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Engaging healthcare users through gamification in knowledge sharing of continuousimprovement in healthcare

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Abstract

Knowledge management systems are key for capturing, retaining, and communicating results from projects and presenting information to staff. The purpose of a knowledge management system is to tap into the vast wisdom from projects and experts across an organization. This research focuses on the knowledge management system within the Veterans Health Administration that was developed as a repository of information on continuous improvement tools such as flowcharts, value stream mapping, 5S, and the application of these in healthcare projects. The use of social network analysis and gamification improves website organization, user participation, and dissemination of shared knowledge related to continuous improvement of operations. The purpose of gamification is to engage, teach, entertain, measure, and improve the ease of use of information systems. The goal of this research is to utilize gamification theory within the knowledge management system to drive behaviors in a targeted audience and engage users in aspects such as writing, contributing, getting the feedback, which will create a more robust, cohesive system. A thorough review of the current knowledge management system was conducted, and a gap analysis was performed comparing the goals and objectives for the system to the current results.Next, gamification techniques with the potential to improve performance were identified and strategies to implement these were developed.

*Keywords:*Gamification; Knowledge management system; Healthcare

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1. Introduction

Knowledge management systems are key for capturing, retaining, and communicating results from projects and presenting information to staff. This research focuses on the use of social network analysis and gamification to improve a Knowledge Management System (KMS) with respect to website organization, user participation, and dissemination of shared knowledge related to continuous improvement of Veterans Health Administration (VHA) operations. The goal of this research is to utilize Gamification Theory within the KMS to drive behaviors in a targeted audience and engage users.

The purpose of gamification is to engage, teach, entertain, measure, and improve the ease of use of information systems. Gamification has been widely used in industrial applications to increase customer retention; such as Starbucks creating custom badges in Foursquare which provides customers that check in at store locations with real world benefits such as discounts and virtual rewards such as becoming mayor at a Starbuck's location. This application of gamification motivates users to voluntarily participate in required tasks, encourages brand loyalty, and provides customer feedback and vast amounts of data about user behavior.

The purpose of the Veterans Health Administration Knowledge Management System for Systems Improvement is to tap into the vast wisdom from projects and experts across the VHA. The first phase of developing the KMS was the creation a repository of information on the basic continuous improvement tools such as flowcharts, value stream mapping, and various other tools, which is known within the system as the KMS Wisdom. The second phase, Improvement in Action (I-ACT), was to focus on the application of that knowledge through projects. The purpose of this research project is to focus on the application of gamification theory in the KMS Wisdom and I-ACT with the goal of engaging users, motivation, and increase content submission. The volume of information and examples on the KMS is very beneficial to the user; unfortunately, it can seem daunting to the user at the same time.

The purpose of the research is to explore using gamification techniques to engage VHA KMS users to improve the users' experiences and to encourage continuous improvement at the VHA. As part of the research, gamification strategies were developed for the KMS Wisdom and KMS I-ACT portions based on the user behaviors, best practices in the literature, and goals of the KMS workgroup.

2. Literature review

The science of gamification, though a recently coined term, was developed in 1973. The modern term was coined by Nick Pelling[1]. However, the basic concept of gamification was first established by Charles Coonradt in his book "The Game of Work" in 1973. Gamification is defined as the use of game design elements in non-game contexts [2]. Contrary to popular belief, gamification does not involve constructing games out of tasks or events. Gamification aims to apply specific aspects of games/gaming to tasks and events to produce desired effects. Gamification is a method of Incentive-Centered Design (ICD), which is the process of designing a system that aligns players/users goals with the goals of the system. Gamification does this through the use of rewards and competitions such as digital badges and leaderboards. Various definitions have been proposed including "the adoption of game technology and game design methods outside of the games industry" [3], "The process of using game thinking and game mechanics to solve problems and engage users" [4], "Integrating game dynamics into your site, service, community, content or campaign, in order to drive participation" [5], and an informal umbrella term for the use of video game elements in non-gaming systems to improve user experience (UX) and user engagement [6]. Gamification has become a large, rapidly growing industry that totalled $421 million in 2013 with projected growth of $5.5 billion by 2018, a growth rate of 67% [7].

Gamification is composed of two subcategories, structural gamification and content gamification. Structural gamification (such as digital badges and leader boards) is the use of game elements to encourage a player/user to obtain a goal. Structural gamification does not change the content of a process but instead it changes the structure and progress chain of the process. Content gamification alters content to make it more game-like. Gamification is often confused with learning games. These are self-contained games designed for a specific purpose such as teaching reading or mathematics. Simulations, such as flight or driving simulators, allow users to practice a process without real world consequences are also different than gamification.

Gamification has been applied with considerable success in many businesses. Many retailers propose gamification as a part of their service offerings in order to attract customers. Motivational affordances such as points, leader boards, and achievements/badges are among the top options that have been observed in empirical studies performed on the subject of gamification. In an experiment that utilized gamification in a utilitarian peer-to-peer trading service, badges were added to the service that the user could earn from completing different activities. The results supported that gamifying the service resulted in an increase in quality and productivity of actions, social interaction, and usage activity [8]. With this success it comes with little surprise that Gartner claimed that over 50 percent of organizations that manage innovation processes will gamify their processes by 2015 [9].

Levels, stories/themes, clear goals, feedback, rewards, progress, and challenges come next in gamification [8]. Foursquare, Facebook, Twitter, Microsoft, Devhub, and StackOverflow are a few of the numerous businesses that have found large-scale success with gamification. Most remarkably, Devhub was able to increase user participation from 10% to 80% using gamification elements, which encouraged user involvement [11]. Two other large areas of applicability, which are currently in high demand, are education and training. SAP and Microsoft have both employed gamification techniques to teach users how to better use their software [12]. Gamification aims to improve employee productivity and involvement. Due to the increasing usage and popularity of gamification, a new market for gamification specific companies has developed. New companies, such as CodeAcademy and Badgeville, are starting their businesses with their main focus on gamifying systems and teaching their customers how to add game elements to their existing services or to start new gamified services [8].

Gamification has not only been utilized by vendors and businesses; researchers have also shown an interest in this considerably new phenomenon. Gamification is becoming a popular topic for researchers, which has dramatically increased in the number of publications since 2010 [10]. Researchers started utilizing gamfication with the purpose of encouraging workplace involvement [13] and supporting mass-collaboration [14]. The University of Washington used gamification techniques to encourage players to manipulate proteins into more efficient stable structures [15].

In the literature review “Does Gamification Work?” published by the IEEE the group researched the context, application, and outcome of gamification in multiple industries and organizations. The context of gamification studies varied from commerce, education/learning, health/exercise, intra-organizational systems, sharing, sustainable consumption, work, innovation/ideation, and data gathering. However, the majority of research was performed on the subject of education/learning [10]. Many quantitative studies in the literature prove that gamification has a positive outcome for all or some of the motivational affordance [10]. Most of the studies in the educational sector show that gamification leads to positive learning outcomes with regards to improved motivation and engagement levels as well as enjoyment over learning [10].

Multiple studies have shown that IBM’s Beehive gamification system has a positive impact on some users for a short period of time [16], [17]. Moreover, a study concluded that removing gamification, in this example point system, would have a negative impact on the user activity [18]. On the other hand, studies have shown an increased level of competency between users due to the time management that some badges required. This produced unwanted behavior such as reduced carefulness that needs to be assisted in future research, task evaluation difficulties, and design features [19].

3. Gamificationstrategies at the VHA

Using gamification, badges can be displayed which provide a public profile that allows other KMS users at the VHA to see the accomplishments of very active system improvement experts. This could be displayed in connection with the contact link for successful projects. The profile would help make novice users seeking information more comfortable with contacting other VHA employees and help build a community within the organization. The KMS will be utilizing SharePoint software coupled with the gamification software extension as a social medium for VHA employees. Three main goals were determined for the implementation of gamification, which included 1) recruiting new users, 2) increase in users contributing to the KMS, and 3) increase in users effectively using KMS.

Using information from a thorough review of the KMS, preliminary points within the system were identified that could benefit from applications of game mechanics. Table 1also outlines the gamification strategies and points identified for potential gamification of the VHA system.

3.1. Recruiting new members goal

3.1.1. Number of unique user visits as measured by KMS analytics

KMS analytics provides data on the number of unique hits that can be analyzed on a daily or monthly basis. Figures 1-4 show the data from the last two weeks of January for the KMS homepage, Wisdom, and I-ACT. This data shows the level of usage before the gamification has been incorporated into the system. It is important to identify how the effectiveness of gamification efforts will be evaluated and to establish baseline values.

Table 1. Gamification Strategies and Points for Gamification.

GOAL	Gamification Strategy	Comment	Pros	Cons
Recruiting new users				
	Contests Badges	We would need to track IP addresses or have new folks give the name of the referring person	Word of mouth is the best "advertising" "Friendly" competition	It would require extra "tracking" of users Contest would have to be meaningful to motivate participation
Users contributing to -Wisdom - I-ACT				
	Contest Badge for - Featured I-ACTS projects - Number of contributions - Fan favorite or star ratings - Reviewing content - Making comments - Areas of submission (easy…, inpatient…, etc.) - Quantity of cost savings	Could increase contributions in specific categories Could encourage reviewing making comments, etc.	This can be used to add content to area that does not have sufficient content Encourages submissions This is the behavior we want: VHA employees sharing what worked	Would someone "judge" the best or simple reward "volume" You can only feature so many projects (limitation) Will they rate projects and can someone "stuff voting box"? Will submitters "inflate" the savings and/or complexity to gain a badge in a particular area?
Users effectively using KMS				
	Quizzes Contests		Should increase usage	Can "effective" use be measured?

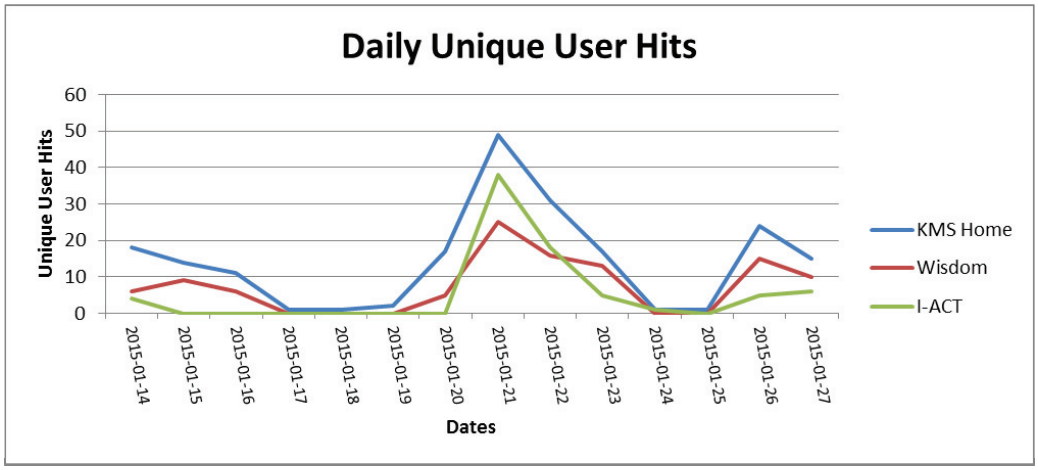

Fig.1. Daily Unique User Hits.

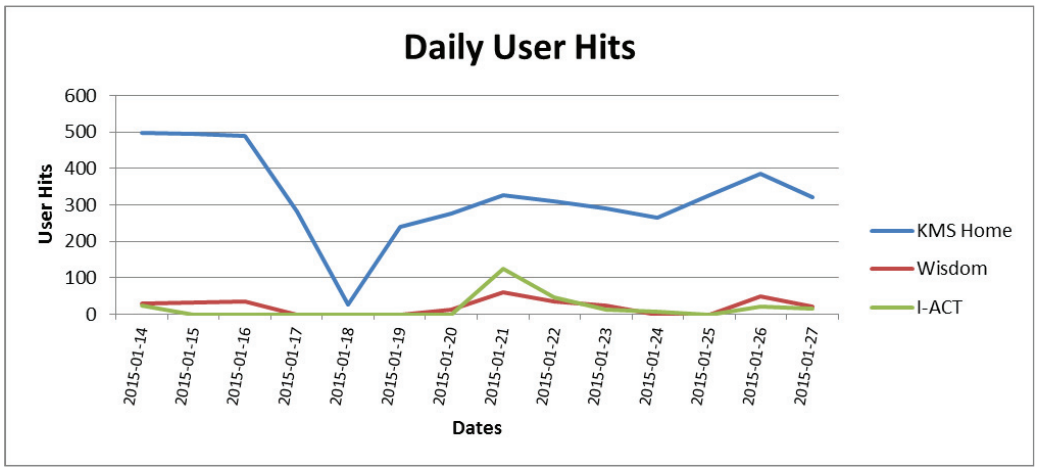

Fig.2. Daily User Hits.

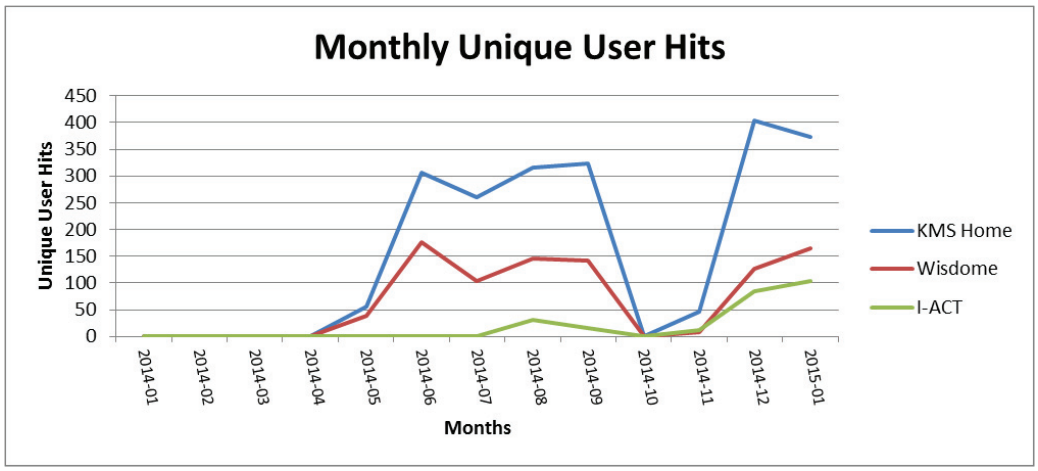

Fig. 3.Monthly Unique User Hits.

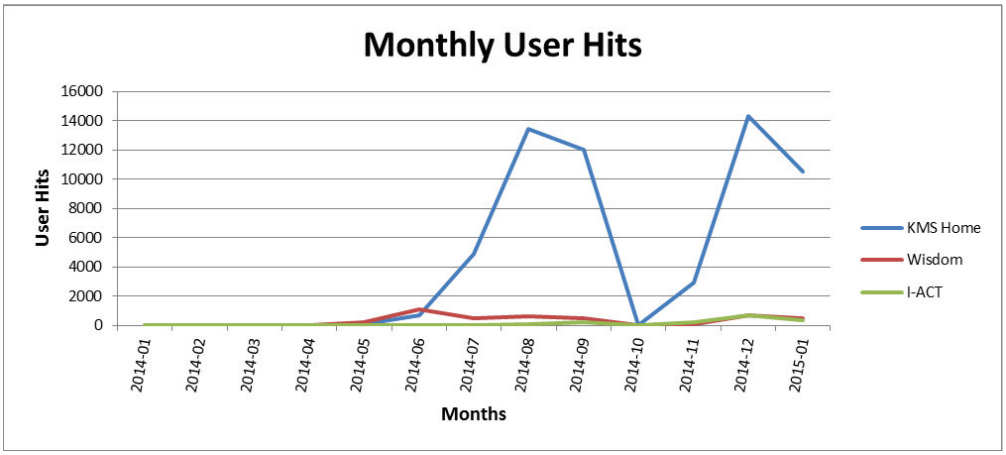

Fig. 4.Monthly User Hits.

3.2. Users contributing to wisdom and I-ACT goal

In addition, content can be tracked to determine trends on user contributions. Prior to the launch of I-ACT in October of 2014, 21 projects were submitted to I-ACT based on referrals from systems redesign professionals. Since the launch of I-ACT, six projects have been added for a total of 27 I-ACT projects. In addition the amount of content in the wisdom library and toolkits can be tracked. This will allow us to evaluate if the gamification of the system achieved the goal of increased content submission.

3.3. Recruiting new users

Since the major SharePoint upgrade in May 2014, data has been collected which shows user hit and unique user rates. The trend is not steady and there is considerable potential to drive more frequent use. Therefore, a key area for growth is increasing hit rates and the number of unique users. Based on the gap assessment the goal is for 20% of current users to recruit another user. Evaluation of this data showed that prior to gamification, members added in waves driven by events such as yellow belt training or newsletter articles about the system.

3.4. Users contributing to wisdom and I-ACT

KMS is an established site with considerable current content. In addition, the Wisdom Library was launched in April 2013. There is considerable information being used in KMS and the Wisdom Library as shown by content counts. I-ACT was launched more recently (October 29, 2014) and, therefore, has more room for growth. This is the area where the focus of improvement should be centered. Currently, an average of two I-ACT projects are added per month, which indicates an area for key growth. The goal should be to increase the submission rate to I-ACT using gamification and competitions to drive submissions to I-ACT by contributors, departments, and sites. Using the information from the gap assessment and discussion with the stakeholders, the goal will be to increase I-ACT contributions by 10-12 projects by the end of strategy implementation pilot. Success in this goal will be a significant achievement for the gamification effort.

3.5. Users effectively using KMS

Using information from the captured search terms, popularity trends were determined. Information on total searches and recent views of projects in I-ACT was analyzed. In addition, abandoned search rates were analyzed and found to be very low. Based on the abandoned search rate, reducing abandoned searches is not an area that needs to be considered for improvement at this time for improvement. Overall, the two analyses show that users are

effectively using KMS to find the information they are looking for. The popularity trends in I-ACT can be used to determine content areas that are lacking to help with increasing contributions to I-ACT. Since the gap analysis indicates that users are effectively using KMS, the team determined that the popularity trends and abandoned searches would continue to be monitored to ensure the current level is constant. This goal has proven to be more challenging to measure but it is a fundamental objective of the KMS.

4. Gamification of VHA Knowledge Management System (KMS)

Using the submission categorization system, a user's submission can be empirically ranked. With the ranking system in place, clear goals have been defined for the process and gamification techniques can now be applied. A necessary first step to the gamification of I-ACT is building a user base. Considering that I-ACT is a social network styled application, social networking tactics can be used to build a user base as well as encourage users to use the application. In order for I-ACT to work a certain number of users must be acquired, this minimum user number is called the user critical mass in the tech world or the tipping point in systems engineering. At this critical mass point, there is enough user contribution to the system that it perpetuates itself. Take for example the application and company FourSquare. FourSquare as mentioned in the gamification history section above, is a very successful application that rewards users for "checking in" to locations and places, much like Green Stamps but with no purchase necessary. FourSquare relies heavily on having a large user base. Without a sufficiently large user base, the system fails [20]. The proposed adaptation of gamification techniques to the KMS will also be dependent on the size of its user base. According to [21], the necessary number of users required to achieve a critical mass is 10-15% of the community. Once the critical mass point is achieved the acceleration of user adaptation grows until plateauing at a saturation point [21]. A proposed method of accomplishing a critical user mass would be to encourage users, upon registration to share the application with peers, friends, and family members.

With a critical mass of users gamification of the system becomes much simpler and more effective. By creating a social aspect to the process, incentive-centered design can be implemented to encourage competition between users (leaderboards), digital incentives (badges), and team building (associated project contribution), among others.

It is easy to become swept in the buzz around gamification and feel the need to "game up" existing systems. This preliminary research has attempted to show that gamification can be performed in a well thought-out fashion. When implementing gamification, the following key questions should be asked:

- What are the goals for user behaviors and system performance?
- How will user performance and user satisfaction be measured?
- What gaps exist between current user behaviors and desired user behaviors?
- How will adding gamification change user behavior?

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