External Influences and Integration as Requirements in Online Community Development

Erno Vanhala, Tommi Kähkönen, Uolevi Nikula, Kari Smolander
Department of Information Technology
Lappeenranta University of Technology
Lappeenranta, Finland
erno.vanhala@lut.fi tommi.kahkonen@lut.fi uolevi.nikula@lut.fi kari.smolander@lut.fi

Abstract —Existing requirements engineering methods and practices do not fully apply to online community (OC) development. This paper highlights the nature of requirements in OC development. This is done with a model that distinguishes between internal and external sources and between design time and refinement time. The paper also emphasizes how integration should be considered as a requirement when developing an OC. The paper ends with a description of an ongoing research project that aims to develop new methods and practices for OC development.

Keywords: online community, social media, integration, requirements
integration in OC

I. INTRODUCTION

Along with the evolution of the Internet, communities have been able to move online, removing the limitations for time and distance and allowing people from anywhere in the world to share their knowledge. A community can be defined as a group of individuals who want to interact, develop knowledge, share their experiences and build up their own entity [1]. According to Kim [2], the social dynamics in traditional and OCs are similar − a community, no matter virtual or real, consists of networked people that all have something in common. Open source software development and crowdsourcing are some examples of enhanced collaboration enabled by the evolution of OCs.

The role of integration has become more important as web applications have developed from static home pages to dynamic mash-up applications that integrate with external APIs and communicate with web services. Early integration techniques included simply hyperlinking and information scraping from other web pages. Now web services allow applications to communicate with standardized languages, like XML and its derivatives, making integration more reasonable [8]. In the past few years, the role of social media has been increasing: there are currently over 600 million users in Facebook and 200 million users in Twitter, not forgetting the ever increasing popularity of media sharing sites such as YouTube and Flickr. Today's social media is largely based on these sites. These trends create challenges for OCs − a modern OC needs to fulfill new types of requirements.

development work. Available methods and practices (e.g. [2], [3]) may be outdated, for example, they do not emphasize the role of social media. In our ongoing research, we have set the following research question: *How should requirements and integration be considered when developing a modern online community?* We argue that requirements must be viewed in a new context and, in addition, integration to existing resources must be emphasized in different phases of the OC development process. This paper is organized as follows: the chapter II presents the key elements of an OC. The chapter III

discusses about the requirements and

OC developers need methods and practices that help them to approach new kinds of requirements in their development. The chapter IV introduces the ongoing research and its research methodology.

II. FUNDAMENTAL ELEMENTS OF AN ONLINE COMMUNITY

In order to better understand an OC, we built a simplified model based on Preece and Arrasvuori et al. [3], [4] that can be viewed as the key requirements for an OC. A successful community needs the presence of purpose, members, content and technology.

A purpose defines why an OC should be established at the first place. An OC can serve as a Community of Practice (CoP) or a Community of Interest (CoI) [1]. In CoP, members are trying to achieve similar objectives by sharing a common interest. Members of this type of OC share experiences, suggest strategies and exchange knowledge with each other [5]. A company may want to enhance the collaboration and information sharing between workers by establishing a community of practice. The members of a CoI have a common passion or interest that can be for example, programming or photography [6].

A single user is the key contributor in an OC, which needs members in order to exist. Without people, there is no community [3]. Users create the content to the OC and very often they also participate in maintenance activities to keep the community organized. Without users there would be no videos in YouTube, nor user reviews in Amazon web store.

An OC needs a technology platform that consists of one or several applications that are created with different web technologies [7]. Discussion forums, blogs, wikis, media sharing tools, instant messaging and virtual words are examples of these applications [3]. When building an OC platform, different technology strategies can be used. The platform can be implemented with different programming languages, by using different frameworks or with Content Management Systems (CMS). Existing social media applications, such as Facebook or Flickr can be also used as a technology platform to establish an OC.

III. ONLINE COMMUNITY DEVELOPMENT

Methods for developing OCs exist (for example, Participatory Community-Centered Development) [3] but they are apparently outdated. For example, Kim developed general guidelines [2] for OC development over 10 years ago – at the time when no modern OCs, like YouTube and Facebook, existed. In the following chapters, we discuss why new models for OC development are needed by examining the requirements and integration in OC development process.

A. Requirements in online community development

Although working with OC development is in many ways similar to traditional desktop software development (both include, for instance, programming), there are also many differences. Tang and Yang say that requirement analysis for web software is different from traditional information system development because users cannot necessary be listed for web software [8]. Ginige and Murugesan describe web as a "mixture between print publishing and software development, between marketing and computing, between internal communications and external relations, and between art and technology" [9]. Our opinion is that the web is a broader domain than, for example, a single company or a gaming console environment and therefore requirement specification for OCs differs significantly from traditional development.

No one forces users to use a specific OC. In that sense an OC is a Commercial Off-The-Shelf (COTS) product. A user decides whether she wants to use it or not. From a perspective of requirements engineering we have to figure out what are the features that make the user want to join OC. There are studies (e.g. [10], [11]) to describe what are the reasons for a person to join and participate in an OC.

In traditional software development models, requirements are gathered from the problem description and from the stakeholders [12]. For instance, we can consider designing of a controlling software for a paper mill as an example of traditional requirement gathering and analysis. A company providing software gets specifications of the mill and can interview workers from each user group and ask their requirements for the software.

When developing an OC that is used by an unknown number of anonymous users, it is impossible to, for instance, interview them all and ask what they want − especially before the OC release. This is why the requirements specification needs to be divided into two levels: external and internal sources of requirements.

Figure 1 presents four different regions of requirement specification which take place after the idea of forming an OC. The horizontal axis defines the project timeline. The left part is design and development phase before release. The vertical line in the middle is the time when the OC goes online. The right side shows the time when the OC is in use and it is refined. In the traditional software development this could be seen as the maintenance phase of the software life cycle.
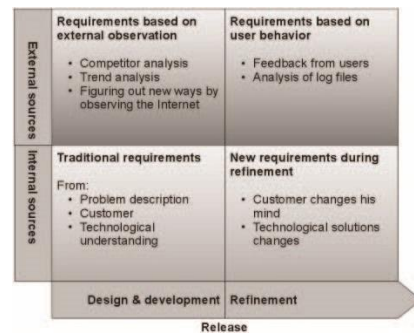

Figure 1. Four sources of requirements

The lower part of Fig. 1 presents internal sources of requirements. The whole lower part could be seen as the ideal traditional requirement specification process. All the requirements come from the customer and most of them exist before the development starts. Only few new or changed requirements appear during the refinement phase.

In real life there are numerous reasons (e.g. new technology, new rules) for new requirements during the refinement phase [13]. New requirements that emerge during the refinement are traditionally seen as maintenance and they represent a large portion of the software life-cycle costs. In OC development the changes cannot be called as "maintenance", because improvements are essential for the public success of the system. Therefore the refinement is a continuous and active process − the new versions with improvements are put online as soon as they can be used.

Fig. 1 makes also the distinction between internal and external sources of requirements. By external we mean here something that does not come from the customer. External requirements may come from other similar applications or they may be something that have even not been invented yet, but so important that they can give an advantage to the OC or be even crucial to its success. Who would have longed for Facebook's "Like"-buttons in other web sites five years ago? Now they are de facto. These kinds of requirements have to be discovered, even invented [14].

Sommerville and Sawyer advise a requirement analyst to identify people who will specify requirements [12]. Although this is a good advice, it is not always applicable when

developing an OC which can be used by anyone. When considering the upper left corner of Fig. 1, we are talking about observing the web. Competitor and trend analyses are the activities to be performed there. Copying already existing solutions is not enough. Instead of that, one should see beyond the existing web, proactively seek new innovations, and watch, for example, new API (Application Programming Interface) releases from e.g. Google and Facebook and thus get a potential for a competition advantage. Sometimes the implemented technology can be totally different than what the OC is used to. Who would have thought 5 years ago some online newspapers would use Facebook to handle their comments on the news items?

The last quarter of Fig. 1 includes external sources of requirements that emerge during the actual use of the OC. In this phase the OC is under continuous refinement based on feedback and new innovations. OC members, or visitors, can give direct feedback, but besides that they leave trails of their user actions. Analyzing logs is a powerful way to improve an OC [15].

Although an OC is like COTS it has also dissimilarities with the concept. With OC requirements, the trend analysis is more important. The web changes rapidly and the OC requires continuous refinement. Trends change fast, like what happened in the competition between MySpace and Facebook. In OCs, logging and log analysis are also more important than in traditional desktop applications.

In summary, the traditional conception of requirement specification is not fully suitable when developing a continuously evolving OC. We argue both external and internal sources are important when developing an OC.

B. Integration as a requirement in online community development

Above we discussed the differences in the nature of requirements in traditional and OC development. There is also another difference that is more technical or functional by nature: integration. The main motivation for performing integration is that it is often more reasonable to use existing information, functionality and services rather than reinventing the wheel. For example, if the application needs to show weather forecasts or use location services, it is reasonable to use existing APIs and web services to have this functionality. Although there is not much published research available about integration in OCs, the blogosphere has developed guidelines to be used when, for example, integrating to other social media services (e.g. [16], [17]).

1) Social media integration

During recent years we have seen the increased integration with web sites and OCs. For example, Facebook's API is integrated with increasing number of web sites. For a user this is visualized by "Share in Facebook" and "Like"-buttons in many web sites they access daily. Some OCs offer

a possibility to authenticate by using Facebook account rather than requiring user to have new account for that site. By observing the spread of Facebook's functionality in other web sites, it can be argued that the role of social media has increased in today's web and mobile applications. Applications are becoming more "social" and integration with Facebook or Twitter can be nowadays considered as an important requirement for an application. For example, Sports Tracker is an application that allows user to keep their exercising diary[1]. A user can publish a notification about the type and duration of the exercise to social media and share it with others.

2) Additional ways to integrate

Integration is more than just working with other social media solutions. Already when considering the business model one can decide to use some advertising service to get money. If the community has some chargeable content, the community builders can use, for example, PayPal to get their payment. When selecting the right techniques, builders can aggregate data from other sites, integrate to e.g. maps from Google, weather forecast from The Weather Channel. Authentication can be made, for example, through Facebook or OpenID. By integrating to existing services, developers save time and money and get quality service to start building their own community on.

After the OC is launched it is important to see how visitors and members come to the community and what they are looking for. There are analytical tools to be integrated with in order to see what is happening in the OC[2]. With analytics tools it is possible to see what content people are looking for and how long they stay in the OC. CMSs provide also their own tools, for instance, to see what search words have been used.

3) Considerations on integration

It can be problematic to find the right level of integration. For example, some users might see Facebook authentication as a good sign − they do not need to remember one more account. On the other hand, nonFacebook users aren't going to be happy if the Facebook authentication is the only way to login. In some cases, like in internal OCs of companies, Facebook-authentication might not even be a choice. Another issue is how much one can trust to other services. How large is the damage if the integrated service leaks private information to competitors? In this sense integration is like outsourcing. There is always the possibility of a leak. All these should be considered when doing a requirement specification. Also the semantic side of integration, that is, identifying the content of the data being integrated, needs certainly be addressed as well but it is out of the scope of this paper.

We argue that integration is a critical part of the development process of a modern OC. Everything can be

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[1] http://www.sports-tracker.com/

[2] e.g. analytics.google.com

done without any integration at all, but with limited resources integration turns out as a time saver and the community can heavily benefit from the right kind of integration.

IV. A PROPOSAL FOR AN EMPIRICAL STUDY

Design science (DS) involves a rigorous process to design artifacts to solve observed problems, to make research contributions, to evaluate the designs and to communicate the results. DS not only results to innovative artifacts, but also to knowledge about creating other instances of artifacts that belong to the same class [18]. An artifact can be defined as a construct (vocabulary and symbols), a model (abstractions and representations), a method (algorithms and practices) and an instantiation (prototype systems) [19]. Producing the artifact is the most important property of DS. The development of the artifact should be a search process that draws from existing theories and knowledge to come up with a solution to a defined problem. The quality and efficiency of the artifact must be evaluated constantly. One benefit of DS is to realize benefits from the practical applicability of research outcomes [20]. This way, DS also has a dual nature: to make theoretical contributions and to assist practitioners in their problem solving [18]. The Design Science Research Method (DSRM) consists of six activities that are 1) problem identification and motivation, 2) definition of the objectives for a solution, 3) design and development, 4) demonstration, 5) evaluation and 6) communication [20].

We are working with the problem that Finnish and Russian travelers need information of certain social services when traveling to their neighboring nation. Xiang et al. [21] pointed out that the role of social media in online travel information search has been increasing. Online tourism communities assist consumers in their travel planning and allow them to post and share travel related comments, opinions and personal experiences. There are online tourism communities (e.g. Travelpod, and Couchsurfing) which focus on world-wide traveling whereas others concentrate on single nations only (e.g. VisitFinland, CoolAustria).

During our ongoing project, we will establish a domain specific OC for different stakeholders (travelers, customs, traveling agencies, hotels, etc.) The community platform offers sharing of information and experiences between the stakeholders. Integration with social media, existing services and OCs is emphasized. DSRM is going to be utilized in the project. In the first phase of the DSRM process, a problem is discussed with all the stakeholders of the project and requirements for the community are gathered. Also, the technology for an OC platform is selected. During the second activity, the scope of integration is determined. The artifact, that is, the platform for OC is created during the 3rd activity. During the demonstration and evaluation (activities 4 and 5), we collect information from the users by using different methods, such as surveys, interviews and monitor their behavior with analytic tools. Finally, the results are communicated and a draft of the new development model for OCs is outlined.

V. CONCLUSIONS

In this paper, we discussed about how requirements should be viewed in OC development process. We also pointed out the key role of integration that can be considered at different levels in an OC development process. Finally, we presented a proposal for an empirical study. The study uses the DSRM to build a domain specific OC for travelers and produces a new model for OC development.

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