USER EMPOWERMENT AS ENVIRONMENTAL CO-MANAGER AGENT OF A BUILDING THROUGH GAMIFICATION

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ABSTRACT

Human behavior on games has been widely analyzed from the psychological and ethnological fields, for its sociocultural implications. Today, immersed in the society of knowledge and digital culture, we are always connected, so that access to social networks, mobile apps, videos, and examples of gamification is so utterly familiar that sometimes we are not aware of it. The application of this term is being carried out for some decades to develop and elaborate marketing strategies, decision-making, even in areas such as health, promoting healthier behaviors into habits.

Gamification consists of applying elements and techniques of game-design in contexts that are not really games. Why apply it in building environmental management? There is a clear problem when implementing strategies of energy savings and efficiency, derived from two distinct issues: users do not know the power of action they have on building environmental management when living / working; and since they ignore it, they are not involved, or not enough. Environmental management in a building often depends on a shortlist of people who are often reduced to Management and Maintenance teams. But, What about users? Can they find comfort in buildings of a certain size? Do they know how to help save energy or use it more efficiently than turning off lights and electronic devices once finished the daily task? The potential of users as actors and part of the whole social team, their empowerment once are aware of that, and beyond, quantifying their action and getting feedback to see how well they are doing, is proposed by gamification methodology.

This methodology requires a prior analysis of the user type, objective, implementing game elements (mechanical, dynamic and play components), scope, and uncertainties.

After initial training on the operation of the building environmental management, users are involved as co-managers, through some media support that reflects their daily activities and their inclusion in the overall calculation of building management. Involving users as well, would be a great achievement especially in tertiary and unique buildings.

Keywords: gamification; User empowerment; social sustainability; environmental management; energy in buildings

1.- Introduction

We are immersed in a new social paradigm in changing industrial society based on the production of material goods to a post-industrial society of services. We are facing a new society in which economic, social, political and cultural relations are being altered by a new form of organization called "network society", post-industrial society, information society or knowledge society [1].

A new revolution much more important than the industrial one, which affects all human activity and that caused a distinct social organization [2]. According to sociologist Yoneji Masuda this new society grows and develops around information and provides a general flourishing of human intellectual creativity, rather than an increase in material consumption; and highlighted as key factors knowledge and innovation, together with the adoption and diffusion of technologies that facilitate the processing and transmission of information and knowledge [3].

Moreover, in Spain there has been a change in the educational profile of its population in recent years, with an increase of the percentage of young people between 20 and 24 who completed their secondary education, while the percentage is reduced for those young people who abandoned early. Also, most of the adult population aged 25-64 years own more advanced training in the first stage of compulsory secondary education (ESO). There has also been a slight increase in the percentage of population that makes lifelong learning [4]. So, we are therefore with a population better educated, better prepared and trained for the production and dissemination of knowledge through the use of new information and communication technologies (ICTs) in the current digital society, in permanent evolution.

2.- The society of the potential of ICTs. New users. The empowerment

2.1.- The user and ICT

In this new social context, Internet is the main protagonist of active communication. According to sociologist Manuel Castells, Internet is the fabric of our lives, it is a means for everything that interacts with the whole of society [5]. According to the National Statistics Institute (INE) in the latest survey on equipment and use of ICT during 2014, 74.4% of Spanish households have access to the Internet, representing nearly 11.9 million households which have Internet access. The mobile connection is most often used in 67.2% through next-generation mobile phone (smartphone), ahead of the ADSL 66.2% [6].

Within the context of ICT there are different ways of categorizing people who use them. Thus, we define as *users* who access and use computer hardware, software and information systems (Web pages). Besides, depending on the different types of users, we can categorize again, as *users* (1.0) and *users 2.0*. The user 2.0 has two characteristics: interacts with information and it is social, because it shares, collaborates and thus has a Web presence. Another type of categorization is established based on the generation of products, whether consumed or performs both functions. These are classified as consumers, producers or *prosumers* [7].

Prosumers are those users able to produce and consume (producers and consumers) information through multimedia tools that allow you to express and share on the Web in *Web 2.0* environments, assume the role of communication channel, are able to learn from autodidactic and contagious form, sometimes getting a power that can go unnoticed by the individuals themselves [8]. This latter categorization is closely related to the type of behavior, passive or active, that can have a user. Passive users are those who only consult or seek information that others produce. The passivity of consumers is precisely because of high doses of consumption information derived mainly from a personal decision of not interacting with the content. Instead, the active user is assumed as a social subject and socializes and

shares content as the user 2.0, creating it [7]. Internet is no longer just a place to search for information; the emergence of *Web 2.0* allows for a constant, democratic, participatory and collaborative relationship among participants in cyberspace [9].
Technologies have always served to empower the individual, for instance the use of printing became revolutionary weapon of mankind as a tool for change, visibility of ideas, opinions or different voices [8].

2.2.- What is therefore empowerment?
The term empowerment is still being defined. From the different disciplines has not been agreed as a concept, being a multidisciplinary term that we find on issues related to education, health, economic policy and governance [10].
What is empowerment? In 1993, Batilwala defined empowerment from two premises: first, control over physical, human, intellectual, and financial resources, and over his own being; and second, control over ideology, beliefs, values and attitudes. If power means control on this understanding, empowerment, and therefore, means the process of gaining control [10].
Among the various disciplinary approaches we can highlight:
From psychology, empowerment concept was developed by Perkins and Zimmerman to refer to a process that allowed to have control and power, and develop esteem of the participants. In the business world, it was closer to the concept of boosting, as the fact of delegating power and authority to subordinates and give them the feeling that they are masters of their own work. Instead, the World Bank defined empowerment as the process of increasing the capacity of individuals or groups for decision-making and to transform those choices into desired actions and outcomes. Central to this process are actions that build individual and collective assets, and improve the efficiency and fairness of the organizational and institutional context which govern the use of these assets. In the latter sense, refers to the relationship between individual or group empowerment and the institutional support to contribute to the strengthening and expansion of human capabilities; and teamwork so that through the organization allows them to raise their voices, demanding basic services, political participation and accountability to different contexts to which individuals face. People who have managed to empower themselves have freedom of choices and actions [10].

3.- Participation and appropriation gap
And, what about the user, who is empowered but not involved as an active part?
If we approach the idea of the sociologist Henry Jenkins on the participation gap, after overcoming access problems – due to available connectivity from households to the public institutions- now is needed to enface cultural factors that may reduce the likelihood participation of different groups. For Jenkins the problem is structural, and the challenge is not only the ability to read and write, but also those required to participate in discussions on topics and relevant knowledge, as well as on ways of knowledge that require authority and respect [11].
If we combine this idea with another gap, arises another known as *ownership gap*, that affects people who do not use the Internet because they believe that this will not cover any of their needs. The ownership gaps occurs when a large proportion of users of the Internet and digital technology make a basic use. And in practice they feel overwhelmed by the tools, perceiving that they could do more sophisticated and valuable uses. Technology generates qualitative and radical changes when users not only "use" it, but also they appropriate it to generate even unexpected uses and therefore innovative and creative ones [12]. This gap is common in developed countries, where the population has Internet access, but the lack of motivation or

digital skills, make the use of technology very limited. Many users do not use technological tools, they do not perceive their actual usefulness [13]. The only way to overcome both gaps (participation and ownership) occurs when users are aware of the benefits that the use of ICT technologies contributes to their work and users are motivated to use them.

4.- The user, the network, and his environmental commitment

4.1.- Environmental awareness

Another feature that defines this new society is to develop environmental awareness. If the environment was only a concern for some sectors of the scientific community, environmental groups, experts and decision makers in politics, today this picture has changed during the last third of the twentieth century. The concern of the scientific community is unified with the severity of the environment condition; environmental groups have been consolidated through the action of movements and Green parties. Environmental policy has become a focus of public one [14].

In contemporary societies, environmental protection has become a value, in a positive and desirable reference. People perceive the deterioration of the environment as a serious and worrying problem depending, among other things, on the extent of information, on the presence of problems in the media, or the extent of uncertainty. Most people are declared as interested in such problems, considering “serious” or “very serious” the issues related to the state of the environment, and the environmental movement has a high degree of acceptance [15].

The shift of environmental policy towards a policy of sustainability implies the necessary participation of citizens. A sustainable society is not possible without ecological citizens and therefore there is no democratic society without citizens committed to their community. While democracy is accompanied by very low rates of interest and participation in the public sphere, commitment is manifested through features or attitudes (f.i. looking for political information, been available to debates or been keen on participating, among others). It is also important features and attitudes that are developed in the private sphere (domestic and private behavior) to lead a sustainable life, aimed at public behavior for community benefit [14].

We can find three types of public provision [14] for the environment:

1. moral commitment: expression of environmental awareness.

2. Voluntary cooperation: adoption of sustainable and environmentally responsible behavior in domestic life and in the private sphere.

3. Active participation: development of an active commitment to the environmental cause, through different ways of political and civic participation.

The citizen is sometimes an actor who merely takes a passive role enfacing decisions from public administrations, businesses and the scientific community; However, we must bear in mind that it is also a decisive actor, whose key role is attached to the transition to sustainability [13].

4.2.- Some data about the user and the environment

According to the Household and Environment Survey [16] carried out by the INE in 2008, a 96.9% of Spanish households have adopted a habit to save some water.

In terms of thermal insulation, the main measures taken by Spanish households are installing blinds or shutters (94.0%); double glazed windows (39.3%); canopy (23.0%); thermal break devices (11.4%), and installation of tinted or sunscreen glasses (4.1%).

Regarding the use of lighting, we found that an 85.5% of Spanish households have some low-consumption lighting; a 66.1% of them have at least one fluorescent tube or light, and a 67.1%, some energy saving lamp (halogen included) [16].
On the attitudes of European citizens towards the environment, the Eurobarometer 2014 [17] contains an important collection about their concerns for the environment. Regarding how important they think the protection of the environment is, a 96% of Spaniards think that is very important or fairly important. Regarding the issues of concern, in order of priority, the first 5 answers are: air pollution (58%); water pollution -seas, rivers, lakes and groundwater- (57%); the depletion of natural resources (45%); shortages of drinking water (41%), and finally the impact on their health, though chemicals used in daily products (40%).
Regarding the relevance of social role within the environment, a 88% of Spaniards believe they completely or somewhat agree with the statement that the individual can play an important role in protecting the environment in Spain, and a 83% strongly agree or somewhat agree that environmental issues have a direct impact on their daily lives.
In consideration of current behavior and expected priorities, the first 5 answers about some of the actions in the last month are: separate most of their waste for recycling (74%); reduce energy consumption, e.g., lowering the air conditioning or heating, not leaving appliances on standby, or buying energy-efficient appliances (63%).; reduce water consumption (55%); choose a more environmentally-friendly transport, -walking, bicycle, public transport- (40%); and choosing local produce (29%). As the three main priorities of the people in their daily lives to protect the environment stand out: use public transportation as much as possible instead of using their own car (59%); trash selecting so it can be recycled (54%) and reduce the energy consumption at home - electricity, heating, appliances- (42%); and in fourth position, reducing water consumption at home (25%).
Regarding the information that the public think that they manage on environmental issues, only a 56% think that it is very or quite knowledgeable, against a 44% who think it is pretty uninformed or badly informed. Furthermore, the five aspects that are less informed are: The impact on their health of chemicals used in daily products (41%); the spread of harmful exotic plants and animals –invasive species- (32%); contamination by agricultural use of pesticides, fertilizers, and others (31%); depletion of natural resources (28%), and reduction or extinction of species, their habitats and natural ecosystems as forests, fertile soils - (28%).
With regard to the shared responsibility to protect the environment, the criteria on which we should base to measure progress, would be: both social and environmental criteria as economic (61%); mainly on social and environmental criteria (17%); mainly on economic criteria such as GDP (15%); and do not know (7%). Similarly, on the involvement of different stakeholders, citizens think is not doing enough to protect the environment: big business and industry (89%); the Spanish government (86%); their region (72%); citizens themselves (68%); your city or town (68%), and the region (72%); the citizens by themselves (68%); their city or town (68%); and the European Union (67%)
Finally, among the most effective ways to address environmental problems protrude these proposals: introducing higher fines for offenders (41%); provide more information on environmental issues (38%); ensure proper accomplishment of existing environmental legislation (31%); offer higher financial incentives - tax cuts, subsidies- to industry, businesses and citizens for the environment protection (30%); introduce stricter environmental legislation (29%), or introduce or increase taxes on harmful activities to the environment (14%).

5.- User-building relationship

5.1.- The user and the environment. The commitment

According to McCunn and Gifford (2012), the employee engagement is a powerful indicator for an innovative and stimulating workplace [18].

The commitment in this context is defined as a state of mind related to work, positive, of compliance, characterized by vigor, dedication and absorption (Schaufeliet al., 2002). It is often measured by Utrecht Work Engagement Scale (UWES). However, the physical environment of the workplace is not mentioned in any of the 17 topics covered in the UWES (Montgomery et al., 2003, Durán et al., 2004, Schaufeli and Bakker, 2004, McCunn and Gifford 2012).

The government of British Columbia developed the Work Environment Survey (WES) in 2006. His results show how behavior and satisfaction of a public service could be improved. However, the WES contains only a small number of questions about the physical environment of the office buildings of the ministry. Despite this, in a recent interview, 28% of public sector employees reported that changes in the physical environment of the workplace could encourage future productivity (British Columbia Public Service, 2007).

Several agencies are working to check how the attributes of green buildings, such as improving ventilation, acoustics, and the degree of thermal control, affect the occupants.

Moreover, research at the Center for the Built Environment (CBE) in the United States, often connect physical aspects of space occupied and human behavior, such as energy consumption and productivity. In the study by Mc Cunn and Gifford, employees in 15 buildings of public and private offices in a medium city in Canada, reported the level of work commitment (measured through job satisfaction, perceived productivity and affective delivery to the organization), environmental orientation, pro-environmental behavior and opinions about the physical aspects of their buildings. The attributes of green buildings were evaluated on a scale of 36 points. No compromise or environmental attitude were correlated with attributes of green design. Surprisingly, results suggested that green design in office buildings did not have a positive effect on employee commitment nor environmental attitudes and behaviors.

This study therefore found no positive relationship between attributes of green design in office buildings and employee engagement, behavior or attitudes of concern for the environment. The greater the number of these green attributes were, the more negative impressions employees tended to have significantly about their offices.

Some complaints in particular such as not having enough access to windows, or not be allowed to decorate or personalize the working areas may have contributed to the negative correlation. These are common complaints in jobs.

One issue that draws attention in the study is that a possible influence is seen in the results derived from an aspect not quantified was how long they have been working there each of the respondents. Familiarization with the workplace can positively affect their relationship with it and therefore knowing it better, it can be assessed.

Many other interesting correlations emerge from the study. Employees with strong environmental knowledge in one of the buildings tended to perceive themselves as more committed to work than those with milder orientations, and they had better ratings to their jobs. These results may be useful for understanding the behaviors and attitudes of those who value the environment.

Although it would be desirable a greater confidence on the evaluation of methodologies, this initial study has increased awareness of social design in terms of how green buildings affect attitudes and behavior of its occupants. Further

investigation would be necessary to investigate the generalization of these results in other workplaces [18].

5.2.- The energy issue. The relationship building-user from a technical point of view

Before analyzing the study cited above, it can may be concluded that there is a direct correlation between the extent of engagement from "green" office-buildings users, and green attributes that they have.

But the question can go further, which takes us into the world of technical perspective: what the user is for the designer technician, or for the consultant in charge of sustainable or environmental issues, green appearance of conditioning, in buildings?.

If we look at the thermal point of view, for example, in a specific building, designed from scratch, the user model may be reduced to stereotypes, user templates and schedules, well defined by the legislation itself or mutually agreed, following a lack of specificity due to ignorance of the actual profile of the end user. This has resulted in academic, policy and research on energy in buildings, exposing areas of improvement for these field, the thermal loads on the users were not among the those "controllable" on a paper, giving way to those more controllable areas of improvement in the first instance, as the building envelope or efficiency of HVAC systems. Of course this is a generalization which then finds its nuances and exceptions. But broadly speaking user is unknown, or at least comparable to an average profile that ultimately results unreal.

But for all the vicissitudes that have accompanied the world of construction in recent years - the housing bubble and the huge housing stock, sectorial crisis, and tighter regulatory requirements in relation to the criteria of energy saving and efficiency more specifically with the energy rating of buildings-, eyes turn to the universe of the existing building, and more specifically into the vastness of tertiary and unique buildings, each with their user profiles, operating, geometric and constructive conditions, and, ultimately, their own story.

But if something positive may be able to see this world of chaos, if not absence, of technical information, history of reforms, adaptations and sometimes several workarounds, etc, it is that we can put a face to the user. We know who can approach at least, or even in many cases, giving them the same profile. And therefore, we can implement improvements with almost “their name”. Or at least that would be our greatest aspiration as designers or technicians in charge of environmental aspects of the building.

5.3.- Social Sciences and Energy. ¿Nonexistent relationship?

B. K. Sovacool and a team of students of various nationalities have published numerous articles on the relationship that should at least exist between General energy research at various scales, and Social Sciences.

As stated in one of his studies, *the time has led to redo the studies and research into energy. This should deliberate, systematic and institutionally be more problem-oriented, interdisciplinary, socially inclusive and diverse. Narrowly, disciplinary studies still have a place, of course, energy research. But if, as once the mathematician Norbert Weiner said, "change comes most often land nobody visited between two disciplines," then we urgently need to explore the spaces that now exist between the social sciences and energy studies* [19].

In another article, on household energy in some way extrapolated to the problem of user in their workplace, the following is stated: *There is a need to better understand the behavior, reeling social expectation and adaptive strategies, away from*

confidence in universal standards or research concerned with comfort in relation to productivity. Second, it is suggested that there is a need for research on negotiation among family members and the most of research into energy perceives households as homogeneous and does not take into account interaction as part of household management. And thirdly, and to achieve this, it will be necessary to develop methodologies that meet both physical and social aspects of daily life at home. It is clear that we need to address domestic household energy research [20].
Finally, in this other study about the lack of interdisciplinarity in the social sciences in research on energy, Sovacool states that *energy is significant not to be consumed itself, but because it makes possible certain services, and crosses and complements routines and behavioral habits* [21].

6.- User Empowerment for environmental co-management. The gamification applied to energy the building

6.1.- Empowerment for environmental co-management

After treating the analysis of the relationship between social aspect (user), and environmental one (energy, resources, indoor environment, etc.) within a building from different points of view, we can conclude that although the average user seems to have at least some notions in environmental terms and some ecological or green consciousness, yet does not seem to take them to apply directly, if somehow depended on them in their field of work.
It is therefore of great interest to detect methodologies acting on the will of the user by altering their behavior towards more favorable energy one, and encouraging a greater commitment, since its active position on the energy of the building affects the operation thereof, and therefore, a possible decision making of their energy managers.
One of these methodologies may be gamification in the working environment.

6.2.- The gamification as a methodology

Gamification is defined as the application of play elements and techniques in environments that are not about games [22].
Gamification recognizes the potential of the game, it serves as a tool through the study of game design to learn more about subjects that understand or analyze human behavior, such as Psychology, Management, Marketing or Economics. Also appreciates the fun as a potential tool to motivate.
Numerous scholars and sociologists, psychologists, philosophers, among others, from the S. XIX theorized about the game as an intrinsic part of being human, even before that culture itself, as established J. Huizinga in his book *Homo Ludens*, 1938. Some of them recognize that play attitudes motivate power, and commit players, even making them feel better.
Among game theorists, is established as features that the game is not casual, and fun way neither is, although even need to seem [22].
The term "gamification" first appears appointed by Richard Bartle, a renowned game designer. He created the first massively multiplayer online game. Although it was not exactly what we understand by that term today, the first idea is launched. Other books of researchers reinforced the ability of the game for use in non-play environments.
In the 80s a group of scholars who defended the teaching skills of video games, appeared in the face of an emerging generation of young people born in full video games emergency.

In 2002, the Movement of "Serious games" is produced by Ben Sawyer and David Rejesk, which led to the academic communities, the private sector and the miliary, and experienced in simulation games or training purposes beyond mere game.
Currently the serious game has changed, but is not considered exactly as gamification.
The movement "Games for Change" is a related initiative or group of initiatives that focuses on using games for social impact.
From here, the first attempts to gamify non-playful environments are taken, reaching the creation of numerous projects with more or less success.
In 2010 the term Gamification is formalized, as it already has critical mass, and the consensual use of the term agreed. At the same time, gamification project scholars and designers established lectures and writings that crystallized the concept and its applicability. Among them, we highlight a game developer, Jane McConigal.
There are three main areas where gamification is given:

1. External (oriented marketing, sales, or customer engagement)

2. Internal (HR, productivity enhancement, crowdsourcing)

3. Change of behavior (health and wellness, sustainability, and personal finance). At this point is where we would place the methodological purpose of gamification.

Thus, we can summarize the idea of gamification in three points:

- The gamification can motivate

- It has applications in many domains

- It covers many techniques.

Although Kevin Werbach warns that gamification does not fit always, it is not always positive, must be done properly if they are sufficient reasons, due to if it was misunderstood or enforced, it could be counterproductive.

What is gamification?

The gamification is not to:

- Turn everything into a game or in a 3D virtual world.

- Play at work.

- Use business games (eg Monopoly Mc Donalds).

- Perform simulations with didactic, educational purposes, etc.

- Use only for marketing or greater customer engagement

- Only apply points, badges and leaderboards (PETs).

- Theory of Games, which are algorithms, formulas and quantitative techniques to analyze the strategic decision making.

So what is Gamification?

Simply an experience is set, more or less directed, in which the user come in an environment with game elements that are related around a narrative, with a purpose different to mere fun, but this is the powerful tool that makes the user feel free,

independent, motivated, and committed to go into that experience, going back to it as many times as possible.

7.- Potential methodological application of Gamification in energy tertiary and unique buildings.

The potential of this type of methodologies that work among other features the involvement, commitment and recurrence (all these attributes included in term *engagement*), although they are of undoubted interest at home, because cost savings can reverse its own behavior, is even a greater challenge, especially those existing and unique commercial buildings.

The user in their workplace does not have a priori direct involvement in energy consumption and therefore economic one, and this, coupled with varying levels of knowledge about energy they may have, or about the possibilities of controlling consumption and environmental quality in their possession, the user does not feel bound, or not entirely, on energy issues.

However, their main role is in these terms of consumption of energy and resources, due to it is useless as many technical and operational measures are taken, if they are not carried out properly or not at least by the end user.

Note the importance of user behavior regarding energy issues in this type of buildings especially for two reasons: one, by feedback and data collection that can be generated, so that both the user and the community such as building managers can analyze, for possible decision making, and even models extrapolated to similar buildings; and second, for the achievement of objectives promoted and subsidized by grants or incentives occasions, in measures of Saving and Energy Efficiency, established in supranational policies.

Methodologies like this, with a tested and proven ability broadly, acting on the ability of will, commitment and user behavior against critical issues such as energy management, can not only make those goals are met, but also involve the user himself as part of a whole, making it feel more useful and connected to their working environment, as co-manager of the building's energy that houses it.

To do this we need a multidisciplinary team that allows us to understand the user-building holistically relationship, and since then, approaching as much as possible the actual profile of the user, since in Gamification, as in each building, the relationship with the user is established in a specific and concrete way, being more successful as long as we are able to portray a more accurate relationship between those.

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