"Gamified" Social Dynamics in the Interactive Systems as a Possible Solution for Increasing Co-Design of Emerging Services in Smart Territories

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Abstract. The co-design practice aims to involve city users in the (re)design of products and services of a territory meeting the real people needs. Although its application gives clear advantages to the territories, many problems of this practice prevent a real, effective, and continuous active participation of people. So, its tools, approaches, and methodologies need to be renovated. In this paper the state of the art of a PhD thesis, aiming to identify how the co-design processes could be improved, is shown. In details, the preliminary analysis and results of the research are discussed, focusing on the gamification of the social dynamics among the city users who take part in the co-design processes as a possible solution to the emerged problems.

1 The Problem

In the last years, the academic debate on *smart territories* focused on many different components (e.g.: technologies, infrastructures, good policies, etc.) as fundamental elements of the "smartness", as stated by Chourabi et al. [1]. Moreover, some studies have identified smartness indicators, with the aim to elaborate rankings of smart cities (e.g.: [37], [38], etc.). However, as we showed in a previous work [39], these approaches put aside the individuality of each territory, assuming that it is possible to compare them. On the contrary, the assumption on the basis of this work is that different territories are difficult to compare, because of both different structural elements and different needs of people who inhabit them.

For this reason, the debate about smart territories is increasingly focusing on the *human component* of territories. In this regard, according to the Human Smart Cities Manifesto, people satisfaction is the main purpose for the smartness [2]. So, the *active participation* is a central requirement for people satisfaction, since it creates, as defined by the OECD (Organisation for Economic Co-operation and Development) [3], a partnership between Public Administrations (PAs) and city users (i.e. all the people who use the different city services for different reasons). In this process, the latter are

actively engaged in the decision-making processes and they determine the topics of this partnership. The *co-design practice*, in details, when applied in the urban environment, aims to involve city users in the (re)design of products and services of a territory meeting the real people needs. In this practice, the points of view of the different stakeholders are considered. Indeed, during a co-design session, designers involve users from the stage of *problem identification* until the stage of *prototyping* of the conceived product or service [4]. Some examples of the use of these practices are PERIPHÈRIA [5] and MyNeighbourhood [6] projects.

Although the co-design gives clear advantages to the territories, many problems of this practice prevent a real, effective, and continuous active participation of people. According to a research investigation carried out in this study, although 85% of people consider positive or totally positive the possibility to involve city users in the PA decision-making processes and 73,6% are willing or absolutely willing to be involved in these processes, only 24,5% of people took part in the past in PA decision-making processes. Among them, 25,9% consider their experience negative or totally negative, defining it "ineffective", "disadvantageous", "unwieldy", "complicated", "not exciting", "trivial", "repetitive", and "boring". Moreover, the respondents affirm that the difficulty in finding people willing to get involved in these processes, the lack of interest from the PAs, the possible lack of experience in the design field by city users, and the lack of openness and collaboration of people are among the main disadvantages of co-design practices. For these reasons, the latter needs to be renovated.

In this paper the state of the art of a PhD thesis, aiming to identify how the co-design processes could be improved, is discussed. The focus is on: the research question of the work, the status of the identified problem in the academic debate, the preliminary ideas and results, the followed methodology, and the contributions of this work to the problem domain.

2   The Research Question

Considering the problems emerged in the previous paragraph, the research question of this work is: "*How the co-design practices can be improved in order to better involve city users in (re)designing services and products of a territory?*". In details, the purpose of this research is to identify dynamics bringing city users to the main territory issues and involving them in designing products or services. The aim is to renovate the co-design practice, making people more willing to be involved in identifying the problems of a territory, in ideating products or services, and in prototyping them.

3   Current Status of the Problem

The co-design, considered as the general practice of involving users in designing products and services for themselves, is not a recent approach. However, in the last years the importance of people in these processes is increased. Just think the increasingly important role assumed by consumers in creating products that companies will market and sell them, as stated by Prahalad et al. [7]. With the larger consideration

of the relationship between PA and the other city users, this practice has been also applied to the design of urban products or services.

In the academic literature and in different projects, a large number of tools and methodologies are applied in order to facilitate the communication processes among people who participate in a co-design session and/or to explore and represent problems. Among these tools: the *group sketching*, the *issue cards*, the *rough prototyping*, the *affinity diagrams*, the *mind maps*, the *storytelling*, the *role play*, and the *character profiles* [8]. The possibilities of a *fast prototyping* of the products/services allow also to facilitate the fabrication of a model of the designed solutions.

However, in the relationship between PA and the other city users, the co-design process is still considered as an exceptional event. On the contrary, it should be inbuilt in this relationship, becoming a common and everyday practice. The use of the new ICTs, for instance, allows that. They can build a direct and continuous dialogue between PA and the other city users, so the latter can deeply influence the public agendas. In details, *web 2.0* tools have created virtual communities focused on specific problems and/or specific territories, increasing the possibilities for people to take part in PA decision-making processes [9].

Moreover, a *mobility co-design*, in which city users take part in the co-design processes during their "use" of the city, could capitalize the lived experiences and emotions, in order to express needs and problems in the moment when they are perceived or conceived. However, these methods are underused. The *customer journey maps* [4] allow to focus on the city user experience in interacting within the territory, but they are usually organized so that the city user is involved after the moment when the experience is lived. In this regard, the *living lab* concept is very important. They are laboratories that allow to create, explore, and evaluate new ideas related to new products or services within a territory. Indeed, they operate in real territorial contexts and they allow to create and test the services in the real contexts of use [10].

The methods above mentioned are some of the ways used to renovate the co-design practices and to facilitate people in participating in the PA decision making processes. The latter is also the focus of the research shown in this paper. Indeed, some of the concepts and suggestions discussed in this paragraph were considered the basis of this work. However, it tries to propose a personal and original way to the identified problem.

4 Preliminary Ideas and Results

The smart territories analysis is the starting point of this research. According to the *systemic perspective* of Minati [11], defining all the components of a system is a very difficult work. So, it is not possible to provide a complete description of the system and it is necessary to investigate a single variable at a time. Moreover, according to Nam et al. [12] the smart territories can be considered as systems with three main components: *people*, *technologies*, and *institutions*. Considering the affirmation provided above, it is necessary to investigate only one of them at a time. The *human component* was the first. This decision is consistent with the topic of this research that is the active participation of people in designing new products and services in their smart territories.

One of the most important contributions for the experts of urban planning is the work of Alexander et al. [13]. In defining the patterns of the language of the territories, they investigated the interactions of people within the territories. In details, they focus not only on the importance of urban spaces arranged around people needs, but also on the usefulness of spaces that allow the interaction among people. Indeed, *social interactions* arise within the territories. The development of these relations leads to the emergence of *new systemic properties* that are new characteristics and attributes of the system, within the spaces.

This paragraph investigates the ideas and results of the research, focusing on the consideration of the territories as spaces of meaning, on the "game" as a cornerstone of the territories, and on how to "gamify" the territories and the co-design processes in order to involve city users in PA decision-making processes.

4.1   Territories as Spaces of Meaning

The territories are constantly (re)defined by the interaction among people. These activities allow the city users to continuously *re-semanticize spaces*, by ensuring to meet their needs and desires. These places become *carriers of meanings* always different over the time. Therefore, the meaning arises thanks to a collective and shared building process. In this regard, Goffman [14] defines the interaction among people as a *representation*, a staging during which two or more parties continuously build a meaning related to an event or a situation. This "dramaturgical metaphor" was also used by Habermas [15], who described the *dramaturgical action* as a possible model of *social action*, where participants represent one to the other an audience and make visible something one to the other.

In this process of transformation, the *language* plays a central role. In this regard, the Speech Act Theory developed by Austin [16] and Searle [17], noted that in every *act of communication* is always present a *performative function*. Eco [18] defines "communication" as an act that produces a *transformation*. The focus is not only on the *verbal language*, but also on the *non-verbal language*. The different forms of the latter, that are the *paralinguistic system* (i.e. the sounds of a verbal communication), the *kinesics* (i.e. the communicative acts expressed by body movements, e.g.: the *gestures*), the *proxemics* (i.e. messages sent with the occupation of space), and the *haptic* (i.e. messages expressed through the physical contact) are carriers of meaning that structure actions, affecting the urban environment [19].

4.2   The Game as a Cornerstone of the Territories

In this process of transformation of the spaces, the *game* is one of the cornerstone. Indeed, it permeates not only the urban spaces specifically dedicated to the game (e.g.: playgrounds, parks, etc.), but also urban spaces born with other purposes but used with playful purposes (e.g.: a road that becomes a playing field, the technique of parkour, the traffic light that becomes a stage for a juggler, etc.). These examples need to be considered over their playful component, since the activity that characterizes those leads to the *award of new meanings* to the spaces. It concerns, for example, the

49

emergence of new social needs, of different points of view, and of new social dynamics. Generally of *new systemic properties*.

In this regard, according to Huizinga [20] the game can be considered as a *significant function* since it gives the community a chance to express how the world is seen. Turner [21] emphasizes this aspect, focusing on the game as a way to *represent the world*, to explore, invent, and recombine it. Moreover, Mead [22] considers the game as a key element in the *formation of the "Self"* process that leads a person taking the *role of the Other* and, therefore, encouraging *social cooperation*. In this regard, Winnicott [23] stresses that the game always presupposes the presence of an Other and that it is a deeply unifying activity.

Starting from the assumption that the game is a cornerstone of territories and an opportunity for the emergence of new properties, the research has investigated whether and how it can be used also during the co-design practices, in order to better involve city users in (re)designing services and products of a territory. In details, this analysis focused on the *gamification* concept. According to Detering et al. [24] this term refers to the application of elements borrowed from the game environment in contexts that do not belong to the game environment, with the aim to make more entertaining and stimulating the activities usually considered boring. The gamification approach has been mainly applied in the education field (in order to stimulate students to learn while having fun) and in marketing field (for consumer loyalty).

This research tries to apply the game elements to the co-design processes.

4.3 "Gamify" the Co-design Processes

In order to understand if and how the gamification approach can positively mould the co-design processes, three types of analysis were conducted: a review of the academic literature about gamification in smart territories and in co-design processes, an identification of the meeting points between gamification and co-design, and a survey with the aim to identify the willingness of people in using solutions combining co-design and gamification.

A Literature Review. This part of the research aimed to investigate how, within the academic literature, the gamification approach was applied in smart territory field. This analysis showed that most of the contributions focused on the design and development of web and mobile applications. Some of these applications were investigated. The focus of the analysis was on: the main areas of application of these solutions, the interaction modes between city users and game/application, and the modes of involvement of city users in the game (in [40], the results of the literature review).

The analysis showed that the main aim of the investigated solutions is to encourage people to carry out eco-friendly actions within the urban environment (e.g.: taking public transportation instead of the car [25], to separate the waste [26], to check noise pollution [27], etc.). So, in using these applications city users generally have to learn something and the correctness of their behaviour is examined [28]. Concerning the relationship between co-design and gamification, the academic literature presents some examples in which the contributions, ideas, and people needs are the core and are used

50

in order to realize, through the gamification approach, products or services useful to the users themselves. Brandt et al. [29] use different game design elements in collaborative design activities, in order to improve the idea generation process and communication between stakeholders. Except for some examples directly linked to the urban issues [30], most of the contributions are related to collaborative design activities concerning other solutions and methodologies. For instance, Cantoni et al. [31] apply a toy-based methodology in web communication design, Svanaes et al. [32] apply role playing in designing mobile systems, and Dodero et al. [33] apply different game elements in a collaborative learning environment.

The Meeting Points between Gamification and Co-design. In order to identify how the gamification approach can be applied in co-design processes, the connections between *practices*, *tools*, *aims*, *stakeholders*, and *areas of application* of these two topics were investigated. The analysis showed that there is a high number of connections between gamification and co-design. The main are: the focus on "improving" the world, the importance of the actions of players/city users, the use of a method and clear rules that produces concrete outcomes, the focus on the cooperation and exploration, the "level" concept (of difficulty in the game and of engagement in co-design), the interaction between different people with specific characteristics, etc.

This operation allowed at a first level to identify the meeting points between co-design and gamification, but at a second level the outcome was the definition of the boundaries of design possibilities that allow to insert game elements in co-design practices. They will show in the paragraph 4.4.

The Survey with City Users. The aim of this survey was to identify the *willingness of people* in using solutions combining co-design and gamification. It was carried out on a sample of 220 participants with an age range between 25 and 54 years old, with no differences between males and females. Indeed, according to the data of ISTAT - Italian National Institute of Statistics [34] and Osservatorio gioco online [35] this target is considered the more active both in participating in social and political issues, and in playing games (in [41], the results of the survey).

According to the collected data, 77,2% of the respondents consider positive or totally positive the use of the gamification approach in order to involve city users in PA decision-making processes. 70,4% of the respondents affirm that the gamification approach could increase their involvement in these processes. Among these people we find also: 50% of respondents who had declared to be not available (or absolutely not available) to be involved in PA decision-making processes; the 71,5% of respondents not already involved in these processes; the 61,4% of people who had declared to be not frequent gamers; the 68,6% of people who do not used services based on the gamification approach.

Generally they prefer to use the solutions combining co-design and gamification in order to identify problems in a specific area. They declare to prefer solutions organized in micro-sessions and to be used in and around the city, simultaneously with other activities (e.g.: walking, strolling, visiting a place, etc.). The preferred areas of

application of these solutions are the mobility and the environment issues. Finally, respondents prefer to use digital solutions rather than "analogical" ones.

4.4 How to "Gamify"

On the basis of the outcomes emerged from these analysis and from the considerations above discussed, we can affirm that it is possible to integrate game elements in co-design processes. Indeed, many meeting points between gamification and co-design were identified (paragraph 4.2) and the city users are generally willing to participate by using solutions combining these two practices (paragraph 4.3). Moreover, the co-design for the urban environment through the gamification approach has been little investigated in the academic literature (paragraph 4.1).

In this paragraph the requirements of the solutions combining gamification in co-design practice are identified. The investigated elements are the most suitable participants, environments, playtime and applications.

The Participants. The main users of these solutions will be *young adults*, who are people aged between 25 and 34 years, followed by people belonging to the age group between 35 and 44 years. Males will be slightly more than women. Moreover, they will have a level of education at least equal to the high school diploma.

Players will be not only people already willing to be involved in PA decision-making processes, but also people not willing or people who did not take part in the past in these processes. So, the use of game elements might be a good mean to encourage them to participate. Most of players who will use these solutions are people interested in the possibility of using game solutions for purposes different from the game itself. However, having already used these types of solutions in the past does not seem to be a key variable to decide to be involved in these applications.

The Environments. The game environment will be the *physical territory*. Most players would use this game in and around the city rather than in a fixed location. This aspect is consistent with the preference of players for games organized in multiple sessions. Indeed they want a high degree of freedom that allows them to decide when to play/co-design, on the basis of their time, desire, and motivation.

The Playtime. Users will play/co-deign in parallel with other activities. So, the best solutions should take into account the activities that normally people carry out in "using" their territories, without interfering with them. This characteristic makes these solutions very similar to the urban games.

Since the possibilities of interaction between the city users and the physical environment in which they live are numerous, there are many opportunities to play/co-design. The variables to consider are the following: the main action performed by the user (she/he moves, she/he is stopped); the goal of the presence of the user in the physical environment (the trip home, the shift work, the shift to another place of the personal life, the shift to other public place such as a public office, relax, walk, visiting the city, shopping, waiting); the used means (public transportation, private vehicle such

as bicycle, car, walking); the places (street, square, park, garden, waiting areas, public offices).

The Application. These solutions will be part of so-called *collaborative games*, since the players should be able to *work together*. The collaboration is intended as the union of the activities carried out by individual players and those carried out by two or more players together. Indeed, although the game focuses on a common goal, the single player needs to have specific missions and related benefits. So, the use of *game mechanics* (points, badges, awards, etc.) is a key element.

Moreover, since the game needs to have a *certain end*, the general *goal of the game* needs to be identified before. The use of *clear rules* helps to lead to the end. The combination of the rules and the resources will lead to the identification of the most suitable product or service.

The most suitable *game elements* for the solutions follow. They can be considered as the framework of the solution discussed in the next paragraph and, for this reason, they can represent the reference points for the design of new solutions combing game elements for co-design purposes.

1. *Role*. Each player (city user) will have their own *resources*, *information*, *possible actions*, and *relationship with other players*. These elements will be used to contribute in (re)designing the product or service. For example, if the common goal is to find solutions for regenerating an urban space, the possible roles played by the different city users could be: "the responsible of the green areas", "the road manager", "the responsible for pollution and waste", "the responsible for security", "the responsible for public infrastructure", "the budget manager", etc.
2. *Mission*. Each player will have a mission to complete. It will be part of the more general goal. In the example above mentioned, the mission of the road manager is to create solutions for a more sustainable mobility. She/he will contribute by using specific *resources* (e.g.: the car/bike sharing services) and *actions* (e.g.: close a road). The resources and the actions will be previously identified by the manager of the co-design process. About that, von Neumann et al. [36] define "game" the rules of the game and "play" the way in which these rules are reflected in the course of a specific game. So, in our solutions the manager of the co-design process will define the game (i.e. the actions and the resources) but the players define the play (i.e. the combination among the different actions and resources).
3. *Experience Points*. Each player, on the basis of the undertaken actions, will receive points and badges, which will represent her/his engagement in the processes.
4. *Story*. Once the planning is completed, people who manage the game (a mentor) not only will decide the winner (on the basis of the collected points and badges) but she/he also will tell the story built by the city users who played (by defining the characteristics emerged from the co-design processes).

The phases of the co-design that may be most affected by these solutions are: the creation of products and services in the area, the identification of the problems in the territory, and the implementation of the designed service/product.

5   The Contribution of the Work to the Problem Domain

As we said, the aim of this research is to show how the use of game elements can improve the co-design processes, through the gamification of the social dynamics. Although nowadays the active participation of city users in decision-making processes is a sector in which PAs are more and more investing, the problems are still numerous. In this context, the game represents a solution, not yet fully explored, useful to encourage people to interact with each other and to take part in these processes. Indeed, the relationship and the collaboration among city users leads to explore unpredictable elements and to find new solutions.

One of the suitable solutions combining game elements in co-design processes is the outcome of this research. This project is only one of the possible "declinations" of the elements of the framework identified in the previous paragraph. Starting from this framework, the identified solution, which in fact is a game tool for co-design processes, uses a *wearable technology*, specifically a *smart ring*, in order to allow city users to interact with the urban environments. This solution requires the use of a *non-verbal language*, the *gestures*, as a communication tool among city users. In details, each player (city user) will have a smart ring, corresponding to a *specific role* (e.g.: "the responsible of the green areas", "the road manager", "the responsible for pollution and waste", etc.) and *specific missions* (as part of the *overall mission* of the game). The ring will recognize the gestures performed by the wearer. Each gesture refers to specific *actions* (e.g.: "add", "delete", "clean", etc.) and *resources* (e.g.: "trees", "meeting areas", "footpaths", etc.), useful to co-design the solutions.

A *mobile application* associated with the single ring allows not only to show the city user their missions, the collected point and badges, and the available resources and actions, but also to record the performed gestures. Indeed, the mobile application, in recognizing the gestures, will transform them into *icons* and will store them. These icons will be associated to a specific place and will be visible to all the players. A combination between the different icons, as the outcome of a process of interaction between the players, will create the *overall story*, corresponding to the (re)designed product/service.

In this solution, the participation in (re)designing products or services of the urban environment occurs when city users "use" the city that is the moment in which they feel their needs and they are able to identify possible resolutions to the problems. Indeed, the use of the experience in the specific moment in which it is experienced allows to produce more effective outcomes rather than its use in other moments (e.g.: during a co-design session organized around a table).

Moreover, it is expected that this *disseminated game* oriented to the co-design takes places during the *cracks*, that are the empty times and spaces of people in their interactions within the territory.

Finally, the interaction modes among city users (the gestures) are used as real design tools. In this process, the used support (the smart ring), is particularly suitable, since it is minimally invasive and its use is independent from the execution of other activities.

6   The Methodology

The research methodology is divided into five main phases:

1. *Identification of the problem*. The academic literature on smart territory was studied. This operation allowed to identify the problem. In order to explore it, a research investigation was conducted, by identifying the aspects to focus on.

2. *Exploration of the solutions to the emerged problem*. The literature on the human component of the territories and on the gamification approach was studied. The reference to the architectural and urban studies, semiotics, sociology of communication, and game studies was necessary in this phase. Moreover, the study of the real application projects, the contact with experts, the participation in conferences and seminars, and in Italian and European projects on smart cities and open government have been crucial to learn more. After the identification of the meeting points between co-design and gamification, the administration of a survey has investigated the effective willingness of the most suitable city users in using these solutions.

3. *Definition of the requirements of the solutions*. A high number of elements concerning the most suitable characteristics for the solutions combining co-design and gamification has been identified. So, the basic requirements have been listed.

4. *Design and realization of the solution*. Starting from the defined requirements, a proof of concept of one of the most suitable solutions has been identified. The choice of the most suitable specific technologies for this project and the suitable gestures associated to the specific "roles" are in progress. The prototyping phase will follow.

5. *Testing and Evaluation*. The project designed in the previous phase will be subject to a test in a municipality of the city of Rome, whose neighbourhood committee has shown interest in the identified solution. The aim was to involve the young adults of this municipality, who complain about a lack of services, in designing solutions that improve their quality of life. This test will be useful to validate not only the designed solution but, more in general, the methodology of applying game elements in co-design processes. In details, the effectiveness of the solution in designing new products or services for the territory, the number of city users involved in this process, and the general experience lived by the engaged city users (e.g.: pleasantness of the process, perception of their usefulness in the process, possibility of a future engagement, etc.) will be evaluated through a final survey which will follow the test.

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