Motivating the adoption and usage of corporate Web2.0 systems using fitness gamification practices

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***Abstract*—**

One of the main problems of introducing corporate Web 2.0 systems in organizations is the problem of low motivation of the employees to adopt and use these systems, caused by the fact that introduction of corporate Web 2.0 is usually an initiative not of the employees, but of the senior management of the company. However, one of the most crucial conditions of success in introducing such systems is the interactivity of the employees' usage of the systems, which can potentially be stimulated by applying the gamification practices.

Among different areas of gamification practices, we think that the fitness gamification area has interesting experience for motivating the employees to adopt and use the corporate Web 2.0 systems, as most prominent fitness gamification projects are based on Web 2.0 technologies themselves.

On the basis of fitness gamification projects experience we suggest and analyze a set of metrics that can be used for assessing and rewarding the employees' individual and collective activity in sharing and creating knowledge via the corporate Web 2.0 systems.

The analysis results in recommendations to use such metrics as amount of specific types of knowledge shared or created via the corporate Web 2.0 system, uniqueness of the knowledge shared via the corporate Web 2.0 system and uniqueness of the knowledge created via the corporate Web 2.0 system.

Keywords — gamification; corporate Web 2.0; knowledge creation; knowledge sharing.

I. Introduction

One of the main problems of introducing the corporate Web 2.0 systems in organizations is the problem of motivating the employees to adopt and use these systems. It is caused by the fact that introduction of corporate Web 2.0 is usually an initiative not of the employees, but of the senior management of the company, thus limiting the employees' enthusiasm. However, one of the most crucial conditions of success in introducing such systems is the interactivity of the employees' usage of the systems. Thus, the employees' motivation to adopt and use the corporate Web 2.0 systems must be based not on the "negative" stimuli of penalties for not using the systems, but on "positive" stimuli of rewards for using these. The positive stimuli for interactivity seem to be more effective when based not only on tangible, but also on emotional reward components, as it is stated by the employee engagement literature [34; 13].

One of the most promising types of employee motivation practices based on the emotional rewards are the gamification practices that can be broadly defined as using game mechanics in non-game contexts for achieving different goals, including the employee motivation through engagement [18; 20; 32].

Among different areas of gamification practices we think that the area of experiences which could be most useful to

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motivate the employees to adopt and use the corporate Web 2.0 systems is the so-called "fitness gamification" area, because fitness gamification is also predominantly dealing with social networks, as contrasted to the majority of practices of gamification of the workplace that are dealing with the individual effort of a particular employee but not the social interactions within the organization.

II. Fitness Gamification Projects Experience

The most prominent fitness gamification projects (e.g., EndoMondo, EarndIt and the Nikeplus program of the Nike company) are social networks where participants register online to show their results in physical exercises of different kind thus making it possible to compare their results with those of the other participants, collecting points and getting prizes and other rewards for certain number of points earned.

EndoMondo, the highest rated fitness tracking application across major application stores [11] is an online sports activity tracker, developed by a company that was created in November 2007 in Copenhagen by three ex-McKinsey consultants. The alpha version of the application and the Endomondo.com website was launched in August 2008, and the beta-version of the website was launched in July 2009. By September 2009, the Endomondo reached the number of a million users, and by the end of 2012 it reached about 12 million users [11].

The EndoMondo feature pack consists of two parts: a mobile application (EndoMondo Sports Tracker) and a website (Endomondo.com). The mobile application is compatible with all the major mobile platforms: as the company website states, the application can be used "with close to all mobile phones with GPS including Android, iPhone, BlackBerry, Windows Phone, Symbian, Windows Mobile and Java. In addition, data can be imported from Garmin sports devices and from certain data formats and the app is integrated with heart rate monitors from Polar, Zephyr and Garmin. ANT+ supported devices like bike speed and cadence sensors will also work on ANT+ enabled Android phones" [11]. A mobile application is tracking the activity in such outdoor aerobic activities as running or biking by a number of parameters including route, average speed, distance, calories burned, and several others; the application records and preserves a history of the user's workouts.

On the Endomondo.com website the users have ability to upload their recorded workouts and compare the workouts of each other, thus engaging into a kind of a constructive competition between each other that can serve as a motivation for these users. Moreover, the users can record for each other the so-called "peptalks" on their audio-coaches, thus motivating each other.

The Nikeplus (Nike+) service was created in 2006, originally as a product of collaboration between Nike and Apple companies.

The technical part of the service consists of two parts: a sensor that can be united with the running shoes and the device (originally, Ipod) connector translating the information about the parameters of the performed exercises to the device.

As for today, a range of Nikeplus products exist, tracking different parameters of the user's sportive activity, giving audio or visual feedback (e.g., the Nike+ SportBand product has a special small display for that) providing the ability for the user to download the results into the Nikeplus.com website. All the parameters recorded by different Nikeplus products are united into a single NikeFuel count of activity points, thus giving the users doing different kinds of sports activity (e.g., aerobic exercises like running, or games like basketball) possibilities to compete with each other [25].

Earndit, created in 2010 by Andres Moran and Harry Kautzman II, is a service rewarding users for doing exercises virtually with an ability to redeem the virtual points for tangible, "real-world" rewards of different type, e.g., "running shoes, jewelry, loose-leaf tea, clothing, webchat with a dietician, etc." [10]. The Earndit website itself is linked to the activity tracking devices (including among all, for example, mobile devices with Endomondo application installed and the Nikeplus devices) giving points for certain results, e.g., a certain distance travelled by foot or by bike, and displaying the results on the website, where the users can track each other via the search box on the website allowing the users to see each other's results and rewards.

The Earndit website is also connected to such social network websites as Facebook and Twitter (where you can post the Earndit points, i.e., results of your activities), and Foursquare, where the user can check in to a gym, including the possibility to check in as a "mayor" of it; however, the really unique part of the Earndit service, differing it from the other major fitness gamification projects and making it close to the workplace gamification practices used in companies, is the redemption of the virtual points given by the system for tangible rewards.

III. Applying the experience for corporate Web 2.0 adoption and usage gamification

We propose that some of the main aspects of the fitness gamification projects described above can be applied for gamification of corporate Web 2.0 adoption and usage.

Firstly, an important aspect is that points given by the fitness gamification services to different types of sportive activity are commensurable with each other (e.g., in the Nikeplus service the points given for different types of activity can be united into one Nikefuel count), making the users performing different types of activity able to compete with each other.

Considering the objectives of gamifying the adoption and usage of corporate Web 2.0 systems, this aspect is important because the corporate Web 2.0 systems have an objective to increase the intensity of interaction of all the company's employees, performing different activities via the corporate Web 2.0 systems.

Besides that, the fitness gamification projects are based on Web 2.0 technologies as such, the Web 2.0 experience of these projects can be useful for design and implementation of practices of corporate Web 2.0 adoption and usage gamification. Specifically, a potentially effective idea seems to be to integrate the gamification Web 2.0 into the system the adoption and usage of which has to be supported by the gamification practice. For example, a special page can be created within the corporate Web 2.0 system that would be displaying the points rewarded to the employees for using this system, with ability for the employees to track each other's results. This integration would be additionally triggering the frequency of the system's usage by the employees, thus indirectly facilitating usage of the system for its knowledge management purposes.

In the context of the corporate Web 2.0 adoption and usage gamification, what can points be given for?

In fitness gamification services, such as the above-described Endomondo, Earndit and Nikeplus, points are given to the users for results in doing exercises, which firstly enables them to compare each other's results thus getting a competition motivation, and secondly provides the opportunity to get material rewards and prizes for certain number of points collected or having collected more points than the competitors.

Like in fitness gamification projects, in gamifying the adoption and use of corporate Web 2.0 points that must be further exchanged for tangible, mainly, financial rewards, can be given for activity in adopting and using the corporate Web 2.0 systems.

Corporate Web 2.0 systems, as knowledge management instruments, can be used for both main knowledge management functions — creation of new knowledge [24] and sharing of existing knowledge [19; 39].

An important issue in developing the criteria of rewarding the knowledge sharing and creation activities via the corporate Web 2.0 system is when to reward the employees for a performed knowledge sharing or creation operation individually or collectively.

Indeed, the knowledge sharing activity is by definition requiring at least two participants — the one sharing knowledge and the one receiving the shared knowledge. However, it doesn't seem logical to reward the participant not sharing the knowledge by her- or himself, but just receiving knowledge; so, even in the cases of mutual knowledge sharing, we suggest that each employee must be rewarded for knowledge sharing activities individually.

Knowledge creation can be a result both of an individual (e.g., an employee submitting an original idea via the corporate Web 2.0 system) and a collective action (e.g., a result of a group brainstorming), so for knowledge creation activities both individual and collective rewards are possible. A collective type of knowledge creation activity assessment and rewarding is of considerably higher complexity than individual type. A reason for this is that in assessing a collective work, especially work related to knowledge creation that can be characterized by an uncertainty of result [39; 2], individual contribution to the result can be uneasy to assess, so assessing the collective work is potentially vulnerable to the users' freeriding behavior that can distort the linkage between the points given for a collective work and the real value created for the company as a result of this collective work [8]. Due to this we suggest that in cases of presentation of a newly created knowledge as a result of the group activity without deliberately emphasized personal contribution of the group participants, rewards shall contain equal amount of points for each group participant. Respectively, each case with presence of deliberately emphasized personal contribution should be analyzed individually.

However, for the sake of commensurability of rewards given for different types of activity performed via the corporate Web 2.0 system, it is rational to develop a single united set of metrics for assessing the operations of knowledge creation and knowledge sharing.

In general, such metrics can be divided into two basic types — metrics related or unrelated to the knowledge content involved in sharing and creation operations [35].

Knowledge as an object of management is a considerably complex thing, being a subjective interpretation of data and information.

Data can be defined in information theory as a set of symbols lacking subjective interpretation by a preceptor [31].

Information can be defined as data together with its subjective interpretation by a preceptor, or data "endowed with meaning and purpose" [41].

Knowledge, in its turn, can be defined as information being applied, or subjectively perceived as suitable for application [31].

Sometimes the hierarchy of data, information and knowledge is also complemented with a construct of "wisdom" which can be defined as a meta-level knowledge of where, when, how and, mostly important, why to apply different knowledge [41]. However, the wisdom level is rarely used for practical applications of the data-information-knowledge-wisdom (DIKW) hierarchy.

Due to that complexity of knowledge as a management object, we suggest to develop the analysis of possible knowledge creation and sharing metrics from the simplest to the more difficult, thus beginning with the analysis of metrics unrelated to the content of the knowledge sharing and creation operations.

A. Content-unrelated Metrics

The most obvious content-unrelated metrics assessing the adoption and usage of the corporate Web 2.0 systems can be suggested to be frequency of a particular employee or a group of employees performing the operations via the corporate Web 2.0 system, and amount of time the employee or group of employees spends logged on the system [36]. As a result of applying these metrics, the points can be given to the employees individually or as a part of the group for the frequency of using the system and, respectively, the time spent being logged on into the system.

These metrics are rather easy to apply, but this easiness of application has a consequence of being weakly protected against the freeriding behavior of the employees that can log in to the system and spend time in it just to get points in a game without creating value for the company at that time.

Another category of metrics not related directly to the knowledge content involved in the operations could be related to the structure of the contacts of the employee in performing the operations via the system.

As it was mentioned above, one of the main reasons of the employees' limited enthusiasm in adopting and using the corporate Web 2.0 systems is the fact that introduction of these systems is usually not an initiative of the employees, but of the senior management of the company. So, a metric that can show the level of the employees' positive attitude to the system as not solely a tool designed to enhance the level of exploitation of the employees by the company, but a useful tool for work could be the ratio of hierarchically horizontal contacts to the vertical. Indeed, if the interactions in using the corporate Web 2.0 system are performed not only in a top-down or bottom-up directions, but contain interaction between the users belonging to the same hierarchical level, the system can gain higher potential for sharing existing and creating new knowledge.

Thus, in a game mechanic designed for gamifying the adoption and use of the corporate Web 2.0 system points can be given to the users for a ratio of horizontal interactions to vertical above some threshold level, or for a number of horizontal interactions in a period of time. Besides that, points can be given to the employees for creating groups and participating in these groups.

However, such metrics, analogously to the frequency of use and the amount of time spent, cannot ensure that the horizontal contacts and the created groups are generating value for the company by either sharing or creating knowledge. There could be two possible reasons for such a weakness. Firstly, the employees can practice freeriding by performing horizontal interactions and creating groups and participating in these groups just for getting the points in a game. Secondly, the horizontal interactions, creation of groups and participation in groups as such can lead to value generation, but this result is not obligatory.

A possible way to overcome the second reason could involve giving points to the employees individually or as parts of the group for the results of using the system in terms of value created for the company. Indeed, if the sharing of existing knowledge or creation of new knowledge leads to the company increasing profits, it would be easy to relate the company's increase in profits to the awards given in a game, likewise to relate the game awards to tangible, e.g., financial remuneration.

However, using the results-related metrics for the purpose of corporate Web 2.0 adoption and usage gamification has several obstacles lowering the potential effectiveness of using these metrics.

The first obstacle is that the profit increase that the company can get as a result of knowledge creation or sharing via the corporate Web 2.0 system can happen within an indefinably long time period, thus destroying the dynamics of the game which is one of the main factors of its effectiveness [23].

The second obstacle to the effectiveness of the results-related metrics could be related to the causal ambiguity of the company's results, especially in the long term [27]. As it is obvious that the results of every company are influenced by a complex set of different factors, in some cases it can be rather difficult for the company's management to figure out the exact contribution of a particular knowledge creation or sharing operation to a particular change in results, even if the existence of such contribution is obvious (again, a time perspective is important here — the more time passed from the particular knowledge creation or sharing operation that contributed to a particular result, the harder it can be to figure out the exact contribution percentage [28]).

So, it can be concluded that using metrics unrelated to the content of knowledge created or shared via the corporate Web 2.0 systems do not seem effective to be used in gamification of the corporate Web 2.0 adoption and usage.

B. Content-related Metrics

The metrics related to the content involved in knowledge creation or sharing operations seem more adequate, as when using such metrics the points are being given in real time, without significant delay (as it can be when using the results-related metrics), and there is less potential of the users freeriding when using the system (as it can be with metrics of the usage frequency and contacts structure).

The content-related metrics can be divided into two groups: quantitative (e.g., amount of knowledge shared or created via the corporate Web 2.0 system) of the content and qualitative metrics of the content (e.g., originality of knowledge shared or created).

Measuring the quantity of shared or created knowledge is surely easier than measuring the quality of knowledge due to the presence of significant subjective element in knowledge. Thus, continuing the logic of going from the simplest metrics to more difficult ones, it is logical to begin the description of potential content-related metrics with the metrics of quantitative type.

The most obvious idea of such metrics is measuring the net amount of knowledge shared or created via the corporate Web 2.0 systems. More specifically, such metric can be measuring the amount of all the content shared or created via the corporate Web 2.0 system in digital information units, e.g., kilobytes, and result in giving points to the individual employees or groups in relation to that amount. However, using this type of metric also has a potential danger of users demonstrating freeriding, as lots of kilobytes shared or created do not obligatory contain valuable knowledge.

A more complicated version of the quantitative type metric that can overcome this problem could be based on measuring the amount of specific types of content shared or created (for

example, a number of files containing data presented in a particular format shared by an individual user or a group in a period, or a number of new ideas presented in a particular format suggested by an individual user or created by a group of users in discussions via the corporate Web 2.0 system). The idea behind application of that metric is that structured requirements to the shared or created content can lower the possibility of freeriding, as time and effort required from the users to organize the content in a specific format can themselves be a motivation to use these time and effort for doing work that can potentially create value. It can be supposed that the motivational aspect of this metric would be more effective for assessing the knowledge creation operations, as the motivation of the knowledge workers, due to the self-esteem of their intellect and skills, contains a significant intangible component of being proud to create knowledge products of high quality [38; 44]. Thus, structured requirements of presentation format can themselves lead to higher effort of these knowledge workers to create or share knowledge of considerably high quality.

The qualitative type of content-related metrics, finally, is the most complicated among the metrics that can be used in gamifying the knowledge creation and sharing operations, but at the same time, we suggest these metrics to be potentially most effective.

Due to the causal ambiguity of the company's results and to the presence of significant subjective element in knowledge, assessing the quality of shared or created knowledge in terms of, e.g., potential for creating value for the organization, is a highly complicated task.

A metric assessing the quality of created or shared knowledge that can be relatively objective and thus easy to apply is the metric of uniqueness of the knowledge shared or created in relation to the knowledge used by the company or by its actual or potential competitors on the respective market and industry [4; 7; 15]). The uniqueness of knowledge shared or created by the employees can be estimated by experts from the senior management of the company [4; 7].

Applying the uniqueness metric to the operations of knowledge sharing and knowledge creation is rather different in relation to the freeriding problem.

Freeriding of the individual employees or groups of employees can be an obstacle for applying most of the abovementioned metrics, but the metric of uniqueness of knowledge shared via the corporate Web 2.0 system is different because it hardly can be favoring the freeriding behavior. Conversely, sharing unique knowledge is an activity requiring specific motivation.

For the employees or groups of employees holding unique knowledge, the control over this knowledge is a source of bargaining power in their relations with the company [33; 42]. Thus, such employees are often reluctant to share their knowledge, especially the knowledge of high tacitness, with the other employees in a company. For example, experienced specialists before retirement can be reluctant to share knowledge with the young employees, thus conducing the process of organizational forgetting [6; 12; 16]. In this case, gamification can be a potentially effective way of increasing the engagement of such employees or groups of such employees in the knowledge sharing processes, increasing their corporate identity and perception of the company as of the game environment [44]. However, several sensitive issues important for implementing the gamification practice in a company are of special importance in this case.

Firstly, for the employees perceiving their unique knowledge as a bargaining power source, the question of balance between the tangible and intangible motivation is of specific importance [2; 29]. Due to that, we can suggest that points and resulting financial rewards given to such employees for sharing their unique knowledge must be an adequate alternative to not sharing this knowledge, but just holding and using it [29; 30; 43].

A second sensitive issue here is that gamification practice as such can be perceived by highly qualified specialists holding unique knowledge (especially in the case when these specialists are of older ages) as an offensive practice due to its being not serious enough, which can be interpreted as a sign of disrespect to the experienced users [5; 26].

To cope with this threat, the development of gamification techniques should consider the specific cultural context of the company and the values of the experienced specialists that have positive meanings for them. For example, the rhetoric used for engaging this type of employees into gamification of knowledge sharing could address the professional self-esteem of the experienced specialists and their pride for creating value for the company, the country, the professional community or other types of communities [17; 18; 32].

Motivation for creation of unique knowledge via gamification, in its turn, does not seem to have these two threats as critical, as motivation for sharing of the existing unique knowledge has.

If we compare the activities of knowledge creation and knowledge sharing by a criterion of closeness to the game as a specific type of activity, it would appear that knowledge creation activities are surely closer. Indeed, the knowledge creation activities can be characterized with an uncertainty of result [19; 22; 37] that can be treated as one of the definitional properties of game activities [3]. From the neurophysiological point of view, creative activities are a typical representation of the searching behavior with its specific nervous activities, another typical representation of which is game behavior [21]. Specifically, in innovation management studies this is supported by studies of the influence of the so-called "adult playfulness" of the employees on the innovation performance of companies, showing the significant positive correlations between the two [1; 9]. Thus, engaging the employees and groups of employees into knowledge creation activities via the corporate Web 2.0 systems with the help of gamification practices can be perceived by the employees as a more "natural" thing than the gamification of knowledge sharing activities [18], so the anxiety toward gamification of knowledge creation activities as a practice of exploitation or a potentially offending practice can be less than in the case of gamification of the knowledge sharing activities.

However, concerning the financial manifestation of the game rewards given for creating the new knowledge, the closeness of knowledge creation and game activities does not mean that the careful development of the scheme of translating the game rewards into the financial rewards is less actual than for gamification of the knowledge sharing activities.

Conversely, creation of new knowledge is an activity that can result in a potentially higher value created for the company, than the sharing of existing knowledge, as the creation of new knowledge can not only sustain the efficiency of processes used by a company at the moment, but lead to radical, disruptive innovations that can make a company a first mover on a new market with all the respective market advantages [14; 40]. Thus, creation of new knowledge is an activity deserving higher rewards, than sharing of existing knowledge. Another reason for that is the fact that knowledge creation activity is uncertain about results, so the employees involved in knowledge creation are facing bigger risk of failure than the employees involved in knowledge sharing activities, thus also requiring a part of reward that can be called a "risk premium" (under the term "risk" we mean here not only direct financial risk which is not very actual for the employees of an established company, but also the risk of spending considerable time and intellectual resources in exchange for uncertain outcome [21; 22]).

Thus, it can be considered reasonable to make the financial equivalent of the game rewards for operations of creating new knowledge via corporate Web 2.0 systems higher than for the operations of sharing the existing knowledge; practically, knowledge sharing operations could "weigh" more points than the knowledge creation operations.

Unlikely the usage of the uniqueness metric to assess the operations of knowledge sharing, applying this metric to assess knowledge creation operations has bigger potential of favoring the freeriding behavior of the individual employees or groups of employees. Indeed, as creation of new knowledge is a process with uncertain result, employees participating in knowledge creation activities can be tempted to present a bigger quantity of results of these activities (e.g., idea suggestions as results of the brainstorming sessions performed via the corporate Web 2.0 system) at the expense of quality of the results [8]. However, this threat can be mitigated by increasing the thoroughness of the expert assessment of the created knowledge and the objectivity of the criteria of this assessment, and making the employees clear about the existence of a set of objective criteria according to which the results of the knowledge creating process would be analyzed. Analogously to the effect of structured format requirements on the quality of knowledge content shared or created, we suggest that objectivity of the criteria of assessing the uniqueness of the created knowledge can increase the employees' effort for creating knowledge of high quality as a result of the intangible intrinsic motivation based on professional self-esteem [44].

IV. Conclusion

In this paper we have analyzed the perspectives of applying the experience of fitness gamification practices to stimulate the adoption and usage of the corporate Web 2.0 systems.

On the basis of experience of most prominent fitness gamification projects, a set of metrics have been analyzed that can be used for assessing and rewarding the employees' individual and collective activity in sharing and creating knowledge via the corporate Web 2.0 systems.

The main types of metrics analyzed in the paper are the metrics related or unrelated to the content of knowledge shared or created via the system.

As for the metrics unrelated to the content of knowledge created or shared via the corporate Web 2.0 systems, the analysis had shown that these metrics contain substantial obstacles preventing these metrics from effective use in gamification.

The content-related metrics have more potential to be used, although not being deprived from several weaknesses and threats that need to be controlled for.

The metrics of this type can be divided into the quantitative and the qualitative metrics.

The quantitative metrics include the net amount of knowledge shared or created, measured in digital information units of measurement like kilobytes, and the amount of specific types of knowledge shared or created, e.g., a number of files containing data presented in a particular format shared by a user in a period, or a number of new ideas presented in a particular format created by a group of users in discussions via the Web 2.0 system.

From these metrics, the net amount is worse because it can be favoring freeriding behavior of the employees in a way analogous to that of the content-unrelated metrics. A metric of amount of specific types of knowledge shared or created seems to be better due to lowering the freeriding possibility caused by considerable requirements of time and effort to perform knowledge creation or sharing operations via the corporate Web 2.0 system.

As for the qualitative metrics, the easiest of these can be suggested to consider the uniqueness of shared or created knowledge in relation to the respective industry and market.

The metric of uniqueness of the knowledge shared via the corporate Web 2.0 system can be presumed the best from all the suggested metrics by a criterion of favoring freeriding behavior. As unique knowledge held by an employee tends to be perceived by this employee as a source of bargaining power, the employees, conversely, need specific motivation for sharing the unique knowledge, thus requiring carefully developed balance of tangible (mainly, financial) and intangible motivation elements.

Finally, the metric of uniqueness of the knowledge created via the corporate Web 2.0 system seems to be the best applicable for gamification of the corporate Web 2.0 adoption and usage, as the process of creation of new knowledge is itself psychologically close to game activity. Besides that, the threat of the employees' freeriding that still can appear when using this metric can be mitigated by increasing the

thoroughness of the expert assessment of the created knowledge and the objectivity of the criteria of this assessment, and making the employees clear about the existence of a set of objective criteria according to which the results of the knowledge creating process would be analyzed.

Thus, the following metrics can be recommended to be used for gamification of the corporate Web 2.0 adoption and usage:

a) amount of specific types of knowledge shared or created via the corporate Web 2.0 system;

b) uniqueness of the knowledge shared via the corporate Web 2.0 system;

c) uniqueness of the knowledge created via the corporate Web 2.0 system.

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