to keep users engaged.

## 5.2 Urban gamification model

Based on phases retrieved from current citizen participation model and gamification framework, urban gamification model for citizen participation has been illustrated. The main purpose of the proposed model is to illustrate expected citizens' behaviour through gamification process with a clear illustration of designers' role and stakeholders' contribution in the process (Figure 8). Proposed model phases are as follows:

- 1) Planning: Similar to current model, essential fund for proposed model is expected to be collected via contributions and donations from stakeholders or the city.

- 2) Design: Collected fund will be used to pay designers to design urban games that aim to promote citizen participation in public spaces.
- 3) Invitation: Similar to current model, stakeholders and game developers are responsible of promoting those games to invite citizens to try them.
- 4) Interaction: Similar to the interaction phase in urban gamification framework, citizens start interacting with the game, so they become players instead of passers-by or users.
- 5) Action: Similar to the action phase in urban gamification framework, players start following game rules to achieve the main goal and get the reward.
- 6) Reward: Similar to the reward phase in urban gamification framework, players are rewarded based on their achievements.
- 7) Feedback: Similar to current model, received reward is considered as a motive that keeps participants encouraged to participate in future activities or share what they have achieved.
- 8) Advocacy: Received feedback encourages players to share what they have achieved with families and friends through game's online platform. Therefore, players here are considered as advocates.
- 9) Social Influence: Resulted advocacy creates a social influence that encourages other citizens to try the game. Pokémon Go still one of the most well-known urban game that resulted a huge influence all over the world. Many research papers have studied Pokémon Go's influence on social and physical activities [37-43].

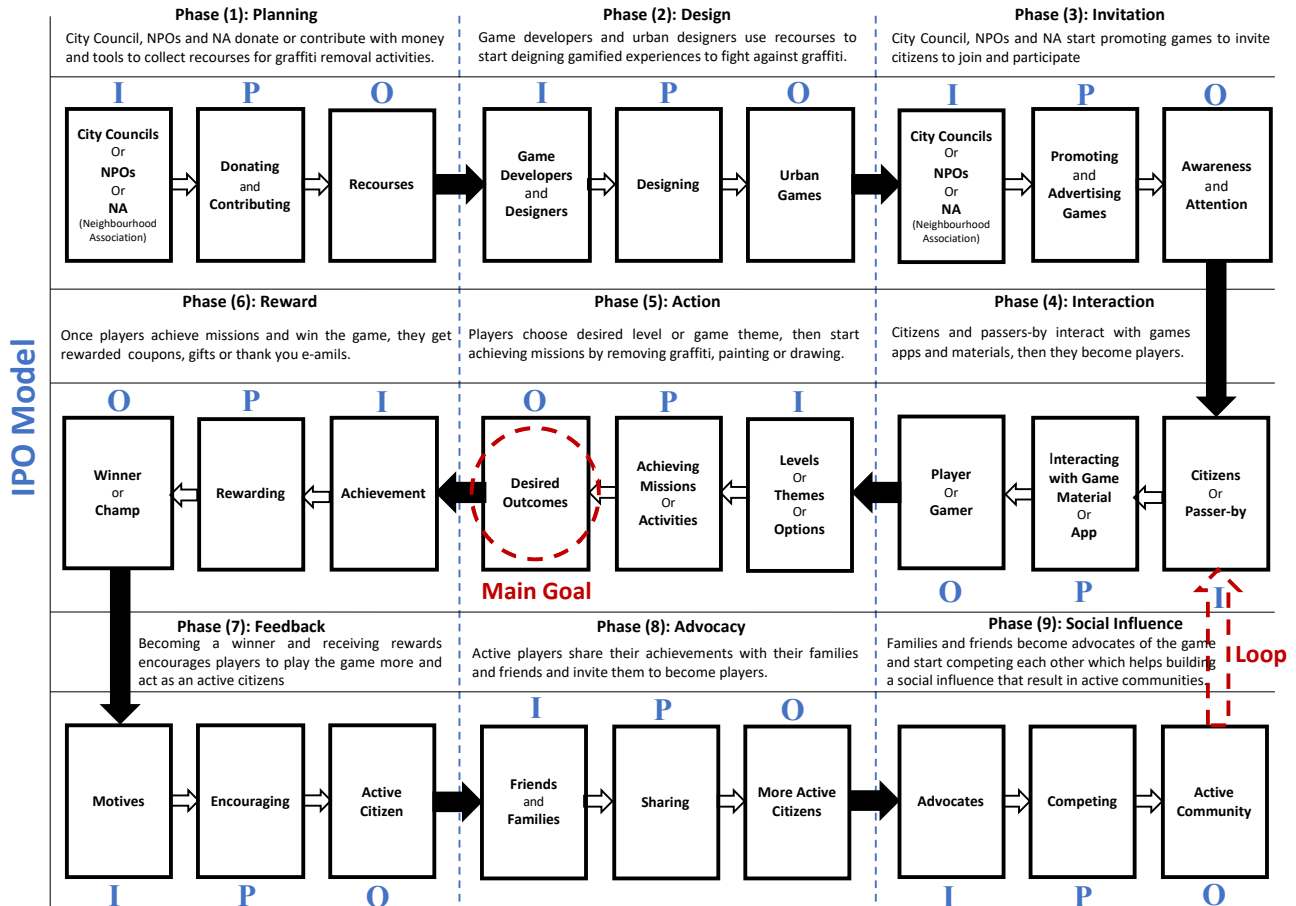


Figure 8. Proposed urban gamification model for citizen participation

Proposed model is expected to create a loop that encourages other citizens to be more active in public spaces which in turn helps to create a more sustainable solution than current model.

## 6. EVALUATION

Both current citizen participation model and proposed one have been evaluated by two different stakeholders to illustrate pros and cons of the proposed model and also to understand obstacles that would stand in the way of achieving it (Table 3). Interview questions included current model side by side with proposed one to make it easier for interviewees to spot differences between both models. Interviews were conducted with the chairman of Tenjin 2<sup>nd</sup> district neighbourhood association, who has been previously interviewed, and an official in Fukuoka City Hall. Received feedback was informative enough to formulate the overall conclusion of this research.

### 6.1 Tenjin 2nd district neighbourhood association feedback

The chairman of Tenjin 2nd district neighbourhood association has been interviewed to refine and evaluate both current and proposed models. A structured interview has been done through e-mail with the interviewee.

Regarding current model, interviewee further explained that neighbourhood associations' and local communities' role are more about securing funds for volunteering activities and coordinating with other stakeholders to make sure everything goes as planned. In addition to other secondary duties such as asking owners for permission to remove graffiti from their property and inviting volunteers. On the other hand, local communities' role in urban gamification model would be more about deciding on the suitable type of activity for the neighbourhood and how long this activity can last. That's beside securing fund for activity platforms and rewards. Interviewee also clarified that in urban gamification model, decisions will be made mainly by the chairman because he or she is considered as the leader who is responsible of all directions.

Moreover, interviewee explained that current model faces some obstacles to be achieved. These obstacles vary from one neighbourhood to another depending on its scale, size and population. For example, interviewee clarified that coordination with police in some other areas is not possible because available number of officers is not enough for such activities. Furthermore, inviting volunteers would be difficult in small neighbourhoods compared to downtown neighbourhoods such as Tenjin 2<sup>nd</sup> district where volunteers can be easily found. Interviewee has also explained that city hall doesn't have a specific department to deal with graffiti

which in turn makes graffiti removal is the full responsibility of local communities.

On the other hand, Interviewee has explained that proposed model could help neighbourhoods to get more participants to be more active towards their community. Proposed model would also help raise more funds through advertisements or sponsorships. Additionally, interviewee clarified that store owners can accept the notion of urban gamification, so they can allow their properties to be part of any game as they are more tolerable compared to other property owners such as private houses. Interviewee has also explained that Japanese people's understanding of volunteering activities is that these

kinds of activities exist in case of natural disasters only, so he hopes that proposed model would change citizens' understanding of community-led activities.

### 6.2 Fukuoka city official feedback

In order to evaluate the proposed model from city hall, interview questions have also been sent to a city official who works in park maintenance bureau in Fukuoka City hall. Interviewee replied by e-mail with answers attached.

Although interviewee appreciated proposed model, he pointed out few obstacles that would stand in the way of implementing it successfully. He explained that securing funds for rewards or platform development (ex. app or websites) would be challenging as city hall doesn't have enough money to do so. Therefore, interviewee suggested that creating a mechanism to secure funds through sponsorships or advertisements would be helpful. Moreover, regarding positive side, interviewee clarified that the current model is more cost-effective which makes it more suitable in terms of cost. Interviewee further explained that proposed model would also increase the awareness of community development which, in turn, would increase graffiti removal culture between citizens.

Additionally, Interviewee considered that current model is more applicable than proposed one for two reasons: because current model is cost effective and because it doesn't require permanent employees to manage it. Interviewee explained that proposed model may require a new division or more employees to be assigned for the purpose of gamification in the city hall which may be an obstacle. Although interviewee explained that proposed model may be costly, he also clarified that if expected achievements are beyond investments, city hall may be willing to assign a budget for such purpose. On the other hand, interviewee considered that proposed model is more encouraging, as it is easier to reach a wider audience through online platform such as apps or websites. Moreover, Interviewee expected that proposed model would achieve a higher impact than current one, as he explained that proposed model would be more effective in monitoring graffiti or enjoying street art in a more joyful way.

**Table 3.** Stakeholders feedback interviews

Interviewee		Interview Method	Interviewee Type/Name	Number of Interviews	Time
Stakeholders	<i>Councils/ Organizations</i>	E-mail structured Interview	(Interviewee A) Chairman of Tenjin 2nd District Neighborhood Association	1	Conducted in November 2020
	<i>City Officials</i>	E-mail structured Interview	(Interviewee C) Park Maintenance, Fukuoka City Hall	1	Conducted in November 2020

## 7. DISCUSSION

Based on the previous comments and feedback received from stakeholders, a comprehensive comparison between both current model and proposed one has been conducted. Table 4 shows positive side and obstacles for both models. From this comparison we can notice that both models have similar weight in terms of obstacles. However, proposed model provides more expected outcomes than current one which makes it a potential solution not only for graffiti, but also for other forms of vandalism.

If we have a closer look at the type of outcomes that

proposed model provides, we can notice that urban gamification can achieve mutual benefits for different parties including stakeholders and citizen. Some other benefits may happen if the proposed model is adopted for a long run such as increasing the number of visitors and tourists of a city to explore its street art. Moreover, it could increase businesses' sales by guiding players to the doors of these businesses. Therefore, urban gamification model is considered heavier in terms of positive side compared to the current one. However, securing enough budget and administration might stand in the way of achieving such a concept.

**Table 4.** A comparison between current model and proposed one

	Current Citizen Participation Model	Urban Gamification Model for Citizen Participation
<b>Positive Side</b>	<ul style="list-style-type: none"> <li>Current model is considered as more cost-effective than proposed one.</li> <li>Current model is supported by the city hall by providing local communities with required tools and materials.</li> </ul>	<ul style="list-style-type: none"> <li>Proposed model can help inviting more participants and volunteers.</li> <li>Proposed model can help raising more funds for local communities through advertisements and sponsorships.</li> <li>Proposed model can change people's conception about volunteering activities.</li> <li>Proposed model can also change people's conception about graffiti.</li> <li>Proposed model could have mutual benefits for graffiti artists, citizens and business owners.</li> <li>Proposed model would increase the awareness of community development that incorporates art.</li> <li>Proposed model can increase number of visitors and tourists in cities.</li> </ul>
<b>Obstacles</b>	<ul style="list-style-type: none"> <li>In countryside neighbourhoods, it may be difficult to find required number of participants and volunteers.</li> <li>Coordination with other stakeholders such as police or city halls is a time-consuming process and may not be possible in some neighbourhoods due to the lack of number of employees.</li> <li>Getting permission from neighbours takes a lot of time and it is local communities' job only. No support is provided from city hall regarding this matter.</li> </ul>	<ul style="list-style-type: none"> <li>Proposed model requires a higher budget to secure enough money for rewards and development.</li> <li>Proposed model requires permanent administration for development and management.</li> </ul>

## 8. CONCLUSION AND FUTURE RESEARCH

This research has illustrated the role of citizens in public spaces to fight against crimes and vandalism, as citizens are considered as passive observer who would be capable of deterring criminals and offenders by existing in the space, deterring abusers, informing authorities or by initiating the change by themselves.

In order to encourage citizens to be more active in public spaces, their needs and desires have to be fitted with the type and goal of participation method. Therefore, this research illustrated different aspirations collected from various in-depth interviews and questionnaires conducted with Fukuoka City citizens. From conducted interviews, citizens expressed their fear of crime to be responsible to fight against graffiti and vandalism in public spaces. Interviews have also shown a lack of awareness of graffiti consequences as well as a lack of involvement, as citizens are not willing to be involved in such a problem. In order to understand why, current participation

model has been examined by interviewing different stakeholders to understand its pros and cons.

Then, urban gamification has been proposed as a model to motivate citizens to take action against graffiti. Proposed model has been evaluated by a local community and Fukuoka City Hall. Evaluation has shown a promising feedback with some challenges pointed out regarding budget and administration.

This research could be extended in future research by expanding the limitation of this research to include other cities' practices against graffiti. A comparative study with other cities in Europe, Africa or America would be helpful to identify differences and similarities to see the global potentials of the proposed model. Furthermore, applying the same methodology of the research to different other forms of vandalism would be helpful to measure the potentiality of urban gamification in solving other problems that threatens our public safety.

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