przegląd organizacji

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METHOD OF QUANTITATIVE AND QUALITATIVE GAMIFICATION ANALYSIS IN SOFTWARE DEVELOPMENT PROCESS — A CASE STUDY

https://doi.org/10.33141/po.2017.11.08

Przegląd Organizacji, Nr 11 (934), 2017, ss. 52-62
www.przegladorganizacji.pl

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Introduction

Gamification is becoming more and more recognised concept and technique applied in human resources management. It provides many advantages, which affect the efficiency of production processes (Lombriser, Valk, 2011) as well as help to sustain the technical personnel employment. After the analysis of employment trends in Polish IT, we can observe an increasing IT specialists migration trends. Preserving experienced employees and sustaining high efficiency of projects development and deployment, requires employment of new techniques for motivating the personnel. Based on our analysis and experiences not only a salary increase can be a key determinant for an employee. Properly designed and tuned gamification can

serve as a preferable way to reward the employees and provide incommensurable rewards such as respectability, popularity, etc. (Deci et al., 1999). This paper describes tools, which have been employed in a software development company supporting HR management process in all aspects: recruitment, work evaluation and employee professional development (Nelson, 2012; Metha, Kass, 2013).

Our previous work on this topic (Chmielewski et al., 2015) discussed gamification techniques, which are applied to increase the efficiency of IT projects, as well as to support human resources management. The sources concentrate primarily on the ICT sector, showing a strong momentum of development and the flow of personnel. This paper presents an original concept of gamification implementation, which has been based on almost three years of experiences with the design of an enterprise game as well as development of the software tool implementing it. The goal of the work presented here is to provide details on the design process of business rules for assessing employees (players), as well as to define the architecture of the system, which can be used as a gamification platform. Experiences gathered from the deployed gamification schemes and projects have revealed two main approaches: the first one being implementing strong quantitative evaluation approach and the later dismissing hard evidence evaluation and favouring subjective interpersonal grading among employees (Deterding et al., 2011). Qualitative methods provide unstructured or semi-structured techniques, and non-statistical data analysis resulting in findings which may not be conclusive and usually cannot be used for generalizations about the investigated population. Such methods are often used to develop an initial understanding and sound base for further decision making process. On the other hand the quantitative methods utilize structured techniques with methodology of acquiring research data and processing the data according to an algorithm (codified method). Acquired findings are conclusive and descriptive, and present attributes that influence the results. Therefore, quantitative methods are preferable in terms of decision making and traceable reasoning.

The presented research is aimed at critical analysis of referenced gamification methods and provides a case study results taken from gamification process implementation in software house taken from eight fixed-price (fixed budget) and nine time-material (budget depends on work hours consumption) IT projects, which have been developed since 2013. The analysis in the field of IT services market is intentional as it provides specific type of labor force requiring constant professional development, with strict financial requirements and competitive employee market. In addition to these arguments, software companies utilize many tools supporting the development process which are easily adoptable to gamification data sources providing reporting events.

This analysis also includes the synthesis and conclusions related to the implementation of the platform on the basis of experience of the company involved in software production. The formulation of rules for events processing, allocating points and achievements control the gamification process and formulate the methodology for employee rewarding and motivation. The designed set of rules assess employee interactions with respect to position and role context, as well as software development process disciplines. Human resource management processes can benefit directly from gamification especially in the acquisition, training and motivation areas. One of the direct effects of implementing the described concept is a proven increase of employee loyalty and decrease of employee turnover.

The evolution of information and communication technology has contributed to the development and wide application of IT tools which can be used to report work progress. These processes necessitate the high demand for products and services, which combined with the complexity of receiving computer science degree, directly affect the level of demand for technical personnel operating in this market. The openness of this market, high demand for engineers and the availability of recruitment tools affect the migration of employees, thus causing problems for companies. The need to offer better financial conditions is accompanied by additional benefits in the domain of not only economic advantages but also personal development. Recruitment processes and market demands generate rapid flow of employees, which may disrupt project executions. However, there also exists a group of employees who by definition focus on contractual work, choosing higher salaries in favour of work stability.

Presented aspects can be viewed as risks and costs of HR policy for the IT services market. Based on acquired in the course of several years experience in implementing IT projects, one of the major groups of risks are personal and organisational risks. The presented argument is one of the most crucial factors for the process of employee loyalty methods development in IT companies. Gamification techniques arouse curiosity, competition and satisfaction with the employee performance. It is worth noting that these techniques (Dabke, 2012) focus mostly on positive motivation, not on strict work monitoring, allowing each employee to find valuable aspects of their position and value in the company. A detailed discussion on this subject is presented in the following part of the work.

The construction of gamification process

The gamification is a construct, whose components derive from two main sources. The first one is the organizational knowledge and roles occurring in the field of business interest of the company (Chmielewski

et al., 2015). The second one is the technology that defines the workshop and details of the monitored interactions, as well as tools used to record the interactions in the system. Organizational details and rules utilised for constructing the gamification were presented in an earlier study (Chmielewski et al., 2015).

The gamification is not limited to the forms of motivation, because by definition it needs to indirectly support self-development and learning which increase the efficiency of work by introducing the principles of natural competition. For this reason the gamification uses: competitiveness, game story and detachment from ordinary life. The recorded experience in management, allows me to state that gamification tools increase the commitment, motivation, efficiency and loyalty of employees (Sands, 2013, pp. 11–14). In addition, the company introducing such techniques may benefit from gaining a positive business image. Properly implemented gamification, the one that offers appropriate rewards and points for self-development, solving quizzes, acquiring certified professional degrees, significantly affects the effectiveness of employees. The self-education process assistance as well as investing in specialized training serves as an efficient way for business activity optimisation and employee development stimulation, thus consequently increases employee satisfaction.

Gamification can be perceived as a tool, adapted in an enterprise or a group of employees and above all it serves for management purposes. The monitored types of employee interactions depend directly on the industry in which the gamification process is implemented. However in majority of cases the game's storyline is constructed as futuristic, and differs from ordinary professional or personal life. Taking into consideration all the above facts, the gamification should be understood as a system for effective management of employee work (or project) commitment and organization. Moreover we can conclude that gamification process delivers a strong motivation impulse or a trigger.

Through a transparent and interesting reward system, an employee is more engaged and involved in the work, which also delivers more effective tools for professional development. The use of gamification makes the work and tasks more attractive to any gamification actor, but most of all gives the impression that they no longer resemble ordinary, often boring duties, and turn professional to playful activities – immersed in an attractive scenario (Herger, 2014; Swacha, 2016).

The process of gamification construction in software development companies

The most obvious area of innovative management techniques can be found in high-tech companies delivering software and IT services. The number and variety of utilised tools increases the capabilities of employee activity monitoring, focusing mainly on recording positive input and actions which can be further mapped to elements of executed business processes. The analysis of ordinary software development and IT consulting companies, provides a set of useful activities, which can be used for employee monitoring and evaluation. These activities mainly focus on (Deterding et al., 2011):

- iterations or stages of the software development process,
- building the value of the company in the context of contacts with customers,
- developing development standards and action,
- employees recruitment processes,
- knowledge sharing and professional qualifications development processes..

The interactions require additional meta information describing types of tasks related to the implementation of an IT project, which can be found in the project management methodologies. These include following disciplines: project management, business and system analysis, system design and development, testing and quality control.

The previously mentioned separate design approaches to gamification construction can be summarised as quantitative (hard) and qualitative (soft) approaches. The context of such distinction is the nature and level of detail for recorded or monitored interactions.

The quantitative gamification requires the use of specialized means, which serve as a recording tool for player's actions, supplemented with qualitative descriptions and mechanisms for transforming them into assessment. The evaluation of employee interactions affect their profile and status within the social groups existing in the company. The basis for such an assessment is a set of elementary (significant) actions performed by the specific type employee (role), which, combined with a set of project characteristics, timeliness and quality factors affect the final assessments and granted awards.

The qualitative (soft) gamification, utilises recorded interactions in a rather different manner. Instead of monitoring the interactions of employees using specialised tools, a simplified approach has been designed and implemented in which employees grade each other. Each employee assigns his personalised rank or grade, based on their own appreciation of a given co-worker or observations how a given person is threated within the society. The rules utilised in the evaluation process and points awarded to individuals do not have to be formally justified. This approach is based on the aggregate assessment of an employee in the context of its role in the project, his efficiency, cooperation and even thoughtfulness. An important aspect in such an approach is the possibility of misevaluating efficient and extremely useful employee for interpersonal imperfections. This provides an interesting set of characteristics of the employee, particularly important from the point

of view of cooperation within the company. The presented approach may favour the employee's soft skills and his team work image, but in a longer spectrum the team efficiency and employee's role will always be dominant. Gamification is also used for evaluating actions connected with knowledge sharing and socialising within a project team. Moreover it also helps to evaluate actions of all employees accounting for project development and manufacturing processes. Each and every time an action is recorded or noticed, the gamification tool will integrate a value for such an action within the specific player's profile. The difference is that in the quantitative approach such an aggregation is performed seamlessly and automatically and in case of the qualitative approach the subjective evaluation is conducted by co-workers and team members. One of the key gamification features is the wall of fame of player's leader board product, which is information presented in the form of a webpage or a printed leaflet, stating current hierarchy of employees, their points and achievements. The employees having the opportunity to openly review published rankings of players, tend to compare and motivate themselves, therefore increasing their efficiency and involvement. However, this technique can only work if the whole company crew commit to such an approach. The important issue while introducing the gamification, is the conscious transition within the organisation itself, in which the employees are willing to search for motivation and efficiency in search of new business opportunities.

Quantitative method for evaluating employee interactions

The issue elaborated in the article is an original approach to construct, develop and deploy gamification in an organisation. The methodology comes not only with techniques and methods but also with specialised tools and guidelines how to implement them in management. These aspects are important from the point of view of project's implementation efficiency, but also management and integration of the project team.

An important determinant for IT systems is their specificity associated with the requirements for engineers and technical staff and moreover project's development risks. Such risks may translate into fluctuations of employee numbers, resulting in negative teammates behaviours and dissatisfaction. The application of agile methodologies (e.g. SCRUM, XP, etc.) (Schwaber, Sutherland, 2013; Beck et al., 2001) and dedicated software environments (such as Continuous Integration & Delivery), deliver monitoring capabilities for implementation and deployment of software.

The gamification design process needs to be implemented iteratively, and it should include experiences from previous, possibly similar deployments. Therefore, the service should be delivered using the organisational knowledge acquired by teams and departments on real world experiences and cases. This knowledge concerns the market success manifested by the company's administration and execution skills. Elaborated rules of player's (employee's) interactions are transformed into points and achievements which consider previous tuning and verification by employees.

Rules for assessing employees interactions have been formulated for specific groups of IT professionals and their roles associated with the project's disciplines and priority of executed tasks. Each rule considers interactions of a single employee. A triggered rule can also execute other associated conditions, which will affect the score of a group of employees or even a whole organisational unit. The guidelines of rules do not restrict the game designer, which actor – an individual or a group – will be affected by the rule.

The rules have already been iteratively verified and validated in the software development process conducted according to several methodologies, various domains of deployment and scale. The scope of the perceived events may be discussed as a separate issue, as many IT projects require consistent and thorough analysis of execution environment and technology complexity. This can be achieved by introducing model driven development, case management and continuous integration environments. An extremely important assumption in case of evaluating the action in gamification methodologies is a positive interpretation of any employee's action, taking into account their quality, not quantity.

Each recorded event reflects the player's interaction within the development process (Fig. 1), which in case of software companies, naturally becomes a continuous integration environment. The interpretation of the events and their context of occurrence, determines the evaluation of all involved employees (players). Such a gamification formulation and supporting proof-of-concept IT system has been developed and deployed in several organisations serving as a testbed. The experiences obtained from implementing the platform have been formulated as guidelines describing IT professional roles related to the project's disciplines and adapted processing tasks. Moreover such work can be easily implemented in a range of different companies remotely connected with software. Gamification utilizes several techniques for evaluating player's progress and involvement: experience points (EXP), experience levels, achievements (trophies, medals, etc.), inventory contents (special equipment, weapons and protection), character development path or evolution paths, player's avatar (personification), quests, missions and competitions (Fig. 2).

Efficient gamification, except virtual characteristics, should provide real benefits such as: gits (cinema tickets, gym passes, spa weekend invitations), additional money bonuses, work promotion, professional training or certificate exams vouchers, extra leave days, etc.

Constructed tools of quantitative analysis provide the following functionality (Fig. 2):

- business objectives identification – establishing a list of motivated entities and evaluated activities followed by a sketch of the evaluation strategy;
- storyline construction – defines game's theme, scripts and world of game in which all gamification elements are immersed as well as game rules;
- behaviour definition – desirable behaviour definitions and principles ruling the process of assigning awards;
- game organization rules: scoring, achievements, accomplishments – the definition of specific rules for gameplay evaluation, what is and what is not permitted as well as system boundaries;
- profiles and player groups descriptions – descriptions and stories behind physical entities of the system, organizational structures, roles, relationships and their representation in the game world;
- players' activities and game event development – activities performed by players recorded (registered) by,

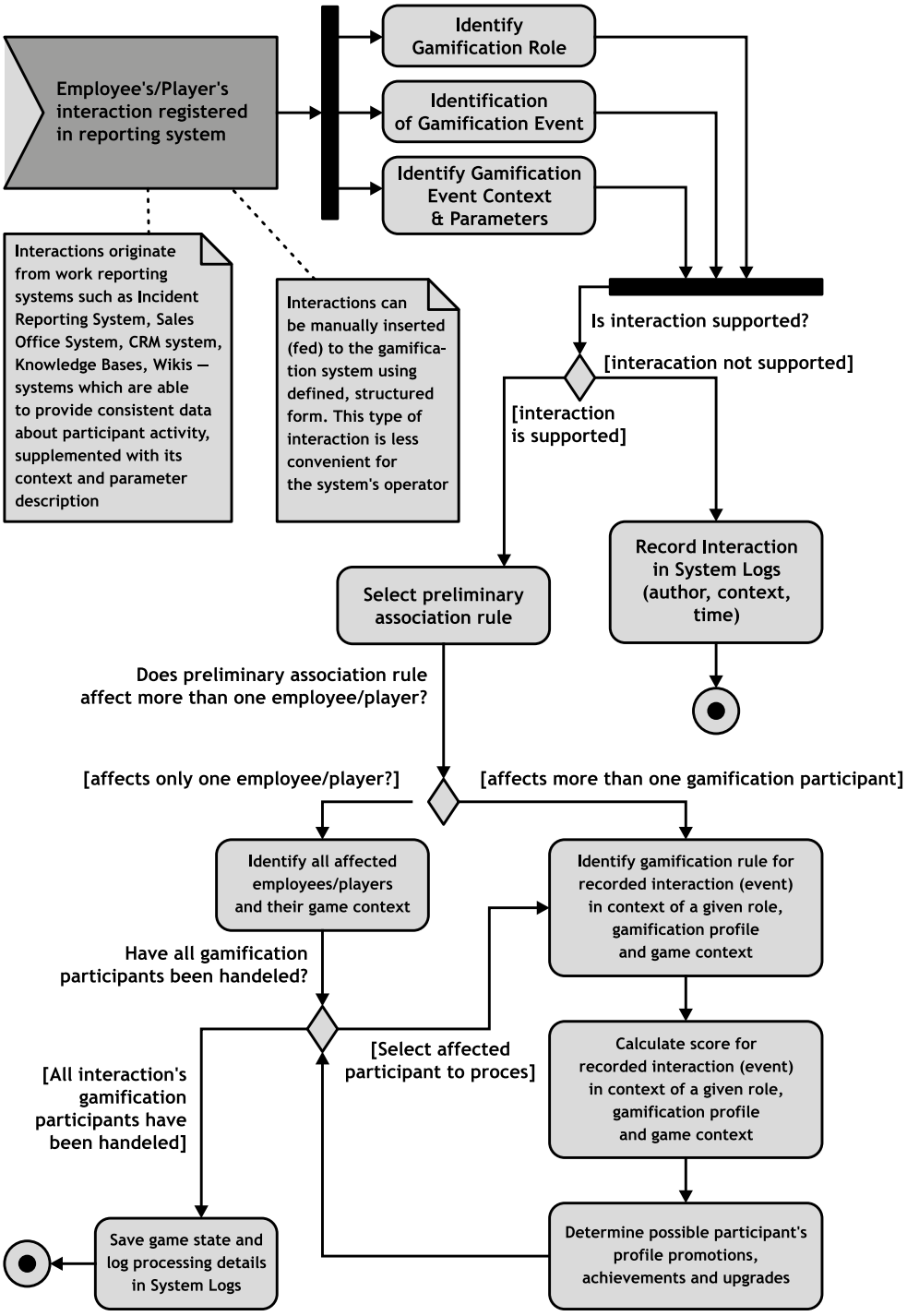

Figure 1. Quantitative gamification processing algorithm, demonstrating event-driven process of identifying rules for participant's interaction interpretation and evaluation
Source: own elaboration

a third-party system, affecting (generating) certain gamification events which further can be transformed into game score.

Qualitative method for employees evaluation

The research conducted by the American psychologist Edward L. Deci and his collaborators (1999) shows that the material rewards can have a negative impact on intrinsic motivation. External motivation, e.g. cash prizes or money bonuses assigned often for monotonous and repetitive work, can cause counterproductive effects especially in tasks requiring creativity. Team leaders and managers face the challenge of how to motivate and improve the work teams, while minimizing the negative effects that may entail rewards and bonuses. Jurgen Appelo (2014) presents six rules to overcome the negative aspects of the bonus. He describes that the external reward should be unexpected and proposed only when the tasks are finished, so that the recipient of the award is not focused on receiving the bonus. The awards, if they are expected should remain small. Rewarding should be a continuous process, not one-time event as well as information about the reward should be communicated as broadly as possible – proving that the award is public. Awards should always relate to the behaviour and not to the result. Very often the results may be achieved in non-ethical manners or shortcuts which are not desirable. The rewarding process should be possible at every hierarchy level not only from superiors – it is a valuable practice to motivate co-workers to reward each other.

The reward for the activities described by Appelo (2014), called Kudos (Kudo Box) can be understood as a way of enabling each employee, friend, colleague to present a small gift (possibly virtual). Implementation described in (Reiss, 2002) has been based on a set of emails in which everyone can add previously prepared notes with a description of the behaviour that has been appreciated by a sender. Such information can be anonymous or intentionally signed by the author. Obtained virtual points can be exchanged for a small gift founded by the company, from a predefined set of available awards. It is also possible to motivate users to join efforts and accumulate points for a more complex price scenario (often targeted for obtaining an award shared by all participants – employees. The author of the system described it as an efficient tool for increasing involvement of employees and offering a better perception of positive attitudes and behaviours minimising possible abuses of the system.

The hypothesis, that the implementation of the reward system, enhances communication and engagement among employees has been proven in the enterprise in the described IT industry. The exact rules have been implemented as a qualitative gamification approach with a minor modification especially in the domain of software tools application. The outcome of the conceptual phase was a solution in the form of a web based application easily accessible by employees and delivered as a SaaS platform. This tool – the Agile Toolbox – is a configurable web portal access to which may be given to individual employees, teams, departments or whole organizations.

The portal has a simple but useful function permitting user to send "appreciation cards" to other users. Each card can be personalised and annotated with short descriptions. It is also possible to anonymously appreciate someone's behaviour but it should be emphasized that each thanks will be public. Such qualitative approach to gamification is in contrast to the quantitative gamification tools allowing participants to be monitored and evaluated based on strong evidence – recorded interactions. AgileToolbox (Fig. 3) provides each user their own gamification profile (Marczewski, 2013), presenting his group, registered motivational parameters and send as well as received reward cards.

Figure 2. Gamification profile view for software developer in GAMIFICATION.ISOLUTION — Windows 10 (left) and Android widget (right)
Source: own elaboration

In any IT organization software development teams are supported by other structures in the organization, i.e. project support department, office manager, assistant or management board. The AgileToolbox (Fig. 3) implementation of applications across the enterprise enables all employees to become involved in the game openly sending and receiving acknowledgments. A brief analysis of card donation sources shows that it is driven by the role in the employment structure. People responsible for work support like office desk assistants, helping high number of other employees may be awarded with larger amounts of cards.

However, the tool lacks the ability to prioritise the cards, therefore, the importance and significance of an appreciation. In conventional gamification systems, a set of established rules often lacks the possibility of expressing and covering the unusual and rarely conducted or repetitive tasks performed by individuals often outside the project team structure. The qualitative approach (Fig. 4) delivers tools to overcome this restriction, thus, helping employees to express their appreciation beyond the company structures, based on the most honest observations. Restraining from the template approach and strict classification rules encountered in gamification systems it is possible to obtain data which help to evaluate cooperation and relationship between employees at a completely different level. Paul Klipp in his article (Klipp, 2015) defines a mechanism acknowledgments as a "secret spy network to monitor employee's behaviour".

Initialising a system of subjective manual appreciation, widely available for the organisation may introduce new risks connected with emphasising team's dysfunctions. It is easy to imagine a situation, in which one of team members will be left aside in the appreciation process due to his or her personal and social characteristics not necessarily associated with professional abilities or work efficiency. If such a situation is not incidental, the leader of the team should pay attention and analyse the reasons for such disturbing and destructive behaviour. In such case the role of a team leader is required. He is responsible for analysis of such behaviours and he should provide methods and actions, which will integrate the team and possibly solve interpersonal issues. Trivializing such issues can cause problems with the proper formation of the team (according to proper team development stages (Nelson, 2012), which may result in non-efficient work and disturbing interpersonal relations. The described gamification system offers several functionalities supporting participants, which help them to identify incentives that motivate and drive them to personal

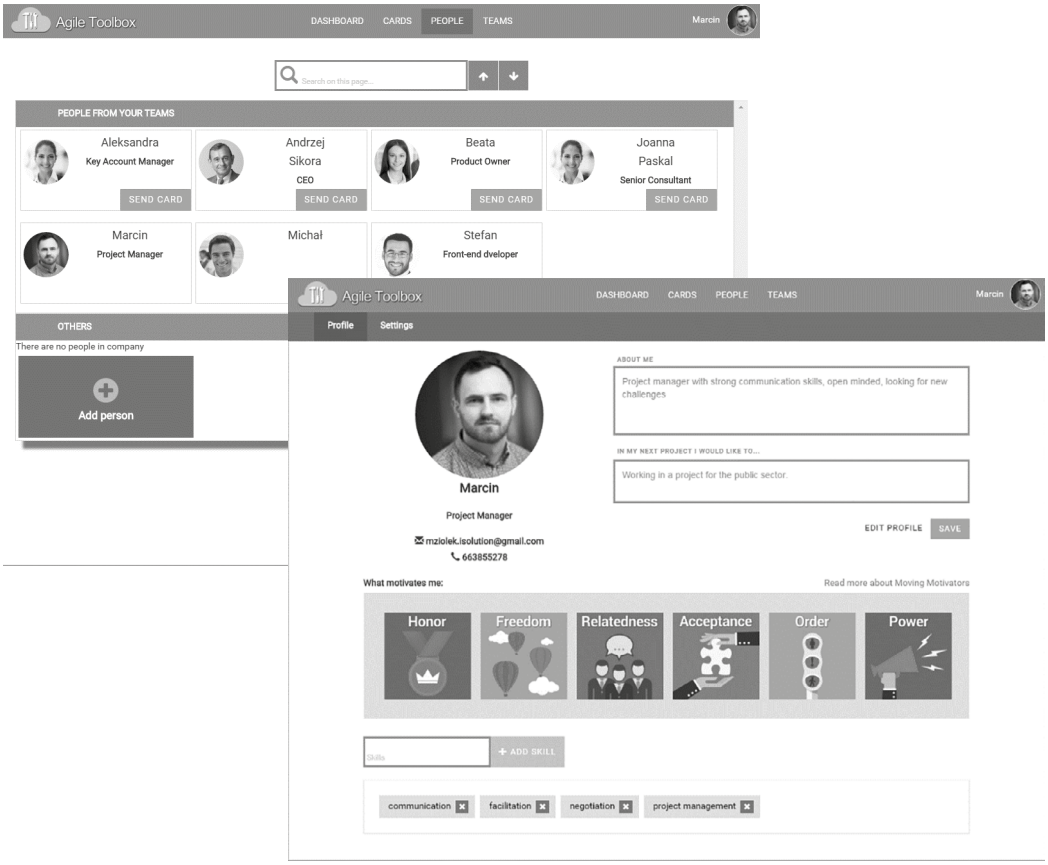

Figure 3. Employees gamification panel in Agile Toolbox - web application - demonstrating information for team manager
Source: own elaboration

and professional development. The source model of such an approach was described by Appelo in (Reiss, 2002) and named "CHAMPFROGS model for intrinsic motivation". The choice of incentives has been based on a careful selection from 10 recognised research publications: David Rock's SCARF model (Rock, 2008), self-determination theory of Deci and Ryan (2000) and Maslov's hierarchy of needs (Maslov, 1943).

Characteristics of software environment used for monitoring and interpreting of employee interactions

The developed gamification concept defines formal rules for rewarding points and achievements for particular groups of employees taking part in the software development process. These groups are directly linked to the elementary IT project disciplines – management, analysis, design, implementation, testing and maintenance. A key element of any automated gamification system are mechanisms for provisioning of employee's action data. The system is required to integrate such a data source, and using formulated evaluation rules is able to provide assessment of employees. Due to the software development form, employees in the IT industry in majority of cases utilise dedicated CASE (Computer-Aided Software Engineering) and RAD (Rapid Application Development) tools recording as well as documenting their activity and work. IT companies often support their manufacturing processes by implementing a tools stack forming a Continuous Integration platform. Such environment is used for evaluating all software products and their quality, automating quality inspections but most of all providing quantitative, mostly objective evaluation of the product quality.

The information on activities in the form of recorded events is supplemented with a relevant quantitative description and further transmitted to the part of the system where it is analysed by the rule-based inference en-

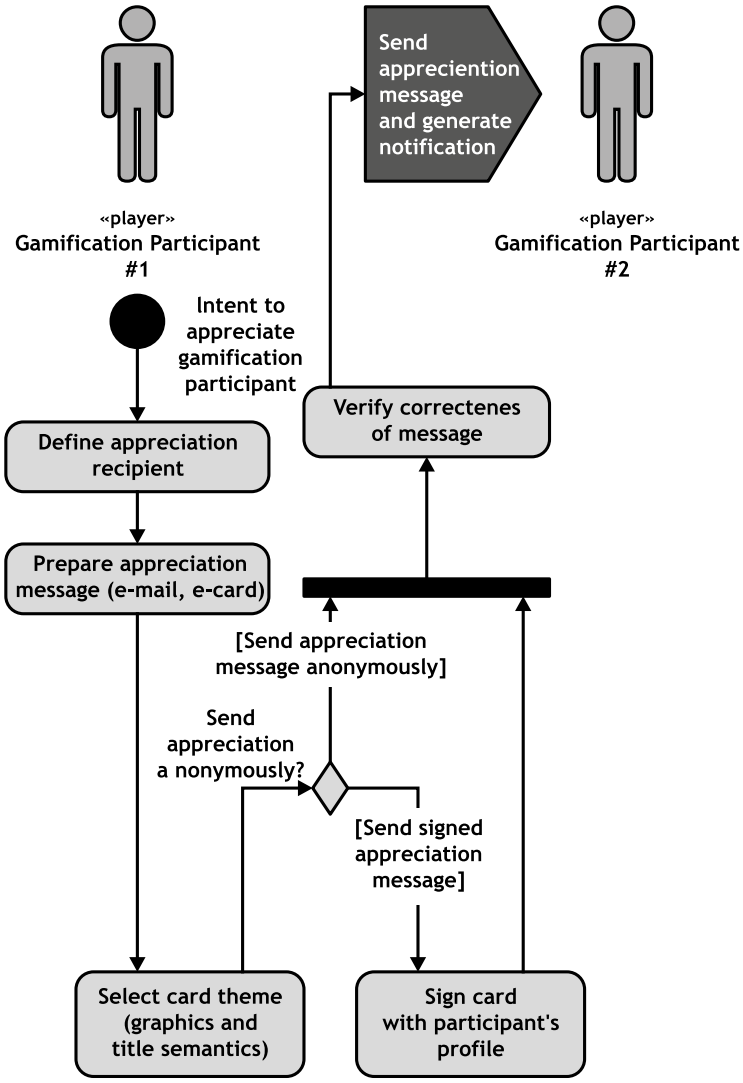

Figure 4. Qualitative gamification algorithm, demonstrating manual participant's intent to send an appreciation message - to gamify a participant effort
Source: own elaboration

gine. From the technical point of view such a construct delivers a more convenient way for dynamic tuning of the system for gamification designers (managers and analysts). The chosen technology stack utilizes Java Enterprise platform supplemented by Drools rule engine and Vaadin as an administration panel frontend technology. The web portal, mobile or desktop applications have been developed according to specific client requirements and needs and support mostly the employee's gamification profile as thin clients. The developed analytical models and tools have been verified on the basis of a large number of active open-source projects, which provided good practice frameworks. Many evaluation rules, parameters, monitoring tools (integrated data sources) for the quantitative gamification, have been taken from observations and management during the construction of the GAMIFICATION.ISOLUTION environment. All software design and development tasks have been carried out in an agile model supported by CI. Utilisation of a central code and artefacts repository (GIT) has been supplemented with static source code analysis tools (Sonar, FindBugs) and code review toolkit (Gerrit). The combination of such tools helped to evaluate and verify product quality by: inspecting and assessing code metrics, evaluating risks and severity of potential errors, inspecting the unit test coverage of code, recommending packages and classes for code revisions, analysis of the packages and components associations in search of architectural faults and redundancy. The monitoring of the software development process, is sequential and divided into several stages, which can usually be analysed using quantitative methods. Such an analysis can be used for monitoring the progress (number of implemented requirements) but most of all code and product quality which can affect the overall costs of the software and its maintenance.

GAMIFICATION.ISOLUTION has been integrated with ready to deploy software development environment utilising following tools: GIT – a tool for source code and artefact versioning, (documentation, configuration scripts and database); GERRIT – a tool for manual code revision, evaluation and auditing; SONAR – a tool for static code analysis evaluating and enforcing code quality and architectural correctness. The static code analysis has been also supplemented locally by CheckStyle or PMD plugins for RAD Java environments and FindBugs offering thorough and more advance revision of code constructs. The whole build and deployment process is managed by the JENKINS CI server supporting cyclic building, analysis, application testing and automated reporting to the manufacturing team. Gamification utilizes PPMS.ISOLUTION, Redmine and JIRA proprietary plugins to report and track issues connected with executed analytical, development and quality assurance tasks.

The presented infrastructure delivers a consistent toolset providing a stream of events reflecting employee's interactions. Based on these activities the quantitative gamification method is able to interpret such data and employ gamification rules to generate participant scoring for his actions. This model recognizes key responsibilities and tasks for software development roles and provides rewards for correct practices, as well as their substantive content. Based on 15 year software development experience, business analysts have selected a set of significant and preferred activities, tasks for key roles and functions participating in the software production. These responsibilities have been divided into groups of responsibilities serving general and development specific activities, which help to evaluate the whole picture of employee's involvement such as timely reported work time, knowledge sharing, participating in company promotion as well as professional development and of course efficient project task execution. General obligations arise from the operation of the organization and culture of cooperation in the enterprise, while the second group includes a specialized set of tasks aimed at implementation of activities, building products specialized for a particular position. System analysts, for example, will be awarded for effective requirement analysis, and project scope definition as well as detailed analytical model construction. Results of their work are further used by software developers therefore they become obvious tools used for verification process of analysis and its quality (e.g. number of questions and information requests to a specific requirement may indicate knowledge gaps and analytical faults).

The developed system permits situations in which one recorded action may be interpreted in the context of two roles and individuals. An example of such situation is a software error in system's functionality. On the one hand identifying, recognising and documenting such a fact is an obvious challenge and a reward for QA tester, who after designing and conducting the testing procedure discovers the error and possibly identifies potential causes. A code developer is a corresponding side of the incident. He or she is responsible for the code, therefore is obliged to repair the fault. To do so they receive a SLA (Service Level Agreement) dependent time window for the appropriate code fixes. Only after a valid repair and re-testing the developer may receive the appreciation score. In this case, it is worth noting that the implemented gamification scheme avoids penalties in the form of negative points. The penalty for a given individual is manifested through zeroing possible reward points. Therefore, inefficient unreliable actions stop from progressing the gamification profile, thus reducing the score and consequently motivating to further development.

Summary and recommendations for implementation

This research presents the concepts of proprietary gamification tools for motivating employees working for Information Technology companies. Both approaches have been applied in the practice of supporting IT projects' management as well as decreasing employee drainage. Introduction of gamification tools and an ef-

ficiently constructed motivational plan for long-term employees, helped to decrease the fluctuation factor of software engineers (architects, designers and developers) from 9.7% to 5.6% (one year scope). Considering the high demand for such specialists and current market trends, gamification proves to be an effective method. This can be associated with HR process but also the efficiency of development for which an average time spent on correcting reported incidents (regression incidents) dropped from 14.3% to 9.7%.

Recently collected surveys and comments prove that employees value gamification in their professional activities as well as interpersonal relations in work. They tend to help each other and engage in collaborative initiatives, which increases knowledge and experience sharing. More elaborated research results especially in HR domain will be presented after completing all of seventeen project reviews delaminating project type, scope, implementation technology, age, position, experience, type of employment. Utilised gamification rules (in the quantitative method) have been tuned for software development processes and teams. Developed approaches demonstrate quantitative and qualitative evaluation of employees, which provide complementary tools – one utilising strong activity monitoring and evaluation and the other delivering more subjective ways of evaluating employees.

The work presents characteristics of the platforms as well as implemented requirements preliminary configured to integrate with software development environments as well as issue tracking and management systems. An important advantage of both gamification concepts is the experience gained from deployment of such tools in real life scenarios. They are a unique value of presented approaches, especially in the context of applying agile (approaches) methodologies in project management (VersionOne.Com, 2014; 2015). The gathered experience shows that HR management, especially in case of acquisition, maintenance and development of workforce can be effectively promoted through the introduction of the gamification. The paper also contains a description of the proof-of-concept environment that demonstrates capabilities for monitoring the employee's actions by utilising the Continuous Integration stack. The CI environment serves as a virtual production inspection environment in which each and every interaction supporting software development processes, can be monitored, recorded and evaluated. The transparency of the process as well as the detail of gathered data, may be used to develop even more sophisticated evaluation rules for the scoring system. In order to verify the proposed gamification methods, two separate software tools have been implemented offering tuneable functionalities to assess employee's efficiency and to increase the motivational drive in executed projects.

The presented systems have been in use since 2013 (GAMIFICATION.ISOLUTION) and 2015 (AgileToolbox). They are offered as SaaS solutions and can be accessed upon request. The systems are currently actively used to gamify software development teams in commercial and research projects. The systems offer valuable tools for motivating employees at different management levels such as project managers, architects, analysts, programmers and testers. The implementation of gamification strategies has already presented positive results affecting the quality of developed software and offered consulting services, but also extended the average employment timespan of technical staff. There are also several positive outcomes, which have been observed in development teams connected with well recognised health check model (Appelo, 2014).

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Ilościowe i jakościowe metody gemifikacji wykorzystywane w zarządzaniu procesami wytwórczymi oprogramowania - Studium przypadku

Streszczenie

Techniki grywalizacyjne stają się coraz bardziej powszechne i rozpoznawalne w dziedzinie zarządzania zasobami ludzkimi. Jest to szczególnie widoczne w zakresie podnoszenia wartości samej organizacji oraz zwiększania wydajności pracy. Szczególnymi przykładami działania tej techniki są branże nowych technologii. Analizując źródła, są one szczególnie narażone na problemy związane z fluktuacją profesjonalnej kadry pracowniczej. Artykuł prezentuje dwa wdrożone autorskie podejścia do opracowania gamifikacji, efektywnie wspierającej politykę zarządzania zasobami ludzkimi w branży firm IT. Aplikowanie tej techniki wpływa również pozytywnie na efektywność procesów wytwarzania oprogramowania, jak też samokształcenia wykwalifikowanych pracowników. Opracowanie zawiera również opis koncepcji budowy narzędzi służących do organizacji i prowadzenia gamifikacji w przedsiębiorstwach IT. Potrzeba wprowadzenia gamifikacji w przedsiębiorstwach IT wynika z kilku istotnych i wyróżniających cech tego typu organizacji. Są nimi duży popyt na usługi tego typu, ograniczony rynek wykwalifikowanej kadry, transgraniczność usług, globalizacja usług IT, możliwość zdalnego wykonywania usług oraz wysoki poziom zarobków pracowników. Analizując powyższe argumenty, przedsiębiorstwa IT muszą coraz częściej wprowadzać nowe techniki zarządzania zasobami ludzkimi ukierunkowane na zwiększenie efektywności i satysfakcji z pracy pracowników. Niniejszy artykuł zawiera podsumowanie doświadczeń z wdrażania gamifikacji w przedsiębiorstwie średniej wielkości (do 100 osób), oferującym usługi wytwarzania i wdrażania oprogramowania. Zebrane doświadczenia obejmują zarówno aspekty techniczne, jak i organizacyjne tego procesu i pozwoliły na skonstruowanie i rozwój dwóch autorskich narzędzi GAMIFICATION.ISOLUTION oraz Agile Toolbox.

Słowa kluczowe

gamifikacja, zarządzanie zasobami ludzkimi, systemy wspomagania zarządzania, rynek IT, grywalizacja, metodyki zwinne, agile project management