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# Gamification at Work: Employee Motivations to Participate and Preference for Energy Conservation

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# **GAMIFICATION AT WORK: EMPLOYEE MOTIVATIONS TO PARTICIPATE AND PREFERENCES FOR ENERGY CONSERVATION**

*Research full-length paper*

*Track: Inter-organizational Systems and Digital Transformation*

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## **Abstract**

*Energy wastage, especially in public buildings, is one of the widely acknowledged issues that have to be addressed towards protecting the environment. Furthermore, affecting the occupants' behaviour has been identified in the literature as an under-investigated means of conserving energy. In this research paper we report on the results from an investigation we conducted in three different workplaces, situated in different EU countries. In a survey of N=119 employees, we explore Employee Motivations to Participate in Gamification at work (EMPG) and identify the needs for (i)Self-Actualisation, (ii)Self-Regulation, (iii)Rewards & Recognition and (iv)Affiliation as most prominent. Additionally we examine the employees' profiles, specific needs and preferences in game elements, towards participating in gamification aimed at conserving energy at the workplace. Correlations of the four types of EMPG with basic game elements and energy-saving actions at work are consequently explored and discussed. Ultimately, taking into consideration employees' motivations and preferences, we derive and propose design guidelines for gamified applications providing personalised feedback towards saving energy at work.*

*Keywords: Gamification, Employee, Motivation, Energy Conservation, Workplace.*

## **1 Introduction**

Buildings are responsible for 40% of the total energy consumption and 36% of CO<sub>2</sub> emissions in the EU, while one third of this demand can be attributed to non-residential buildings (European Commission, 2017). In addition, energy consumption is the source of at least 2/3 of greenhouse-gas emissions (International Energy Agency, 2016). At the same time, electricity is the preferred energy source in the commercial sector, accounting for 53% of the energy demand in 2012 and expected to reach 62% in 2040, with an average yearly growth of 1.6% – the fastest among all sectors (Conti et al., 2016). Moreover, commercial and industrial sources in the US emitted three times more CO<sub>2</sub> compared to residential in 2010, while the buildings sector accounts for 20% of the total delivered energy consumed worldwide (Lülfes & Hahn, 2013). The need for energy conservation has also been stressed

through the Paris Agreement on climate change (UN News Centre, 2016), an agreement about energy and transformative change in the energy sector at its heart (International Energy Agency, 2016). Thus, it is important to increase our efforts in reducing energy consumption in public buildings.

The behaviour of buildings' occupants is considered an important factor in the consumption of energy, as it can add – or save – a third to a building's designed energy performance (Nguyen & Aiello, 2013). Furthermore, the average amount of energy consumed per employee in the EU was over 5.600 kWh in 2015 (ODYSSEE, 2015). Although the determinants of individual energy consumption behaviour are likely different at work compared to at home (Stern, 2000), limited literature exists on the behavioural aspects of energy conservation at work (Scherbaum et al., 2008), with limited references on employees' energy use at an individual behavioural level of analysis (Bansal & Gao, 2006). Furthermore, little is known about how organizational context affects employee energy-saving behaviours (Lo et al., 2012), although employee behaviour can affect the effectiveness of technical measures implemented to save energy at work (Lo et al., 2012). Therefore, there is a need to investigate employee energy consumption behaviour and factors that may affect it towards conserving energy in public buildings.

Moreover, gamification – “the use of game design elements in non-game contexts” (Deterding et al., 2011) – has been employed towards increasing occupants' motivation for energy conservation (Reeves et al., 2012; Knol & De Vries, 2011; Brewer et al., 2013; Geelen et al., 2012; Orland et al., 2014; Bourazeri & Pitt, 2013), with achieved reductions in energy consumption in the range of 3-6% and more than 10% considered achievable, as reported in a comprehensive review of relevant published studies (Grossberg et al., 2015). Hence, gamification should be further investigated towards effecting employee energy behaviour change. Inspired by these facts, we decided to explore employees' motivations to participate in gamified activities at the workplace, as well as their specific preferences in a gamified app aimed at energy conservation. Our research is conducted in three workplaces across different EU countries. Our findings highlight that the needs for Self-Actualisation, Self-Regulation, Rewards & Recognition and Affiliation are the most prominent Employee Motivations to Participate in Gamification at work (EMPG). We also present relationships between the four EMPGs and basic game elements as well as energy-saving actions. Ultimately, we propose design guidelines for a personalised gamified application that provides feedback to employees towards saving energy at work, while taking into consideration their motivations and preferences. Next, we briefly present a review of the relative literature. Then, we present our research purpose and approach, and present our findings. Finally, we discuss the practical and theoretical contributions of this research.

## 2 Background

### 2.1 Human Behaviour towards Energy Conservation at Work

The human factor in energy conservation has been studied, from a wide range of disciplinary perspectives, since the oil shocks of the 1970s (Stephenson et al., 2010). Energy conservation through behavioural change should be considered alongside the deployment of technological improvements (Delmas et al., 2013), while bearing in mind that energy in commercial buildings is mostly consumed through heating and cooling systems, lights, refrigerators, computers, and other equipment (Conti et al., 2016). A variety of motivational theories have been recruited in various contexts, towards explaining energy conservation behaviour, such as Values-Beliefs-Norms theory of environmentalism (Scherbaum et al., 2008; Wilson & Dowlatabadi, 2007), Theory of Planned Behaviour (Lo et al., 2014) and the Norm Activation Model (Matthies et al., 2011; Stephenson et al., 2010).

Utilising altruistic motives (i.e. supporting the organization in energy and monetary savings, contributing to environmental protection, complying with peer expectations) has been suggested towards engaging employees in energy saving behaviour at the workplace, as no personal monetary gains are normally expected (Matthies et al., 2011). Therefore, promising means include educating employees

in low-energy work routines, changing organisational procedures and norms, and utilising feedback to increase the employees' awareness of their own behaviour and consequences (Lo *et al.*, 2012). Recorded savings from behavioural interventions employing feedback in specific have reached 5-15% for direct and 0-10% for indirect feedback (Darby, 2006), while, according to a meta-analysis of energy conservation experiments conducted between 1975-2012, feedback led to 7.4% reductions on average and, in contrast, monetary incentives to a relative increase in energy usage (Delmas *et al.*, 2013). Tailored information has been more effective towards energy behaviour change (Matthies *et al.*, 2011).

The role of occupants' behaviour has been largely overlooked in energy consumption analysis so far – although it also significantly affects the successfulness of technology-based efficiency improvements (Lutzenhiser, 1993). More importantly, a limited number of studies on energy conservation have been performed in workplaces, compared to households, few of which regarding individual employees' energy-related behaviour and none including inter-organisational comparisons (Lo *et al.*, 2012). Bearing in mind the abovementioned facts, we decided to conduct our research towards increasing employee motivation to conserve energy, via affecting their energy-saving norms and habits at work.

## 2.2 Workplace Gamification towards Energy Conservation

Gamification, in its most widely accepted definition, has been defined as “the use of game design elements in non-game contexts” (Deterding *et al.*, 2011). It can lead to behavioural change by utilising positive emotional feedback, break existing habits and update them with new ones by continuously setting appropriate stimuli (Blohm & Leimeister, 2013). Furthermore, it can be used to increase employee participation, improve performance and compliance in specific goals (Seaborn & Fels, 2015), and enhance employee satisfaction (Robson *et al.*, 2015). More importantly, employees can become fully engaged with new company initiatives when organizational goals converge with their own goals (Dale, 2014). By utilising gamification, we can turn traditional organizational processes into fun, game-like experiences (Robson *et al.*, 2014), change behaviour, create motivation, increase and sustain employee engagement and productivity within an enterprise (Webb, 2013; Pickard, 2015). Examples of organizations that are using gamification to motivate employees towards varying targets at the workplace include the U.K.'s Department for Work and Pensions (Burke, 2014), Deloitte (Huang & Soman, 2013) and IBM (Erenli, 2013). More importantly, the engagement mechanisms used in popular games can also be leveraged to promote real-world energy saving behaviours (Reeves *et al.*, 2012). In that spirit, energy efficiency games have already been deployed in workplace environments, such as “Cool Choices”, “WeSpire”, “Ecoinomy” and “Carbon4Square” (Grossberg *et al.*, 2015). WeSpire in specific has led to over 5 million positive actions in 45 countries (WeSpire, 2017), while Cool Choices has helped >7.000 employees, in organizations across multiple industries, to increase their energy savings through almost 260.000 energy saving actions (Cool Choices, 2017).

A variety of theories have been adapted to explain the motivational power of gamification, in an effort to harness its effects and allow for a more efficient deployment of gamification initiatives. They include: Maslow's hierarchy of needs (Ashridge, 2014; Richter, Raban, & Rafaeli, 2015; Reiners & Wood, 2015), Expectancy theory (Richter *et al.*, 2015), Goal Setting theory (Reiners & Wood, 2015), Fogg's motivation wave theory (Lewis, 2014), Theory of Reasoned Action (TRA) and Technology Acceptance Model (TAM) (Rodrigues *et al.*, 2013), Self Determination Theory and its sub-theories (Ryan & Deci, 2000; Ryan *et al.*, 2006; Vansteenkiste & Ryan, 2013), and Csikszentmihalyi's Theory on Flow (Csikszentmihalyi, 2009). The effectiveness of gamification relies on leveraging the psychology of motivation to encourage players to play (Ashridge, 2014). Therefore, understanding the individuals that are involved in a gamified experience is fundamental (Robson *et al.*, 2015) and a user-centred approach, focused on the needs and desires of end-users, should be followed in the design of gamified systems (Seaborn & Fels, 2015).

Developing models to explain and predict the influence of employees' profile on their preferences in game elements is essential when they are to be introduced in workplace environments (Codish &

Ravid, 2014). Furthermore, a pressing need also exists for the exploration of the use of game elements across contexts (Seaborn & Fels, 2015). Single elements can fulfil different functions, but in interaction with each other they can have varying and complex motivational effects (Sailer et al., 2013). As gamification might contradict with some personality types and cultural norms, it is important to distinguish between different types of end-users and their respective needs and characteristics (Shahri et al., 2014). The game mechanics that are incorporated into a gamified application also have a different impact on different user types (Uskov & Sekar, 2015). Thus, gamification must be designed to match the target users' individual characteristics, by distinguishing between different user types and assessing their characteristics and preferences in game mechanics, to motivate towards performing certain behaviours (Uskov & Sekar, 2015; Werbach & Hunter, 2012). Additionally, game mechanics that are incorporated into a gamified application have a different impact on different user types (Uskov & Sekar, 2015). Various gamer profiling typologies have been suggested in the literature. Bartle has suggested 4 basic types of gamer in his categorisation, according to their preferences and behaviour – socialisers, achievers, killers and explorers (Arnold, 2014), which he later elaborated into 8 types by dividing each of the original types into two sub-types (an implicit and an explicit one). Marczewski's HEXAD model (Tondello et al., 2016) expands Bartle's model, and lists six user types and their particular motivations to play games and gamified systems (Diamond et al., 2015): Socialisers, Free Spirits, Achievers, Philanthropists, Players and Disruptors. An individual will possess traits of each player type to some degree (Ashridge, 2014) and can possibly change type over time (Huber & Hilty, 2015).

Another direction of research has, instead of user types, identified types of user motivations as more representative of player behaviour. N.Yee's motivations to play Massively-Multiplayer Online Role-Playing Games (MMORPGs) is the most prominent example, with 10 motivation subcomponents grouped into 3 overarching components: achievement, social, and immersion (Yee, 2006). At the same time, with regards to motivations at work, Self-Determination Theory has identified Competence, Autonomy and Relatedness as predecessors of intrinsic motivation (Gagne & Deci, 2005), while D. Pink identified Autonomy – the desire to direct our own lives; Mastery – the urge to get better and better at something that matters; and Purpose – the yearning to do what we do in the service of something larger than ourselves as the basic drives of employees in the modern workplace (Pink, 2009).

However, to our knowledge, no player typology has been specifically designed to adhere to employees' individual characteristics and profiles, albeit the significantly different conditions and motivations that workplace gamification entails. At the same time, the motivational theories that explain organizational behavior, have a main focus on employees' intra-role behavior, while gamification and energy-saving at the workplace are usually connected to extra-role behaviours. Therefore, having identified this gap, we decided to research the specific characteristics and profiles of employees within the workplace context, towards applying gamification to boost their motivation for energy conservation.

### **3 Research Approach**

Our research goal was: (i) to explore Employee Motivation to Participate in Gamification at work (EMPG), (ii) identify any relationships between the employees' personal profiles and behavioural patterns towards energy consumption and conservation at the workplace, and (iii) assess their gamification design preferences in an application intended to encourage energy conservation at the workplace. Based on the reviewed literature, we compiled a composite questionnaire instrument and conducted an online survey. The employees that participated in the survey belonged to three different workplace environments: (i) a municipal IT-support office in Greece, (ii) an electricity regulation authority in Spain, and (iii) an art museum in Luxembourg. The prospective survey participants on all three sites were contacted by e-mail and invited to participate, with two additional rounds of reminder e-mails sent. The questionnaire was administered to employees of various roles in their organizations through an online platform, while a total of 119 completed questionnaires were collected. The participants

were in their majority aged between 18 and 45 years old (66,1%), while only 33,9% were older than 45 years old. Regarding their gender, male outnumbered female participants (55.7% vs 44.3%).

### 3.1 Research Instrument

We utilized a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) on all parts of the questionnaire. The aim of the first part was to assess the participants' adherence to 8 different daily energy-offending behaviours at the workplace, towards recording their existing energy consumption habits. The self-reported adherence of participants' in specific energy saving behaviours at their workplace was rated, based on (Scherbaum et al., 2008). Some of the energy consumption behaviours assessed by the original questionnaire – such as “turning off desk fans” – were not relevant in our case, as the respective equipment did not exist within the participants' workplaces. We adjusted the relative items accordingly, to fit our study context. The items we employed can be found in Table 3.

Having reviewed existing literature on game and gamification user types, as well as employee motivation at the workplace, we decided to also explore the behaviour of employees in our specific domain of application and their motivations to conserve energy through gamification. Towards that end, in the second part of the questionnaire, we utilised a subset of the HEXAD questions (Diamond et al., 2015), adding more items to cover additional facets of the game playing experience as it may be encountered at the workplace. Ten HEXAD questions were carefully selected, based on their fitness to the context of our study (the organisational setting). As for the 3 extra items employed, they further cover the workplace aspects of training, peer/social comparison and team-play within organisational boundaries. Training is a popular organisational means of enhancing employee skills and knowledge, as well as one of the most pervasive methods for enhancing employee productivity and communicating organizational goals to new personnel (Arthur et al., 2003). Social comparison processes have been connected to organizational justice, performance appraisal, virtual work environments, affective behaviour, stress, and leadership behaviour at the workplace, while the merit of integrating organizational phenomena and social comparison processes in future research has been underlined in the literature (Greenberg et al., 2006). Finally, team players are important in an organisational setting. In many companies, an established but unspoken code of proper conduct defines a “team player” as alert to the social cues that he receives from his superiors and peers, while playing his part without complaint (Alvesson & Willmott, 2002). The items we employed in this section can be found in Table 1.

The next section of the questionnaire assessed the participants' preferences in game elements within our specific field and context of application: a game aimed at reducing energy consumption at the workplace. Choosing game elements based on the players' profiles is important when designing games, to make them intrinsically motivating to them (Ferro et al., 2013). Our aim was therefore to match game elements preferences with user profiles, to derive game design choices that would make future applications more intrinsically motivating. We based the categorization of game elements, as well as their definitions, on the “legend of game element terminology” (Seaborn & Fels, 2015). The introductory question was phrased as follows: “The following table includes and explains the functionality of game elements that a game may include. Please state how important it is for you, that each one is utilized in a game aimed at reducing energy consumption at the workplace, by selecting between 1-Not Important to 7-Very Important”. The last section of the questionnaire included demographic questions (age and gender). We shall utilise the answers collected from this part towards exploring the connection between demographics and employees' game motivations and preferences.

## 4 Results

We performed three kinds of analyses on the 119 questionnaire answers collected: (i) *Reliability analysis*, to determine the reliability of the scales proposed for the respective constructs. (ii) *Factor analysis*, to ensure that the appropriateness of the items included within each construct, and/or deter-

mine the specific factors included within our proposed constructs. Newly formed constructs that were derived through this process, were also re-analysed as per their reliability. (iii) *Bivariate correlation analysis*, to explore the relationships between our variables. Correlation analysis is used to describe the strength and direction of the linear relationship between variables, while correlation values are interpreted as small ( $r=.10$  to  $.29$ ), medium ( $r=.30$  to  $.49$ ), or large ( $r=.50$  to  $1.0$ ) (Pallant, 2010). All statistical analyses were performed using IBM SPSS Statistics v.23. Prior to conducting a correlation analysis, we calculated composite scores for all the constructs mentioned in Table 1, by summing responses to the respective construct items and dividing by the number of items. Composite scores were used in the subsequent correlation analyses. The Pearson product-moment correlation coefficient ( $r$ ) is reported for all correlations as part of our analysis, along with the level of statistical significance, indicating the confidence levels of correlations calculated. Furthermore, to assess their internal consistencies, we calculated and reported the scales' Cronbach's alpha coefficients. A measurement of  $\alpha = .70$  and above is widely considered as acceptable (Pallant, 2010).

#### **4.1 Factor Structure and Scale Reliabilities**

The items of the section that assessed the participants' preferences in game elements within our specific field and context of application did not form a scale in the first place and hence the individual items were treated as separate factors in the concurrent analysis process. Additionally, the scale consisting of the self-reported behaviour items featured low internal consistency ( $\alpha = .646$ ), with a number of low (even below  $.150$ ) inter-item correlations in some cases. Therefore, we decided to treat the behavioural items as indicators of the eight different behaviours and not as a unified construct. As per the items recording the employee motivations to conserve energy through gamification, we performed an exploratory factors' analysis to derive communalities in our dataset and uncover the underlying factors. More specifically, a Principal Components Analysis (PCA) was followed after the suitability of our data for factor analysis was assessed. Indeed, an inspection of the correlation matrix revealed the presence of many coefficients of  $.3$  and above. The Kaiser-Meyer-Olkin value was  $.741$ , exceeding the recommended value of  $.6$  and Bartlett's Test of Sphericity reached statistical significance ( $p < .001$ ), supporting the factorability of the correlation matrix. The results from the PCA revealed the presence of four components with eigenvalues exceeding 1, explaining 33.63%, 14.79%, 11.78% and 9.08% of the variance respectively. Additionally, the four-component solution explained a total of 69.27% of the variance. Therefore, the results of this analysis supported the division of the items into four separate sub-scales (see Table 1).

Following the factor analysis, we performed a reliability analysis on all factors derived, to determine their uniform structure and validity. We found that all four factors were reliable, with Cronbach's  $\alpha$  ranging from  $.666$  to  $.793$ . The reliability of the Self-Regulation scale ( $\alpha = .666$ ) in specific was deemed acceptable – although below the  $.700$  threshold regularly reported for scale reliability in the literature – also taking into account that it is a three-item scale, with acceptable levels of inter-item correlation ( $.302 - .531$ ). Cronbach alpha values are quite sensitive to the number of items in the scale, while with short scales ( $< 10$  items) it may be more appropriate to report the mean inter-item correlation for the items (Pallant, 2010). Furthermore, inter-item correlations examine the extent to which scores on one item are related to scores on all other items in a scale, while values over  $.20$  indicate that the items are representative of the same content domain (Michalos, 2014). The next subsection details the four reliable factors that drive Employee Motivations to Participate in Gamification at work (EMPG).

#### **4.2 Employee Motivations to Participate in Gamification at Work (EMPG)**

We characterised each of the identified EMPGs in line with existing theories of behaviour, while taking into account the content of the questionnaire items they include. We also considered the fact that an individual is motivated to act in a way that fulfils their needs (Maslow, 1943). Hence, based on our analysis, the resulting four reliable factors that we consider as distinct employee needs/motivations to

play a gamified app at the workplace, are Self-Actualisation (3 items), Self-Regulation (3 items), Rewards & Recognition (3 items), and Affiliation (4 items). The resulting factor structure, along with the corresponding scale reliabilities for each factor can be found in Table 1.

<b>A. Self-Actualization</b>		
	<i>Items</i>	<i>Scale Reliability (Cronbach's <math>\alpha</math>)</i>
1	I like helping others to orient themselves in new situations.	.755
2	I like mastering difficult tasks.	
3	I like sharing my knowledge.	
<b>B. Self-Regulation</b>		
	<i>Items</i>	<i>Scale Reliability (Cronbach's <math>\alpha</math>)</i>
1	I prefer setting my own goals.	.666
2	It is important to me to follow my own path.	
3	I like to take changing things into my own hands.	
<b>C. Rewards &amp; Recognition</b>		
	<i>Items</i>	<i>Scale Reliability (Cronbach's <math>\alpha</math>)</i>
1	I like competitions where a prize can be won.	.793
2	Rewards are a great way to motivate me.	
3	I like comparing my performance with others. *	
<b>D. Affiliation</b>		
	<i>Items</i>	<i>Scale Reliability (Cronbach's <math>\alpha</math>)</i>
1	I like being part of a team.	.765
2	I would like to enhance my skills by training. *	
3	Interacting with others is important to me.	
4	I like to play with others in a team. *	

Table 1. Motivations to Play a Gamified app for energy conservation at the workplace - Factor Structure. Note: All items derived from (Tondello et al 2015), except those marked with \*.

A more detailed description of each of the four motivations to participate in gamification at work, anchored in theory, follows.

- **Self-Actualization** is defined as the realization or fulfillment of one's talents and potentialities, especially considered as a drive or need present in everyone (Oxford Dictionaries, 2017). It is a term that has been used in various behavioural theories, which was originally introduced by the organismic theorist Kurt Goldstein for the motive to realize one's full potential (Compton, 2014). Expressing one's creativity, quest for spiritual enlightenment, pursuit of knowledge, and the desire to give to and/or positively transform society are examples of self-actualization. Furthermore, self-actualization has also been defined as the desire for self-fulfillment, the tendency to become actualized in what a person is potentially or, alternatively, the desire to become more and more what one is, to become everything that one is capable of becoming (Maslow, 1943). Self-actualization is also a need that is considered important by both bottom- and middle-management employees, while it is not perceived as significantly more satisfied at the middle-management level than at the bottom-management level (Porter, 1961).
- **Self-regulation** is defined as the ability to act in ones long-term best interest, consistent with their deepest values, as well as a system of conscious personal management that involves the process of guiding one's own thoughts, behaviors, and feelings to reach goals (Bandura, 1991). It therefore refers to self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the



attainment of personal goals – a cyclical process because the feedback from prior performance is used to make adjustments during current efforts (Zimmerman, 2000). Furthermore, when we self-regulate, we adapt our emotions and actions to situational requirements as well as internalized social standards and norms (Berger, 2011). In social cognitive theory human behavior is extensively motivated and regulated by the ongoing exercise of self-influence. The major self-regulative mechanism operates through three principal sub-functions: self-monitoring of one's behavior, its determinants, and its effects; judgment of one's behavior in relation to personal standards and environmental circumstances; and affective self-reaction (Bandura, 1991).

- **Rewards and recognition** are discussed in connection to the extrinsically motivated behavior that occurs when an activity is rewarded by incentives not inherent in the task (Shiraz et al., 2011). According to (Maslach et al., 2001), rewards and recognition is one of the six areas of work-life that lead to burnout and engagement and, therefore, work engagement is also associated with appropriate recognition and reward (Saks, 2006). Rewards and recognition also have a great impact on employee motivation. Furthermore, it can motivate employees to excel in their performance, as well as create a linkage between performance and motivation. However, according to Lawler, there are two factors which determine how much a reward is attractive to an employee, namely the amount of reward given and the importance attributed by an individual to it (Danish & Usman, 2010).
- **The Need for Affiliation** is a term popularized by D.McClelland describing a person's need to feel a sense of involvement and "belonging" within a social group, therefore establishing, maintaining, or restoring a positive affective relationship (Smith et al., 1992). Furthermore, people with a high need for Affiliation spend more of their time interacting with others than people with low need for Affiliation in a work environment, as well as tend to be sympathetic and accommodating toward others, adjusting their behavior, as well as avoiding competitive interpersonal endeavors (Smith et al., 1992). The need for affiliation has been found to also positively affect satisfaction in workplace training, as well as the practical performance of employees in learnt skills – those with a high need for affiliation tend to exhibit lower performance when working alone (Klein & Pridemore, 1992). More importantly, those who are high in affiliative motivation prefer affiliative-oriented and not competitive feedback, as well as affiliative instead of personal goals (Smith et al., 1992).

The correlations between the four types of EMPG can be found in Table 2. Self-Actualization is correlated with Affiliation, as well as with Rewards & Recognition, whereas Affiliation with Self-Actualization, as well as Self-Regulation and Rewards & Recognition. Furthermore, Self-Regulation is correlated with Affiliation, while Rewards & Recognition with Self-Actualization and Affiliation. Hence, employees that will participate in gamification towards satisfying their need for Self-actualisation – becoming their optimal self – are expected to also need to satisfy their need for Affiliation – establishing, maintaining, or restoring a positive affective relationship with their colleagues – as well as their need for Rewards and Recognition – towards becoming more motivated at work.

	Self-Actualization	Affiliation	Self-Regulation
Affiliation	<b>.509**</b>		
Self-Regulation	.152	<b>.242*</b>	
Rewards & Recognition	<b>.370**</b>	<b>.423**</b>	.121

Table 2. Identified correlations between the four EMPGs.

\*\* Correlation is significant at the 0.01 level (2-tailed) – \* Correlation is significant at the 0.05 level (2-tailed).

Similarly, the ones that will participate in gamification at work towards satisfying their need for Rewards and Recognition, are expected to do so, towards becoming their optimal self (Self-Actualisation), as well as more popular to their fellow employees (Affiliation). At the same time, the

ones that will participate in gamification towards satisfying their need for Affiliation, are expected to also need to satisfy their needs for Rewards & Recognition, Self-Actualisation and Self-Regulation, towards becoming more popular amongst their colleagues. Finally, those who will participate in gamification at work towards satisfying their need for Self-Regulation – adapting their emotions and actions to situational requirements as well as internalized social standards and norms – are expected to do so towards satisfying their need for Affiliation at work. These relationships can be modelled as seen in Figure 1:



Figure 1. Inter-correlations between the four different Motivations to Play at the Workplace.

### 4.3 EMPG towards Gamified Energy Conservation at Work

The correlations between EMPG and the adherence to the eight different self-reported energy-saving behaviours we screened as part of our survey can be found in Table 3. Self-Regulation was found to be correlated with turning the lights off when leaving a bathroom, as well as turning off the printers when not used and not opening windows when the A/C is on. Affiliation was also correlated with turning off the printers when not used and turning the coffee machine off when the last to drink coffee in the afternoon. Therefore, employees driven by different EMPGs seem to also exhibit distinct energy conservation behaviours at work.

	When I am finished using my computer for the day, I turn it off.	When I leave a room that is unoccupied, I turn off the lights.	When I leave a bathroom that is unoccupied, I turn off the lights.	When I am not using my computer, I turn off the monitor.	When I leave my work area, I turn off the Air Conditioner(s).	When I leave my work area, I turn off the printer(s).	I often leave the windows open while the Air Conditioner is on (Reversed).	When I am the last to take coffee in the afternoon at work, I turn the coffee machine off.
Self-Actualization	-.057	.016	.014	.069	.132	.166	-.034	.156
Affiliation	.064	.122	.180	.083	.171	<b>.191*</b>	.012	<b>.209*</b>
Self-Regulation	.055	.017	<b>.202*</b>	-.062	-.083	<b>.212*</b>	<b>.279**</b>	.068
Rewards & Recognition	-.019	.021	.079	.030	.077	.061	-.018	-.043

Table 3. Identified correlations between EMPGs and Self-Reported Energy Cons. Behaviours.

\*\* Correlation is significant at the 0.01 level (2-tailed) – \* Correlation is significant at the 0.05 level (2-tailed).

Furthermore, linking a gamified app’s mechanics directly to the participants’ needs should be a core characteristic of gamification, through which the game designer can motivate players to act in certain ways (Ashridge, 2014). The correlations we identified, in our case, between the motivations to play and Game Element Preferences, can be found in Table 4. Self-Regulation was not correlated to any

game elements, while all the other variables (Self-Actualization, Affiliation and Rewards & Recognition), with all game elements. However, as expected, Rewards & Recognition was most strongly correlated with Rewards, while Affiliation with Progression and Self-Actualization with Status.

	Points	Badges	Leaderboards	Progression	Status	Levels	Rewards	Roles
Self-Actualization	.342**	.319**	.335**	.443**	.460**	.453**	.325**	.435**
Affiliation	.414**	.393**	.407**	.497**	.427**	.476**	.296**	.442**
Self-Regulation	.063	.089	.056	.058	.102	.072	.110	.161
Rewards & Recognition	.491**	.445**	.425**	.380**	.372**	.426**	.663**	.443**

Table 4. Identified correlations between EMPGs and Game Element Preferences towards an energy conservation application at the workplace.

\*\* Correlation is significant at the 0.01 level (2-tailed) – \* Correlation is significant at the 0.05 level (2-tailed).

Finally, with regards to the correlations between the employee motivations to conserve energy through gamification and demographic characteristics, male gender was correlated with the motivation for rewards and recognition ( $r=.256^{**}$ ,  $p=.006$ ), while the preference in most of the game elements was negatively correlated with age (Points:  $r=-.242^{*}$ ,  $p=.010$  / Badges:  $r=-.205^{*}$ ,  $p=.030$  / Progression:  $r=-.221^{*}$ ,  $p=.019$  / Status:  $r=-.231$ ,  $p=.015$  / Levels:  $r=-.188$ ,  $p=.047$ ).

## 5 Discussion

### 5.1 EMPG and Related Constructs

The Employee Motivations to Participate in Gamification at the workplace (EMPG) we derived through our analysis is also partly in line with: (i) the factors defined in N.Yee's motivations to play MMORPGs (Yee, 2006), as well as (ii) the Self-Determination Theory's (SDT) extrinsic motivation and Cognitive Evaluation Theory's (CET) – one of SDT's mini-theories – predecessors of intrinsic motivation at work (Gagne & Deci, 2005), and (iii) D.Pinks' basic motivational drives of employees in the modern workplace (Pink, 2009). More specifically, according to their characteristics:

- The need for Self-Actualisation is related to D. Pinks' Mastery, SDT's Competence and N. Yee's Achievement dimensions.
- The need for Self-Regulation is related to D. Pink's and SDT's Autonomy, as well as N. Yee's Immersion dimensions.
- The need for Rewards & Recognition is related to SDT's Extrinsic Motivation dimension.
- The need for Affiliation is related to N.Yee's Social motivation, as well as SDT's Relatedness and D. Pinks's Purpose dimensions.

We stress that the related constructs in other models are not identical in their nature or conceptual content to the EMPGs we propose, hence justifying the distinctness of our proposed factors from others in the literature. Therefore, a more detailed investigation of the common ground between related theories and our proposed model would have to be performed in the future, in order to test and assess the exact levels of correlations, combinations and relationships between the hypothetically related constructs.

Our assumed hypothetical connections between the theoretical models outlined, as well as a short description of the inherent factors can be found in Table 5.

<b>EMPGs</b>	<b>Motivations to play MMORPGs (Yee, 2006)</b>	<b>SDT intrinsic &amp; extrinsic motivation at work (Gagne &amp; Deci, 2005)</b>	<b>Basic employees' drives in the modern workplace (Pink, 2009)</b>
<i>Self-Actualization</i> Need for becoming one's optimal self – reaching one's full potential	<i>Achievement</i> Advancement, collection of Mechanics and Competition in the game	<i>Competence</i> Tackling challenging but achievable tasks, enhancing abilities and mastering situations (Lewis, 2014)	<i>Mastery</i> The urge to become better in work-related skills.
<i>Affiliation</i> Need to establish, maintain, or restore a positive affective relationship with one's colleagues	<i>Social</i> Socializing, forming Relationships and Teamwork	<i>Relatedness</i> Tasks that create a feeling of connectedness to others – caring and being cared for (Lewis, 2014).	<i>Purpose</i> The desire to do something that has meaning and is important.
<i>Self-Regulation</i> Need to adapt one's own emotions and actions to situational requirements, internalized social standards and norms	<i>Immersion</i> Discovery of things, Role-Playing, Customization and Escapism	<i>Autonomy</i> Making choices as one sees fit, being the perceived origin of one's behavior (Lewis, 2014).	<i>Autonomy</i> The desire to be self directed in ones actions.
<i>Rewards &amp; Recognition</i> Need for one's actions to be recognised and rewarded by incentives not inherent in tasks.	---	<i>Extrinsic Motivation</i> Factors outside of the work itself, such as rewards or expected evaluations (Amabile, 1993).	---

Table 5. Conceptually Related Constructs to EMPG Factors in the Literature.

As evident from the comparison provided in Table 2, our proposed taxonomy is different from other conceptually related ones in the literature, since the focus of EMPG is on employee (and not gamer/player in general) needs and motivations, towards participating in gamification at the workplace (and not employee motivation in general).

## 5.2 Towards a Personalised Gamified Feedback Mechanism

Taking into consideration all the correlations identified through our analysis, we propose a strategy on how to provide feedback to employees towards adopting desired actions aimed at energy conservation at the workplace. Personalized feedback can be provided according to the following approach via a gamified application. As already delineated, we deduced that employees are driven by four distinct needs/motivations to play a gamified app in the context of energy saving at the workplace: Self-Actualisation, Self-Regulation, Rewards & Recognition, and Affiliation. Bearing in mind the characteristics of each of these four needs/motivations, as well as their preferences in game elements, the feedback served to the users should be adapted accordingly. Therefore, apart from mentioning the actual action that should be adhered to in a feedback message to the users (e.g. turn off the lights), the message should also include a motivating content towards the users, appropriate to their recorded profile.

As an example, having the characteristics of each of the four needs/motivations recorded in our sample in mind, the message to “turn off the lights” could be complemented and served to the corresponding users as follows:

- To those driven by Self-Actualisation: “Turn off the lights to improve your energy conservation performance and improve your performance compared to last week”
- To those driven by Self-Regulation: “Turn off the lights to improve the energy conservation at your workplace and protect the environment”
- To those driven by Rewards & Recognition: “Turn off the lights to gain 10 points and become the best in your team”
- To those driven by Affiliation: “Turn off the lights to let your co-workers know that you care about the environment and help your team gain first place in the game this week”

All feedback concerning desired behavioural outcomes should be adapted accordingly, based on the characteristics of each need/motivation outlined in the previous section. Furthermore, as users may be motivated by more than one of the identified needs in different degrees, the following approach should be adopted, to better tend to the users’ profile. First of all, each user should randomly receive feedback corresponding to the different motivations they have identified with to a certain degree. Therefore, in a total of many consecutive feedback messages, they should receive the differently phrased feedback proportionately, based on their profile. For example, let us take the example of a user that, on the average, rated Self-Actualisation items on average with a 5, Self-Regulation with a 3, Rewards & Recognition with a 4, and Affiliation with a 6. This user, in a total of  $N=18$  messages (the summed average score for all motivations), should receive 5 messages phrased to match the need for Self-Actualisation, 3 to match Self-Regulation, 4 to match Rewards & Recognition, and 6 to match Affiliation.

To enable personalized feedback in the spirit of the process outlined, all potential users of a gamified initiative should be asked to answer the questionnaire in Table 1, towards assessing their EMPG profile, as part of the user registration/on-boarding process in the initiative. Furthermore, an automated feedback system should be populated with all the different phrasings for the different actions and EMPGs. Finally, the feedback mechanism should facilitate the proportionate emission of messages, according to the users’ profile, as delineated in the examples presented in this section.

To engage the users in participating in a gamified app employing the forementioned feedback mechanism, we propose that their preferences in game elements should be taken into account during the game design process. Having assessed our samples’ specific game preferences, we conclude that: (i) Employees with a high need for Self-Regulation don’t exhibit any specific preferences in game elements and, therefore, should receive all types of game elements proportionately. (ii) Employees with a high need for all the other types of motivation (Self-Actualization, Affiliation and Rewards & Recognition), would be more engaged in a gamified app that provides feedback towards energy conservation at their workplace, by taking into consideration their proportionate preferences in each game element in the game design. More specifically, for example, those with a high need for Rewards & Recognition should receive more Rewards, while those with a high need for Affiliation experience more Progression in the game and, finally, those with a high need for Self-Actualization should be given the opportunity to gain more Status in the game.

## **6 Conclusion**

Gamification is a relatively new instrument that can be used to affect employee behaviour at the workplace. We conducted a survey with  $N=119$  employees in three different sites and explored their motivations to participate in gamification at the workplace (EMPG). We identified the needs for Self-Actualisation, Self-Regulation, Rewards & Recognition and Affiliation as prominent. Our proposed taxonomy differs from other conceptually related ones in the literature, as it focuses on employee (and not gamer/player in general) needs and motivation, as well as participating in gamification at the workplace (and not employee motivation in general). Additionally, having focused on energy conservation at the workplace through behavioural change, we matched the employees’ EMPG profiles with

specific preferences in game elements in a gamified app aimed at energy conservation at work. Furthermore, based on the relationships we discovered through our analysis, we propose a feedback mechanism that can be utilised to provide personalised feedback to employees participating in gamification aimed at energy conservation in public buildings. This mechanism design can also be used as a template towards designing gamification in different settings, with minimal modifications, thus guiding future research in the same direction.

We firstly contribute towards explaining employee motivation for participating in gamification at the workplace in general, by providing a set of such motivations that can be leveraged in behavioural interventions. As per energy conservation in specific, we have matched employee profiles to energy behaviours and game elements for energy saving actions at the workplace. By combining the outcomes of this research, future researchers and practitioners in the field of energy conservation in public buildings through behavioural change can design interventions in a more personalised and – in most probability – more effective way. More specifically, one of the four distinct steps that need to be taken towards utilising the potential of environmental psychology for understanding and promoting pro-environmental behaviour is, having identified the behaviour to be changed, to design and apply interventions to change behaviour towards reducing environmental impact (Steg & Vlek, 2009). After identifying energy conservation by employees at the workplace as our targeted behaviour, we have contributed towards designing and evaluating such interventions through our research.

As all research, our work does not come without limitations. First of all, we have relied only in self-reported measures, thereby introducing the factor of potential personal bias to our results. In addition, our survey results have been based on a limited number of answers (119). A larger sample of participants would have provided an even more firm basis for drawing safe conclusions. More importantly, some of the constructs we have employed in our survey consisted of a low number of items each, thereby weakening their consistency in some cases, as well as potentially their generalisability. Additionally, we have yet to test our model in a real-life experiment that would record longitudinal data, towards proving its utility, as well as fortifying, or extending the recorded relationships. Furthermore, as already noted, we have yet to test the similarities and connections we have outlined between our proposed framework of Employee Motivations to Participate in Gamification at work (EMPG) and other existing game/gamification user typologies and motivations to play in the literature. Finally, we also aim to complement our research in the future, by experimentally testing our theoretical findings in actual workplaces, towards proving its utility, as well as its validity.

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