

Proposal for Master Thesis in Software Engineering

Base information

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Title (preliminary): Knowledge Management (KM) in Agile Teams

Link to project home page (if any):

Academic Advisor: Darja Šmite

Start date:

Proposal ok by date:

Presentation date:

(OBSERVE, your thesis proposal has to be ok 15 weeks BEFORE the presentation date).

Thesis type: Empirical Research

Student 1 suitability

Software engineering course credits completed at BTH (total): 75 ECTS credit points

Software engineering courses completed at BTH relevant for thesis work:

- Research Methodology
- Global Software Engineering
- Advance Software Project Management
- Applied Software Project Management

Student 2 suitability

Software engineering course credits completed at BTH (total): 75 ECTS credit points

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- Research Methodology
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Background

Software engineering is knowledge intensive area. Software organizations are interested in managing their knowledge and using smarter innovative ways to solve problems [1]. Knowledge management is essential for success in ever changing global software development [2]. It helps software development organization to acquire and maintain competitive advantage. One of the objectives of KM is to improve productivity through effective knowledge sharing and transfer [3]. Knowledge management activities for globally distributed agile teams need further exploration.

Global software development is “software work which is attempted or engage in different geographical location across the national boundaries in a coordinated fashion to involve synchronous and asynchronous interaction” [4]. Global software engineering involves with communication, coordination and control to make a high quality product. In the globally distributed agile teams share project-specific knowledge through frequent face-to-face interaction, effective communication and customer collaboration [5]. Some studies identified knowledge sharing is difficult in the distributed agile teams due to face-to-face communication between teams [6] [7]. In the agile software development collaboration and coordination depends on communication, which is the central to successful software development [8]. Software development depends on the developer’s knowledge and experience [9]. One of the objectives of KM is to improve productivity through effective knowledge sharing and transfer [3]. So, success of agile projects relies on effective knowledge sharing among teams.

Pioneers of this research area, Nonaka et al. [10] presented a model of the dynamics of knowledge creation which is built upon the distinction between explicit and tacit knowledge. There are four modes of knowledge production: tacit to tacit knowledge (Socialization), tacit to explicit knowledge (externalization), *explicit to explicit knowledge* (combinational) and *explicit to tacit knowledge* (internalization) [1][5]. These four types of knowledge production are important to create organizational knowledge. But explicit knowledge has more value rather than tacit knowledge[12]. Because explicit knowledge is tangible, documented, and resides within the organization. Focusing on one type of knowledge less likely to succeed; So, organization should pick solution that emphasize both tacit and explicit knowledge when planning KM initiatives to support knowledge engineering [13].

Knowledge management is considered as software process improvement initiative [1][8]. Knowledge management in global software development projects is essential in order to cope with the coordination and multiple knowledge sources under time and budgetary constrain [15]. Two main strategies for knowledge management: Codification and Personalization. Codification, which is systematize and store information about the company that constitutes knowledge (Knowledge-as-object [14][16][17][18]). It’s develop an electronic document system that codifies, store and allows reuse of knowledge which helps the new team member to reuse the knowledge [19]. Personalization (Knowledge-as-relationship [20][21]), supports the flow of information in a company which is centrally stored information about the knowledge source [22][23].

Michael Earl [24] has classified Knowledge Management (KM) into three broad categories: technocratic, economic, and behavioral. Earl also divided these three categories into seven schools; System, Cartographic and Engineering (Technocratic), Commercial (*Economic*) and Organizational, Spatial and Strategies (*Behavioral*). Torgeir Dingsøyr et al. [13] discussed the

relation between knowledge management schools and software development methodology. The authors found technocratic schools are closely related with traditional software development and those who are developing software through traditional approaches they are probably getting benefit from technocratic schools. On the other hand behavioral schools are more related with the agile approaches and agile teams are more benefiting from the behavioral school [23]. Torgeir Dingsøy et al. [25] also conducted a survey in traditional and agile companies where they found, agile companies seem to be more satisfied with their knowledge management approaches compared to traditional companies. In this survey the authors also found medium sized companies are more satisfied with their knowledge management approaches rather than small companies. Authors also mentioned, “In the agile processes, knowledge sharing happens through the interaction” [25]. Developers share knowledge by working together and through close interaction with the customers; and more specifically pair programming, extreme programming, daily scrum meeting, and sprint retrospectives in scrum. In the traditional software development the knowledge management relied primarily on explicit knowledge; on the other hand in the agile software development KM relies on tacit knowledge [26]. In the agile software development information radiator and co-locating teams related with spatial school.

In the traditional software development the knowledge is explicit and easy to capture but in the agile development methodology the knowledge is tacit which are stored in human mind [3]. So, extracting tacit knowledge to explicit knowledge is one of the greatest challenges of knowledge organization [21]. Due to the absence of explicit knowledge/documentation in the agile software development experts need to spend much time in repeatedly answering the same questions, experienced developers leave project, less support for reusability and less contribution to organizational knowledge. In the agile collocated development, informal communication is the key enabler for knowledge sharing but when agile project in the distributed settings, informal communication and knowledge sharing is slow down due to low communication bandwidth as well as social and cultural distance [27]. Due to spatial, temporal and cultural factors communication also aggravated in the distributed settings [28].

The intention of spatial school is to encourage socialization (tacit to tacit knowledge) as a means of knowledge exchange [29]. Spatial school is more concern with the development and utilization of the social capital which develops from people interaction, formal or informal, repeatedly overtime [24][29][30]. The target of this research is to discover KM activities in agile software development team in distributed environment. Spatial school focuses on designing office space to promote knowledge sharing [13] [17]. But there are no empirical studies found, spatial school fostering KM activities for globally distributed agile team [13] [23]. Our intension is to find out, in distributed setting how agile teams contribute to share knowledge creation and transfer, scope of the shared knowledge, and also attempt to find how distributed teams access and use those spatially shared knowledge.

Aims and objectives

The aim of this thesis is to find out how agile teams practices KM activities through spatial school in the distributed development.

- Finding types of knowledge resides locally in among distributed sites.
- Identifying how sites use office space to create local knowledge.
- Identifying ways how those knowledge are made accessible in distributed development team.

- Finding preferences of knowledge management techniques and sharing approaches in different sites.
- Finding common understanding of knowledge management in distributed sites.

Research questions

- How agile teams contribute to shared knowledge creation and transfer activities in the distributed setting?
- What is the scope of the shared knowledge? Is it sufficient?
- How sites access and use the spatially shared knowledge?

Expected outcomes

- A description of knowledge management activities.
- Guidelines of using tools and techniques used by practitioners.
- Process improvement scope and guidelines.

Research Methodology

Because this research addresses an issue that has been rather under-investigated for that reason this study takes an explorative approach. Exploratory research helps to find out what is happening, seeking new insights and gathering ideas [31]. In the exploratory research typical techniques like case studies, observation and historical analysis are used, which provides both qualitative and quantitative data.

In order to answer the central research question, different methods will be use to observe the KM activities in agile distributed teams. This research consists of three main activities, namely a literature review, a series of semi-structured interviews and a series of multiple case studies. The goal of this literature review is to find out the boundaries of this field. Therefore, the literature review will give the relevant and necessary background knowledge about this field. So, from the literature review the state-of-the-art academic knowledge will be revealed, and gap in the literature can be identified. Furthermore, it will show how agile teams contribute to shared knowledge creation and transfer activities and scope of the shared knowledge. This will be improved by discussion with expert and people from the industry through semi-structured interviews. Because of the exploratory nature of this study, six to eight semi-structures interviews will be conducted at the early stage of the study in order to identify how practitioners are creating, storing and sharing knowledge related to software development among geographically agile distributed teams. The selection criteria for these interviewees will be based on kind of firm they work, experience of the firm in agile distributed development, their role in the firm, and their role in the distributed agile teams. This data will be used to design multiple case studies.

The nature of the multiple case studies is exploratory as current literature review shows insufficient researches. The multiple case studies will be conducted using interviews and observation. The observational design is to extract spatial information about knowledge management. For these multiple case studies, four to six firms will be identified that are involved with agile distributed development. Several considerations will be made to the selection criteria for finding appropriate case studies. It is essential that the case study gives good insight in the problem addressed and process employed by organization.

This research entails as exploratory multiple case studies, so it has to foster higher degree of validity and reliability. There are two types of validity (in addition to *Reliability*) that have to be consider, namely construct validity and External validity [32]. Construct validity involves creating correct operational measures for the concept that are measured in the case studies. During the interviews session, we will apply the chronological order in the discussion to maintain the chain of evidence. We will send the case study report to key informant (the interviewee) in order to check whether case study correctly used the operational measure. In addition to interviews, some follow-up questions will be pose on varies issues, maps and charts of the geographical characteristic or layout of a place. The external validity needs to be obtaining which will help to refer the ‘domain to which the findings of the case studies can be generalized’. The selection criteria play an important role in the creation of external validity. In addition *reliability* of these case studies is an important issue. The goal of reliability is to minimize the errors and biases in the study. Though the multiple case studies are primarily based on interviews but we have also planned to use different sources of information (e.g. document, direct observation, participant observation, and physical artifacts). Furthermore, a case study protocol will be sent to all interviewees before interviews actually being conducted.

Risks

Risks	Possible Solution	Probability
Interpretive validity	Systematic testing of emergent interpretations against participant’s words and actions.	High/Medium
Internal Generalization (within group or sites)	Purposeful sampling.	Low
External Generalization (to other groups or sites)	Site selection.	Medium
Inaccurate or incomplete evidence	Detailed evidence or Triangulation of data sources.	High
Insufficient time	Creating milestones for research, documentation and prioritizing tasks.	Medium
Lack interest of the companies	We will have backup list of the companies.	High/Medium
Authors Influence (might alter the data from interviews and observation)	We will send the case study report to key informant (the interviewee) in order to check whether case study correctly used the operational measure.	High
Team Work	Promotes the concepts of sharing, communication and working towards for a common goal.	Medium
Case studies in Different sites	Due to time constrain their might not possible to visit all the sites. To mitigate this problem, we will try to conduct interviews through Skype and we will also ask for photograph of their physical space or layout.	Medium

Time plan

Scheduled Milestones and Meetings:

- 20120215: Start writing the proposal
- 20120402: First draft of proposal to supervisor
- 20120422: Final draft of proposal to supervisor
- 20120430: End of literature review
- 20120505 : Interview guide finished
- 20120630: All interviews conducted and transcribed
- 20120820: Final draft to supervisor
- 20120912: Supervisor tells examiner we are ok for presentation
- 20120919: Updated final draft sent to opponents
- 20120926: Thesis Presentation
- 20121010: Final thesis updated, approved and sent to examiner

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