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Development of a framework to study communication barriers in the Distributed Agile Development environment

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Agile software development is a modern iterative and incremental framework aiming at customer satisfaction through frequent delivery of the working software. It values rich interaction between all stakeholders throughout a project. However, when the stakeholders are located remotely, special actions must be taken to remove the communication barriers in order not to lose the benefits of the agile methods.

This paper attempts to create a conceptual framework for an empirical study of the communication barriers in the Distributed Agile Development environment. The proposed framework consists of a theoretical part connecting the communication barriers and the Distributed Agile Development challenges, suggestions on developing a quantitative questionnaire to study the topic and a review of the existing literature on how to overcome the communication barriers in the Distributed Agile Development environment.

The author believes that the research results will be useful for organizations deploying or planning to deploy the Distributed Agile Development and agile practitioners as a reference for a further study or as a ready made framework for a survey. However, solving part of the Distributed Agile Development challenges by enhancing the communication is very difficult and must be approached only if the distribution is unavoidable.

How to de-distribute software development project is proposed for future study.

Keywords
Agile, Scrum, communication barrier

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1 Introduction

Agile software development is a modern iterative and incremental framework aiming at a customer satisfaction through the frequent delivery of working software. It values rich interaction between all stakeholders throughout a project. When the stakeholders are located remotely, the communication channel shrinks and the communication barriers are unavoidable. Special actions must be taken to remove the barriers and maintain the communication channel wide enough in order not to lose the benefits of agile.

1.1 Background

Since the end of the "dot-com bubble", many software development companies were threatened as a non-efficient and non-responsive to business needs organisations producing low-quality and expensive products. Projects became bigger and more often late. In addition, employees were feeling detached from the decision making and the employee's morale started to decline.

To address these threats, software development companies took one of the two approaches. The first ones, in order to keep their operating expenses low, started to move the development into the low-cost countries. China and India became the main offshore software development service providers. The others bid on the more efficient processes in the traditional development sites like the U.S. and Europe. They started to adopt the lean principles from "just-in-time" systems developed by the automobile industry leaders like Ford Motor Company and Toyota after World War II. In the software development industry the lean principles are implemented by the agile methods.

After few years of experiments, both continue to struggle with serious problems. The first ones resulted in the low product quality and the long time to market, whereas the

second ones could not compete in the market due to high costs. Blending the two approaches could be a solution. (Moore & Barnett 2004, 4) However, implementing agile in the distributed environment is not straight forward because agile software development relies on constant rich interaction between all stakeholders. The communication barriers were mentioned as the main reasons for the distributed agile failures in several studies (Therrien 2008; Kajko-Mattsson et al 2010; Noll et al. 2010).

This research attempts to create a framework for an empirical study of the communication barriers in the Distributed Agile Development environment.

1.2   Definition of key concepts

Agile SW development – An "umbrella" term for several lean software development methodologies sharing following key principles: customer satisfaction through frequent delivery, adapting to requirement changes, stakeholders close collaboration, frequent feedback, development teams empowerment and accountability, continuous reflection and improvement (Beck et al, 2001).

Communication – "the transmission of information and meaning from one individual or group to another… the process of communication is successful only if the receiver understands an idea as the sender intended it." (Guffey & Loewy 2009, 7.)

Communication barrier – A factor which hamper a successful communication.

Distributed Agile Development (DAD) – A software development following agile methodologies and implemented in a geographically distributed environment.

Offshoring – "having the work done in another country, whether or not it is done by part of the same company." (The ACM Job Migration Task Force 2006, 8)

Organization – "…a social entity that is goal directed; is designed as deliberately structured and coordinated activity system and is lined to an external environment." (Daft 2010, 11.)

Scrum – "Scrum is an agile framework for completing complex projects. Scrum originally was formalized for software development projects, but works well for any complex, innovative scope of work." (ScrumAlliance 2012)

1.3   Research problem

If an organization, which deploys the DAD, suffers from a product low quality, delayed deliveries, technical experts overload, or other problems, it is required to perform a systematic problem solving process starting from identifying the DAD challenges and the root causes.

The DAD challenges jeopardize the business objectives of an organization deploying the DAD. The author believes that by resolving the issues the organization will increase the employee satisfaction, shorten the development cycle and increase the quality and the market value of a product.

The author of this paper believes that the communication has crucial role in agile (and especially in the distributed agile) software development. He assumes that one of possible root causes for some of the failures might be in an inefficient inter-site communication. To prove the assumption and simultaneously to calibrate the current effectiveness of the inter-site communication he suggests conducting an empirical research.

The main research problem of current study is to develop a framework for an empirical research of effectiveness of inter-site communication in the Distributed Agile Development environment. The author has formulated following investigative questions to address the main research problem:

IQ1: How the inter-site communication barriers are connected with the Distributed Agile Development challenges?

IQ2: What are the recommendations to develop a quantitative survey to determine the main communication barriers in the Distributed Agile Development environment?

IQ3: What are the recommendations to overcome the communication barriers in the Distributed Agile Development environment?

The overlay matrix presented in appendix 1 demonstrates the connections between the investigative questions, theoretical frame of reference and the research results.

The author was acting as a Scrum Master in a large SW development organization deploying Scrum in the time of the study. Potentially, the employing organization can be affected by the inefficient inter-site communication in case it will start to collaborate with offshore development site(s). One of the roles of a Scrum Master is to help an agile organization to follow the practices of Scrum. The Scrum Master leads the organization through the often difficult changes, which are required to achieve success with agile development. This means: the task to identify the communication barriers between the stakeholders when they arise and propose the means to overcome them is assumed in the author's direct job responsibilities. In addition, the author is interested in the area of intercultural communication and sees research potentials in the selected topic.

The international aspect of the study is defined by the global nature of the software development and by the fact that intercultural communication being an essential part of it.

1.4   Demarcation

The scope of this study is limited to the research framework development including overview of the agile software development methods by the example of Scrum and its

benefits as well as deeper study of the classes of the DAD challenges and types of the communication barriers; suggestions for a quantitative questionnaire design with presenting an example of it and recommendations for overcoming the communication barriers.

The research paper assumes a reader is familiar with the agile software development concept. There were no intentions to describe all implementation details of agile or Scrum development methods. An interested reader is referred to specific literature, for example Cohn (2010). Only DAD challenges introduced by a weak communication channel are of the interest of this study. Other possible challenges such as IT infrastructure, testing tools and methods, continuous integration framework, architectural solutions and general level of personal technical competences and skills are out of the scope of this study. The author has not got an access to run the quantitative questionnaire proposed by this study. That is why conducting the survey, analysing the results, planning and executing the experiments to overcome the communication barriers are not a part of this study.

1.5   Structure of the thesis

The thesis paper has five parts. The "Introduction" clarifies the background, the key concepts and the benefits of the study as well as sets the thesis objective and the research problems. The "Communication in the DAD" sets a theoretical foundation for the research. Such topics as offshore development model, agile software development, communication models and communication barriers were uncovered. The "Methodology" explains the methodology utilized in the research. Results in the form of recommendations for developing a questionnaire and on overcoming the communication barriers are provided in the "Framework for an empirical research". The "Discussions" concludes with the results applicability, limitations and validity, suggestions for further research and the author learning process.

2 Communication in the DAD

This chapter aims to create a strong foundation for the empirical research framework. The following concepts as well as their relations to the study will be described in more details: offshore development model, agile software development methods in general and Scrum in particular, as well as communication models and communication barriers. As a glue between the concepts, the role of communication in the DAD will be emphasized.

2.1 Developing organization

A developing organization passes through several phases. For a mature organization a need for decentralization, flexibility and leaner management was identified during the revolution of the red tape crisis. Micromanagement, rigid planning and formal procedures of previous phases are replaced by the collaboration of people and self-organized teams within a company or in alliance with external partners. This creates flexible and innovative collaboration environment but requires sophisticated information and communication systems. (Senior & Fleming 2006.)
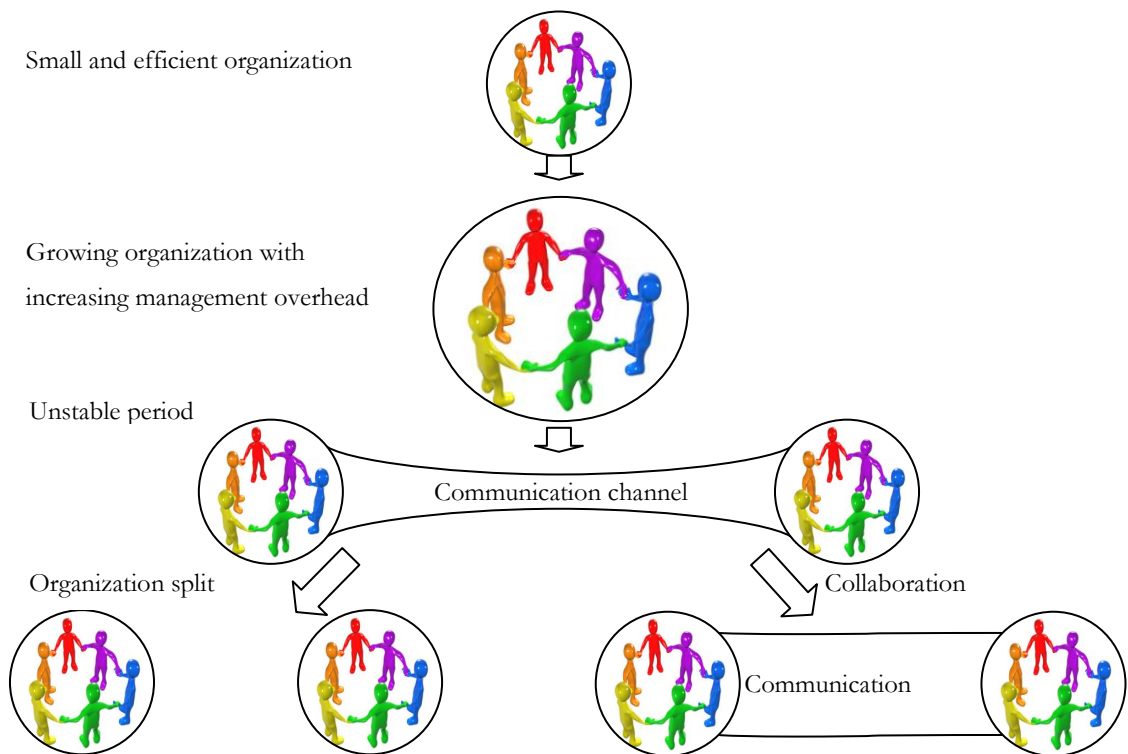
Figure 1: The unstable period of establishing a collaborative organization

The period of transformation to collaborative organization is characterised by very weak communication capabilities. Depending on strategic management decision and level of organizational development, the period can end up with either complete diminish of the communication channel and organization split or the communication channel increase and further development through external collaboration like shown in Figure 1. The unstable period of establishing a collaborative organization is in the scope of this paper.

2.1.1 Offshore expanding

Offshoring is one method to cut the operating expenses while still expanding. Modern information and communication technologies reduce the technical barriers in globalization of the software business. And the following factors start to play bigger roles in offshoring decision:

Labor cost. Reducing costs was cited as the main reason for offshoring by The Outsourcing Institute (Agliano 2004), ACM (The ACM Job Migration Task Force 2006, 57-60) and many more. Indeed, according to the same sources, engineer in India costs $5000-$10000 per year, whereas in the USA - $50000-$100000.

Competent resources availability. For example India – the leading service supplier – educates more than 165000 IT graduates per year with existence of several fairly high rated universities like Indian Institute of Technology (The ACM Job Migration Task Force 2006, 220). BRIC countries altogether hold a pool of millions of highly skilled IT professionals. Sanford (in Minevich & Richter 2005, 10) states: "There is a serious issue that the U.S. is not generating enough skilled engineers/technical students to meet internal business demand."

Proximity to target market. The developing countries market is growing, whereas the markets of Europe and Northern America are stagnating. In order to be closer to the target markets geographically as well as culturally and timely, the multinational corporations tries to move (part of) work to the developing countries.

Finally, it can be concluded that "Offshoring is here to stay… Offshoring leads to opportunities and benefits in terms of productivity, prices, profits and wages for various stakeholders." (Minevich & Richter 2005, 9.)

2.1.2   Agile Software Development

Agile software development is the umbrella term for several iterative and incremental lean development methodologies. While the incremental software development is rooted back to 1950s, term "Agile Software Development" has been officially founded in February 2001, when the 17 process experts published the "Manifesto for Agile Software Development" (Larman & Basili, 2003).

> We are uncovering better ways of developing software by doing it and helping others to do it.
>
> Through this work we have come to value:
>
> Individuals and interactions over processes and tools
>
> Working software over comprehensive documentation
>
> Customer collaboration over contract negotiation
>
> Responding to change over following a plan
>
> That is, while there is value in the items on the right, we value the items on the left more. (Beck et al, 2001.)

The following core principles staying behind the values above are shared among all agile methods. For complete set of the 12 principles refer to Beck et al (2001).

– Customer satisfaction through frequent product delivery

– Easy adaptation to requirement changes

– Progress visibility through frequent feedback

– Stakeholders close collaboration

– Development teams are empowered and accountable

– Continuous reflection and process improvement.

These values and principles make agile projects more productive with lower cost, faster product time to market, improved stakeholder's engagement and employee's job satisfaction.

To represent practical implementation of the agile principles in this study, Scrum method has been selected because firstly Scrum is the most widely used agile methodology (75% of 4770 participants from 91 countries of the "Agile survey" by VersionOne in 2010 (VersionOne 2010) were using Scrum) and secondly the author of the study was acting as a Scrum Master in the large SW development organization deploying Scrum in the time of the study. However, any other agile methods such as XP, Scrumban, Feature Driven Development, Adaptive Software Development, Crystal, etc. could be used equally for this role.

The Scrum framework, based on the agile principles, defines only nine things: three roles, three ceremonies, and three artefacts designed to deliver working software in Sprints, usually 2-4 weeks iterations. Scrum process is presented in the Figure 2 below.
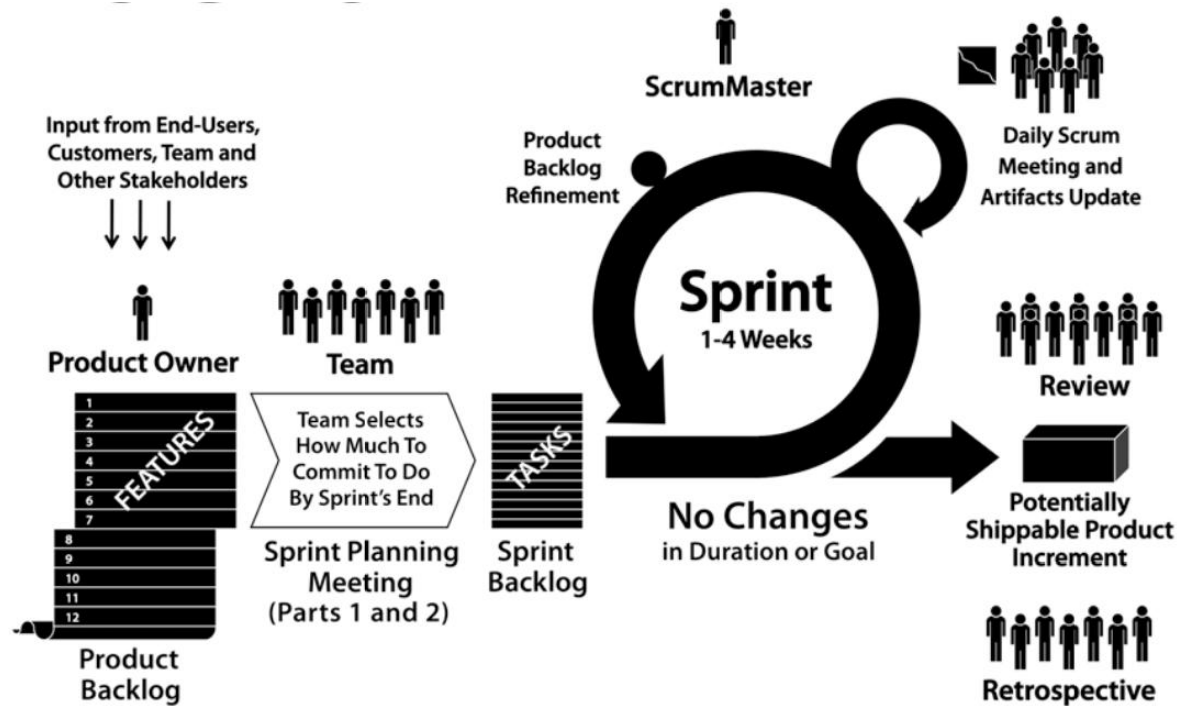
Figure 2: The Scrum process (Deemer, et al 2010, 5)

A **product owner** creates and maintains a prioritized wish list called a **product backlog**. During a **sprint planning**, the **development team** pulls tasks from the top of the wish list into the team's **sprint backlog** and decides how to implement them. The team has a certain amount of time – a **sprint** – to complete its work. The team meets each day in a **daily scrum** to assess its progress in a **burndown chart**. Along the way, the **Scrum Master** keeps the team focused on its goal and ensures that Scrum practices are properly applied. At the end of the sprint, in the **sprint review,** the team demonstrates the potentially shippable item to the product owner and other stakeholders. Each sprint is reflected by the team in a **sprint retrospective** where the team seeks for improvement ideas. (ScrumAlliance 2011)

The following benefits of Scrum, which is fully aligned with the agile principles, are mentioned in different respected sources.

Higher productivity and lower cost: Even if the software development productivity is very difficult to measure and no widely accepted methods exist so far, but several empirical and subjective evaluation in a form of the quantitative surveys tries to prove that productivity and the effectiveness increase (Mah 2008 in Cohn 2010, 11-12; Rico 2008 in Cohn 2010, 12; DDJ in Cohn 2010, 12; VersionOne 2010). Laanti et al. (2009) pointed that the perception of agile effectiveness positively correlates with experience in agile development. In addition, Cohn (2010, 12) states that due to frequent feedback, an agile team less likely to produce the functionality that is no longer needed. The last statement is directly related to the higher productivity and lower cost advantage.

Improved employee engagement and job satisfaction: Agile values the lean management principles based on "pull" system. Empowered and self-organized teams pull the tasks from the top of the product backlog and define how the task will be done. Scrum does not determine development practices, neither it like micromanagement. Therefore team members feel engaged, committed and enjoyed as never before. Melnik and Maurer (2006) found the following three strongest factors of job satisfaction in agile: the ability to influence decisions that affect the individual, the opportunity to work on interesting projects, and the relationships with users/customers.

Out of 4770 surveyed agile practitioners, 71% show among the agile benefits "Improve team morale" (VersionOne 2010). Cohn (2010, 13) points also to the sustainable pace, especially among software integrators and testers, as the improved job satisfaction factor. Melnik and Maurer (2006) in the quantitative study of 756 employees all over the world and Laanti et al. (2009) in Nokia show significant positive correlation between agile experience and job satisfaction.

The increased collaboration had been marked by Laanti et al. (2009) as statistically significant and positive especially among employees experienced in agile. "Agile development makes work more fun" and "Agile development increases the autonomy of development teams" were also positive, but not statistically significant. In the same survey overall 60% would stay with agile and only 9% would go back to traditional "waterfall". (Laanti et al. 2009.)

Quick response to changing market requirements: The biggest problem in the traditional "waterfall" model was slow reaction to the requirement change. Once planned in the beginning of a large project, the content never changed. As a result, considerable part of the initial requirements was not valid or not needed at a time of delivery. Risk of a project failure was high.

Agile addresses this issue by the close cooperation with a customer, visibility of a project status, short feedback cycles and readiness to the requirement change. The product backlog is open. Customer is entitled to update the content any time. The product owner periodically revises priorities of development items. The development team picks a new task from the top of the backlog during the sprint planning if there is capacity in the team. The project progress is constantly updated and transparent to all stakeholders. This mechanism allows software developers to concentrate on a customer value, increase the revenue and improve usefulness of the product by reducing "waste". The VersionOne survey (VersionOne 2010) shows that 87% of the respondents like the improvement in "ability to manage changing priority", 78% like the improvement in "project visibility" and 68% - in "alignment with business objectives". Laanti et al. (2009) found that the transparency had highest score among the employees experienced in agile.

Shorter time to market: Thanks to the higher productivity, eliminating the waste and the incremental delivery, agile shows considerable decrease of a product time to market compared to the traditional "waterfall" methods. 70% of the VersionOne survey (VersionOne 2010) respondents showed "improved" or "significantly improved" time

to market. The QSMA quantitative study of the 26 agile projects (Mah 2008 in Cohn 2010, 14) found 37% faster delivery than in the traditional projects.

Higher quality: Several studies claim quality improvement up-to 73% (Rico 2008 in Cohn 2010, 15), 65% (VersionOne 2010) or 77% (DDJ 2008 in Cohn 2010, 15). However the author did not find this statement proven by his experience.

All of the above advantages shorten the development cycle, increase the quality and the market value of a software product and improve employee satisfaction (Cohn 2010, 10). However, Scrum, as any other agile methods, is very demanding. It requires high level of organization development, team discipline, and personal commitment.

2.1.3   DAD challenges

In the previous chapters the classical agile software development and its benefits has been discussed. It was stated, that the close proximity and the stakeholders collaboration are viable for agile success. However, when the stakeholders are distributed over geographic, temporal, cultural and linguistic distances, problems arise. The agile principles start to break and the advantages of agile start to vanish.

In this context, the geographical distance introduces physical separation between the agile project stakeholders, the temporal distance limits the opportunities for the synchronous communication, the cultural distance negatively impacts on the level of understanding and appreciation of remote colleagues and, finally, the linguistic distance creates further barriers to communication (Noll et al. 2010, 67).

Based on several empirical studies (Therrien 2008; Kajko-Mattsson 2010; Noll et al. 2010; Ramesh et al. 2006; Vax & Michaud 2008) and own experience, the author defines the following DAD challenges introduced by a weak communication channel:

Loss of business context: Due to geographical separation of development team(s) and customer representative(s), the teams and the individuals are not aware of a

business case and do not fully understand business requirements. This does not allow making correct long term design decisions, accumulate technical debt, decreases engagement and accountability, and contradicts with the agile principles of easy adaptation to the requirement changes and the stakeholders close collaboration.

Loss of technical context: Due to geographical separation of development team(s), analysts and architects, the teams and the individuals are not aware of architectural and design solutions in own area. This prevents the teams and the individuals from making correct short term decisions, accumulates technical debt, limit the individual's competence development, increases the product time to market and contradicts with the agile principles of stakeholders close collaboration, sustainable competence development and technical excellence and best architectures, requirements, and designs emerge from the self-organizing teams.

Loss of project visibility: Due to limited information flow and especially lack of informal communication, the stakeholders do not know what is going on around. As a result of insufficient project status visibility, each site does its best separately – not as a single unit. This denies the agile principles of progress visibility through frequent feedbacks and stakeholders close collaboration.

Higher documentation overhead: Due to geographical separation of development team(s), analysts and architects, limited information flow and especially lack of face-to-face communication, a lots of effort is spent on documentation and upfront requirements specification. This creates waste, increases time to market and contradicts with the agile principles of simplicity, stakeholders close collaboration, easy adaptation to requirement changes, best communication is face-to-face, best architectures, requirements, and designs emerge from the self-organizing teams.

Experts overload: As a result of mistrust and absence of sense of responsibility, the decision making is delegated to experts. This builds high load on the experts, creates bottlenecks and discourage team members from own competence development. The

agile principles of sustainable development built on self-organized teams and motivated individuals are not followed.

Difficult competence transfer: Cultural difference, mistrust and different business and technical references makes competence transfer challenging.

Lack of trust: The fear to be vulnerable is the base of a teamwork dysfunction. As a result: ineffective communication, lack of commitment, avoidance of accountability, disautonomy and absence of courage. This contradicts with the following agile principles: "build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done." and "The best architectures, requirements, and designs emerge from self-organizing teams." (Beck et al 2001.)

Lack of responsibility: A feeling of not being responsible for the system overall in long run. In complex SW development projects the feeling leads to not scalable and not sustainable interface design, not maintainable implementation, poor integration testing and inefficient fault correction. It directly opposes the agile principle of self-organizing teams.

2.2   Communication

In this chapter the author will discuss the communication theories applicable to this paper: the organizational communication development, the communication models and the barriers.

2.2.1   Organizational communication development

Until the middle of 19th century the classical approach of the organizational communication, inspired by the Taylor's scientific management theory, prevailed. It is classified by top-down, one way, formal, written communication of management decisions. This approach does not leave any space for the employee participation in the

decision making. In 1930s a number of collective researches led by Mayo from the Harvard University of how work environment impact on the productivity of factory workers shows that the productivity is positively correlated with management attention to employee's well being, participative management style and social factors at work place. These findings were supported by Maslow's hierarchy of needs and McGregor's X and Y motivational theory. They form a ground to more participative human relation and human resource approaches in the organizational communication. Horizontal and informal communication in working place started to be recognized. Still the organization was considered as a machine: hierarchical, static and isolated. (Miller 2009.)

While the organizational behaviour discipline develops, "organism" (or "systematic") metaphor has emerged in 1970s from applying the systems theory from biology to the organizational communication. It considers an organization not as a self-contained and self-sufficient mechanism, but as a complex organism that must be hierarchically ordered, interdependent, permeable (components opened to each other and whole system – to its environment), controlled and maintained through the feedback. (Miller 2009, 64.)

Distributed agile, as the most sophisticated organisation to-date, requires the most complex communication approach, which combines the machine, the organism and the cultural metaphors.

2.2.2 Communication models

The communication modelling is traced back to work done by Shannon and Weaver and published under name "Mathematical theory of communication" in 1949. They develop a model to describe how telecommunication equipment transmits the information. Originally it was one-way model, where transmitter selects a message and a channel, encodes the message into a signal, sends it through the communication channel and, finally, receiver decodes the signal back to the understandable message.

(Narula 2006, 29.) In the process of transmission certain factors distract the signal. Studies by Berlo in 1960, Gerbner in 1956, Westley and McLean in 1957, Osgood in 1957, DeFleur in 1966 further enhanced the model (Narula 2006) and in most comprehensive view it can be presented by Figure 3
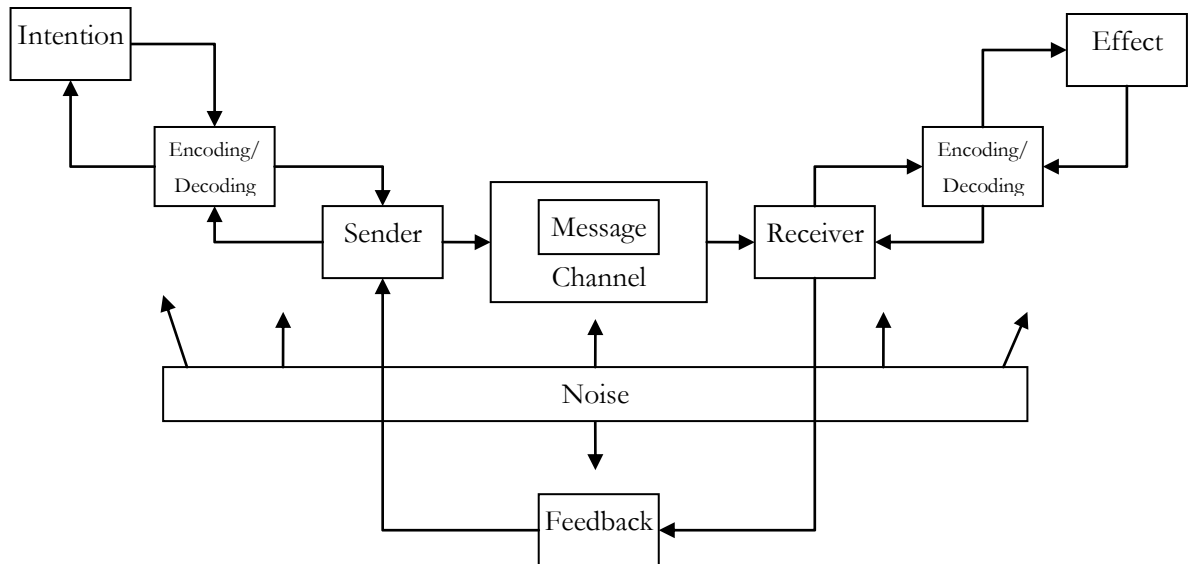
Figure 3: The communication model (Narula 2006).

Even this model was argued later by Craig as oversimplified. He developed a constitutive meta-model where communication is seen as a coherence of seven traditions of communication (Craig 1999 in Miller 2009, 11-12). For the purpose of this study let's consider the Source-Message-Channel-Receiver-Effects-Feedback communication model from the Figure 3.

2.2.3 Communication barriers

Already Shannon and Weaver (1949 in Narula 2006, 27) identified three levels of noises or barriers: channel or technical, when a message is physically distorted; semantic, when a message is misunderstood; and effective, when a message does not affect the receiver's behaviour. However, they did not pay enough attention to a non-technical barriers neither to the message semantics nor to a feedback loop. (Narula

2006, 29.) Other scholars have defined different classifications of the barriers for their purposes. For the purpose of this study following classification of the barriers is sufficient:

Personal

Communication barriers like poor knowledge or use of a language, insufficient knowledge of a subject, an information overload, poor public speaking, poor non-verbal clues, gestures, postures, eye contact, etc. can make a message non-understandable. A receiving party, on the other hand, is responsible for effective listening. Interruption, over-speaking, being not concentrated enough, carelessness or insufficient knowledge of a subject and absence of a feedback are properties of poor listening skills. In addition, poor appearance may alienate the other party. Physical disabilities can be addressed by the modern technological solutions. To reduce the personal communication barriers, an individual need to acknowledge the fact, identify the mistakes and work on them by applying suggestions in practice.

Interpersonal

An interpersonal communication skill is the ability to understand other people's feelings, moods and intentions. Correspondingly, interpersonal communication barriers, like psychological or emotional, can negatively affect the interpersonal relationship, the attitude, the level of trust and co-operation, the enthusiasm, the objectivity or the reputation.

Psychological (mental) barriers like "halo" effect, indifference, poor attention and retention, defensiveness, fear of penalty, expertise or close mindset. A person can intentionally create selective perceptions or assumptions and is not motivated to listen what that person says. The psychological barriers can also be created by the poor organizational culture.

Emotional barriers like bad mood, stress, negative attitude or fear affect the way how the message is sent to or received from the channel. Keeping own emotions under control is an essential skill of a successful communicator.

Intercultural

People belonging to different cultures will have a different frame of reference. The culture is an iceberg of human qualities: age, education, gender, social status, economic position, temperament, health, beauty, popularity, religion, political belief, ethics, traditions, values, motives, aspirations, rules/regulations, standards, priorities. It is important to acknowledge the existence of different cultures and adjust your communication style.

Organizational

Such phenomena like poor organization's culture or climate, stringent rules, regulations, worship a status, hierarchical structure, non-encouraged feedback, non-friendly relationship, inadequate facilities or opportunities for growth and improvement badly affect the organizational communication and the interpersonal relationship.

Communication channel

Properties of a communication channel like length, physical quality, accessibility and provision for the feedback loop can be affected by environmental factors like large working areas, physical separation, poor lightening, staff shortage, background noise, poor translation, etc. In addition, the communication parties might choose communication medium inappropriate for a given task. All these reduce the signal quality contributing to the physical or environmental communication barrier.

3 Methodology

This research consists of three parts: building a theoretical frame of reference, presenting suggestions on quantitative questionnaire development for a future empirical study and reviewing recommendations for overcoming the communication barriers in the DAD environment. Every part requires special research methodology.

There are considerable number of theoretical studies and qualitative empirical researches available on the communication in the DAD environment. However, the author has failed to find the structured framework which would connect the communication barriers with the particular DAD challenges and be suitable for creating the quantitative survey to measure the effectiveness of the inter-site communication in the DAD environment. Therefore, following suggestions of Saunders et al. (2007, 117-120), the author has selected inductive approach for the first part of the research project. The inductive approach builds a new theory based on qualitative data, where a researcher is a part of a process.

The grounds for the theory is collected from publicly available as well as commercial articles, books, conference papers and academic studies about the communication and distributed agile software development. Since agile as the software development framework is relatively new, the age of the sources about agile development has been limited to five years. A total of 32 sources were referenced. While constructing the theory, the author has extensively applied own observations and knowledge gathered during his 3 years experience in agile and a total of 15 years in the international software development industry.

The second part of the research assumes solid theoretical frame of reference, clear and persistent investigation goals. When these are in place, a researcher can apply the deductive approach to gather data, create a causal relationship between variables analyse and, if needed, generalise the outcome (Saunders et al. 2007, 117-120). The

current thesis includes only starting point of the deductive process, i.e. recommendations for constructing a quantitative survey.

The third part of the research is conducted as the desktop study of the selected existing literature. One white paper, one article, three conference papers based on empirical researches and two books have been selected. The purpose of the desktop study is to collect and synthesize the ideas of the reviewed sources without the author's own interpretation.

4 Framework for an empirical research

This part creates a framework for an empirical research of the relationship between the inter-site communication barriers and the DAD challenges.

4.1 Relationship between the communication barriers and the DAD challenges

For the purpose of connecting the inter-site communication barriers with the DAD challenges in a given organization the author proposes to run an empirical research of these two topics in one survey, combining the communication audit and the agility audit. It shall cover the communication barriers, presented in chapter 2.2.3 as the personal communication, the interpersonal communication, the intercultural relations, the organizational culture, the communication channel and the working environment, and the DAD challenges presented in chapter 2.1.3 as the business and technical contexts, the project visibility, the information management, the competence transfer, the workload, the sense of responsibility and the sense of trust.

4.2 Recommendations for developing the quantitative questionnaire

The quantitative method is suggested for the empirical research based on the current framework because it provides valid and objective results from large sample size within short time and requires little resources during the data collection and analysis. It is unbeatable if the goal is to find the quantitative relationship between the variables. However, the quantitative method is demanding to the preparation (pre-empirical) work. Best results are achieved if a theoretical frame of reference is well defined and research questions are well structured and do not change dramatically during the process. In other words, the quantitative surveys are good for the deductive exploratory type of research (Saunders et al. 2007, 138).

Thanks to the well defined research topics created in the previous chapters the author can suggest a set of data collection questions for each of the thirteen specific research topics. Additional questions help to set the respondent's background information. The relationship between the specific research topics and the suggested data collection questions is presented in Appendix 2. According to Punch (2007, 21), by measuring a correlation between the communication barriers representing the independent variables and the DAD topics representing the dependent variables a researcher can:

– Explain the relationship.
– Identify the barriers which have strongest relationship to the biggest DAD challenges
– Propose further research topic to study the most interesting relationships deeper

The questionnaire suggested by the author as an example is presented in appendix 3. It is developed with interviewees' convenience in mind. Every data collection question has two collaboration attributes: "from…" with values "organization", "us" or "me" and "towards…" with values "common", "other site" or "my site". These attributes allow structuring the survey by the applicability to a specific collaboration situation and offer to the interviewee mentally concentrate to one of them. For example, the interviewee is asked to… "Think about how your work has been organized… in your site" when questions are applicable to processes in own site.

Following suggestions of Saunders et al. (2007, 140-142), the author recommends to apply the survey in the mode of longitudinal action research as depicted in Figure 4:

1. Implement and run the survey.
2. Based on the empirical data obtained from the survey, identify the communication barriers which affect the most important or the most problematic areas.
3. Plan a set of experiments from the recommendations presented in chapter 4.3 of the current study to deal with the identified barriers. Consult with an experienced

agile practitioner for possible other experiments suitable for the specific environment.

4. Implement the selected experiment(s)
5. Use results of the consequent survey(s) as measure of the success of the previous actions and plan for the next ones. The intermediate questionnaires can be substituted by qualitative surveys.

Communication barriers	Quantitative survey	**DAD challenges**
personal communication		business context
interpersonal communication		technical context
intercultural relations		project visibility
organizational culture		information management
communication channel		competence transfer
working environment		workload
	Recommendations on ovecoming the barriers	sense of responsibility
		sense of trust
	Experiments	

Figure 4: Framework to study the communication barriers in the DAD environment

When doing a sample selection, a researcher of the communication barriers in the DAD must ensure the rich representation of all groups in the selected sample. A researcher may alter the group of observed stakeholders to, for example, a subset of the development sites or the technical areas. The size of the sample is selected by a researcher based on the chosen data collection method. Small or non-representative sample would threaten the reliability and the validity of the collected data. Selection of the data collection and the data analysis strategy and methods are given out to a researcher's choice based on his/her capabilities and preferences.

4.3 Recommendations for overcoming the communication barriers

Several empirical and theoretical studies exist with suggestions on how to minimize the communication barriers specifically in the DAD environment. In this chapter, the author attempts to summarize and arrange the suggestions from the selected sources by the type of the barriers described in chapter 2.2.3. Finer division of the barriers and the suggestions is not feasible due to wide effect each recommendation may have on an organization development.

4.3.1 Personal communication

As mentioned in chapter 2.2.3, this type of barriers mainly relates to the personal communication and listening skills. This is the most difficult area to affect because it heavily depends on a person's motivation to improve. However, the possibility for learning must exist.

Keep cultivating the agile culture. It is not a onetime effort especially in high attrition environment. External agile coaches and Scrum Masters are the agile ambassadors. (Larman & Vodde 2010, 469.)

Appreciation is valued in many countries (Bavani 2009), especially with high power distance, individualism and masculinity cultural dimensions. Keep in mind that a word of appreciation from on-site manager is even more motivational for the off-site developers.

Poor corporate language skills must be addressed by language learning. Try to avoid communicating through one good English speaker. (Larman & Vodde, 2010, 456.)

4.3.2 Interpersonal communication

As already stated in chapter 2.2.3, the interpersonal communication skills are the ability to understand and adapt to other people's feelings, moods and intentions. This is not

only about individual's emotional intelligence; organizational culture also must support it.

There is no substitute to the face-to-face communication, especially on the project start-up phase. This allows team members to get to know each other, build rapport and trust and mitigate "Us vs. Them" attitude. The visit must be planned and include not only work-related matters. (Miller 2008, 10-11)

Base camp with new distributed project key players would build the rapport in addition to setup initial rules, guidelines, processes, design and architecture (Bavani 2009, 76). Larman & Vodde (2010, 449) suggest to clarify roles, values, principles and basics of Scrum or other agile method to be used. Don't assume it is well known.

Continue to pay mutual "seeding" visits to maintain personal relationships (Fowler 2006).

Establishing good quality video and audio connections, in addition to increasing communication channel (see 4.3.5), somewhat substitute face-to-face communication, which enhance reality check, quality of communication and personal relations and eliminate "Us-Them" attitude (Larman & Vodde 2010, 425-427).

"Buddy" system helps newcomers to smoothly roll in to the system especially in the high-attrition environment (Larman & Vodde 2010, 469).

4.3.3 Intercultural relations

In the DAD environment a clash between sites' main national cultures must be considered.

Keep a session about a remote site culture and communication style (Miller 2008, 7).

When paying a visit to a remote site, consider to bring a touch of own culture (a gift, a snack a sweet, etc) (Fowler 2006).

Prepare a calendar of both sites' national holidays. Corporate images or a team's own made pictures in the calendar create the team spirit (Fowler 2006).

Be cultural aware when deal with offshore teams from the low uncertainty avoidance culture. Be explicit when you delegate. Mention the criticality, the background, the audience and the priority of a task. (Bavani 2009, 77; Larman & Vodde 2010, 437.)

4.3.4 Organizational culture

In addition to a person being aware about national culture, corporate culture must support collaboration over geographical and cultural distance.

Special measures must be taken when introducing a new team member to a distributed team (Miller 2008, 15).

By all means try not to create functional knowledge silos by offshoring a full function like testing, component like web interface or knowledge area like user interface (Miller 2008, 12). Favour feature teams: a team which develops, tests and maintains a feature end-to-end. "…since each feature team is self-contained and does not require much of any coordination with any other team to complete a feature except at a level of code. …Multisite development [with feature teams] becomes dramatically simpler." (Larman & Vodde 2010, 419.)

Don't neglect presenting a big picture – a vision, or a business context. All small decisions built upon own understanding of a bigger picture. (Fowler 2006.)

Sharing future plans with the offshore team provide them with the context to better architect the product, to estimate feature requirements with the future in mind and to plan the resource capacity (Therrien 2008, 371).

Lean management ideas like empower a team are not easily implemented in the West, but it is even harder in the East. Be prepared to convince both parties: the management and the developers. (Fowler 2006.)

By all means avoid "onshore management, offshore development". This "breaks just about every practice and goal in lean and agile". (Larman & Vodde 2010, 470.)

4.3.5 Communication channel

Geographical distance is the root cause of many communication problems. Nothing can be worse for agile than communication vacuum with rare meetings hosted by one site or person over bad phone line without video presence and collaborative idea development. But this barrier can be reduced by applying the following recommendations.

The effort needed to set up a meeting must be minimal. Equip a meeting room with phone and video. Optimize the cost of the connection so that the channel can be on-line whole working day. Use the conferencing software to share applications, documents, video and audio. Best if a document can be collaboratively modifiable on-line (Miller 2008, 9.) Consider shared electronic work space like in SharePoint (Vax & Michaud 2008, 311).

Make sure both voice, data and video connection quality is sufficient (Therrien 2008, 372).

Enable the personal communication tools like (video)phone, VoIP, IM(Miller 2008, 9) also from home to maximize the overlapping time period (Vax & Michaud 2008, 311).

Teach people to use right channel for different types of messages (Fowler 2006).

The informal communication can be replaced by the formal web-based tools for issue tracking, test management, backlog management, code review, document management (Miller 2008, 9).

The formal query tracking tool builds a knowledge base and tracks pending queries (Bavani 2009, 77). This is especially valid when dealing with offshore teams from the low uncertainty avoidance culture.

The communication can be an explicit role of one team member to deliver results of a "hallway conversation" to a remote location (Miller 2008, 9; Vax & Michaud 2008, 311).

Establish a role of "proxy customer" to off-site and "ambassador" to on-site. The proxy customer should be able to speak business as well as technical languages to provide a business context to the off-site teams. The ambassador must have good communication skills to be a communication proxy between the off-site development teams and the customer, the architects and the on-site development teams. Both must be from or well aware of the location country' communication culture (Fowler 2006). However, pure "communication proxy" considered as a bottleneck, an unnecessary waste and does not correspond with the agile principle stakeholders close collaboration. The role of the ambassador is to match the stakeholders. (Larman & Vodde 2010, 450.) The ambassador must be periodically rotated (Larman & Vodde 2010, 455).

Multisite meetings via the phone line and the "one room" meeting are very different. Imagine yourself off-site – participate in a meeting from home. How it feels? Teach all stakeholders how to keep a multisite meeting. (Larman & Vodde 2010, 435-436.)

Try to schedule the working day in all sites to maximize overlapping when the time zones are different (Miller 2008, 12).

Asynchronous meetings via "communication proxies" must be avoided (Larman & Vodde 2010, 434).

Accept to have more documents. Documentation is a price of doing offshore development. Don't try to impose heavily structured documentation. Other people may not like your template but unified is preferred. In agile everything evolve to be better, so will the documentation structure. (Fowler 2006.)

Not all communication has to be real-time. More detailed and pictured requirements, design, and other documentation help offshore team to understand the user requirements. (Therrien 2008, 372.)

Move the documentation and the discussion around documentation to the Web 2.0 sphere like wiki. Avoid the e-mails for this role. Establish a role of the "WikiGardener" to keep the wiki clean. (Larman & Vodde 2010, 440.)

5 Discussions

In this chapter the author discusses the results, the applicability, the validity and the limitation of the research. In addition, subjects for the future studies are proposed and the author own learning is assessed.

5.1 Results and applicability

The main research problem has been formulated as "To develop a framework for the empirical research of effectiveness of the inter-site communication in the DAD environment". The proposed framework consists of a theoretical part connecting the communication barriers and the Distributed Agile Development challenges, suggestions on developing a quantitative questionnaire to study the topic and a review of the existing literature on how to overcome the communication barriers in the Distributed Agile Development environment. However, the framework does not attempt to define a cause-effect relationship between the communication barriers and the Distributed Agile Development challenges. This requires empirical data and further study.

The first investigative question "How the inter-site communication barriers are connected with the Distributed Agile Development challenges?" is uncovered in chapter 4.1 and supported by the theoretical part of this work. The study of the contemporary resources on the subject shows strong relationship between the effective communication and the agile success. "High-bandwidth communication is one of the core practices of Scrum… The best communication is face to face, with communications occurring through facial expression, body language, intonation, and words." (Schwaber 2007 in Miller 2008, 2.) What are the "agile failures" and what are those barriers, which can contribute to the failures? The framework attempts to list the easily noticeable challenges of the DAD and simultaneously classify possible communication barriers. When combined in one research, these topics give an

opportunity to assess the efficiency of the communication and its importance in such a demanding environment as the distributed agile.

Second investigative question "What are the recommendations to develop a quantitative survey to determine the main communication barriers in the Distributed Agile Development environment?" is answered in the chapter 4.2. Not only the topics for a survey are suggested, but also the questionnaire design issues and the sample selection are discussed. Using these recommendations, a researcher can create own questionnaire or directly utilize the proposed example presented in appendix 3. Thanks to academic approach in the research framework development, the proposed example can be applied as is or with minor adjustments to any organization deploying the DAD.

Finally, to satisfy the third investigative question the author has collected and systematized suggestions to overcome the communication barriers from selected sources. Don't take these recommendations for granted. They are not the absolute best practices. "Best practices inhibit… continuous improvement pillar of the lean thinking." (Larman & Vodde 2010, 4.) Approach the problem solution systematically. Carefully assess current situation with all stakeholders, a need and an applicability of each suggestion to your specific environment. Perform an experiment, measure the results and evaluate the usefulness and sufficiency of the improving action. The author recommends asking for an advice from the professional consultants.

The presented framework can be utilized in developing other empirical researches of the communication in agile development environment or as a collection of references to recommendations for overcoming the communication barriers.

5.2 Validity and limitations

Reliability, credibility, generalization and applicability of both the theoretical part and the recommendations are assessed below as suggested by Saunders et al. (2007, 149-151).

The theoretical part has been developed with high level of internal and external validity. Most of the utilized sources were written by the founders of agile or presented in international conferences. Several qualitative studies confirm the existence of the problem and refer to similar theoretical background. In addition, the author reflected the material through his 3 years experience of working in the agile environment and 15 years in software development industry overall.

Some recommendations for developing the quantitative questionnaire may not be applicable or very difficult to implement to specific organization in specific conditions. The quantitative questionnaire, proposed as example of the framework implementation, has not been tested. Data collection strategy and methods were not considered in this study because it depends on a researcher's preferences, access level, available resources, and time. Due to no quantitative data has been collected, no data analysis method can be selected either. This part of the research can be considered as the weakest in the study.

The recommendations for overcoming the communication barriers in the DAD environment were gathered from 6 different sources, some of them were repeated in several. They mostly are in-line with the ones collected earlier by Noll et al. (2010) and Kajko-Mattsson et al (2010). Therefore, the recommendations can be considered as valid and reliable. Agile software development is fairly new, flexible and constantly developing framework. There are many different implementations. New ideas and findings are issued constantly in books, conferences, internet forums, etc. Organizational communication model and organizational culture are very specific to

one environment. Therefore the recommendations for overcoming the communication barriers can not be generalized.

5.3   Suggestions for further studies

Even though the author has created an example of the quantitative questionnaire based on the developed framework, but has not got an access to run the survey. Assessing the framework in different environment, running the survey, studying the cause-effect relationship between the communication barriers and the DAD challenges and testing the recommendations are suggested subject for further studies.

In addition, it is confirmed that the most effective method to increase the effectiveness of agile is to avoid or to minimize the geographical, temporal, cultural and linguistic distribution. What are the ways to de-distribute the software development can be another subject for further studies.

5.4   The author's own learning process

Already in the very beginning of the problem definition the author has identified a risk of the academic research taking too much time and the results, when ready, will not be needed for the commissioning company. As the research progressed, the commissioning company suddenly has undertaken the project re-organisation, and the distribution aspect of the software development has dramatically reduced. This eliminated great majority of the inter-site communication problems and made the survey meaningless. From this lesson the author learned to match the complexity and sustainability of the research objective with the available time and plan the process with care. On the other hand, the author agrees that the re-organization was very efficient solution for the problems. No empirical confirmation of the overall project productivity can be found, though. The project continues at the time of completing the thesis.

At the beginning of the research process the author believed that knowledge of the agile practices, understanding of the communication model, expert advises obtained from many sources and motivation for the change can improve performance and satisfaction of the distributed teams. Now, after researching the subject, the author changed his point of view and now agrees with Cohn (2010, 387) and many other agile practitioners: "Distributed development can be made to work, but a distributed team will never perform as well as collocated team."

In a course of writing the thesis, the author was struggling with enormous amount of information to be obtained, processed and shape. Not everything what has been read was digested and recalled, neither everything what has been shaped, end up in the final version of the paper. Critical literature review is a difficult but very important skill for a researcher. It is a pity the author did not have it before.

Researching and shaping the paper took very long time. It is true that a researcher must reserve uninterrupted time for even small part to read, digest and record. The time management was crucial skill to complete the thesis in time. Family, full time job and ongoing school courses on the top of the thesis were delivering enormous load. On the other hand, own on-the-job experience in the field of the study gave additional knowledge, interest and energy.

Nevertheless, the author considers research work very exciting and particularly useful from the learning point of view.

6 Conclusions

Despite of the fact that the questionnaire developed during the research project has not been tested in fields, the project overall is considered successful. Idea of connecting the classical communication barriers and degree of the distributed agile software development success in one quantitative survey was innovative enough to bring the fresh vision to the widely discussed research topic.

The author believes that the research results will be taken in practice and bring real results to the organizations deploying or planning to deploy the DAD. The author hopes that the recommendations for overcoming the communication barriers in the DAD collected in this paper will be useful for agile practitioners. However, solving the DAD challenges by enhancing the communication is very difficult, not sustainable and must be approached as the last chance if the distribution of the software development is unavoidable.

> While it is true that technologies mitigate some problems, still, the most comprehensive research of the subject concludes that distance will ALWAYS have some negative impacts. …Do not believe that multisite specific issues are inconsequential in large-scale development or magically resolved by holding a distributed daily scrum – that will not solve the big problems. (Larman & Vodde 2010, 415-416.)

Latest development in this field amplifies the opinion that when the communication bandwidth is reduced, the affected development practice needs to be modified or replaced to minimize the impact of the geographical, temporal, cultural and linguistic distribution. In other words: to reorganize a project so, that the distributed teams would have a need to communicate as less as possible.

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Appendices

Appendix 1: Overlay matrix

Research Problem	Investigative questions:	Theory relating to the topic	Results relating to the topic
To develop a framework for the empirical research of effectiveness of inter-site communication in distributed agile development environment	IQ 1: How inter-site communication barriers connect with distributed agile development challenges?	2.1.3, 2.2.3	4.1
	IQ 2: What are the recommendations to develop a quantitative survey to determine the main communication barriers in distributed agile development environment?	-	4.2
	IQ 3: What are the recommendations to overcome the communication barriers in distributed agile development environment?	2.2.3	4.3

Appendix 2: Relationship between the specific research topics and the data collection questions

Specific research topics	Data collection questions numbers
Personal communication	73; 80; 74; 81; 39; 49; 40; 50; 61; 41; 51; 62; 63; 64; 65; 66
Interpersonal communication	30; 42; 52; 31; 32; 33; 34; 67; 68; 43; 53
Intercultural relations	54; 55; 83; 84; 85; 86; 87; 88
Organizational culture	56; 20; 21; 22; 23; 24; 25; 26; 27
Communication channel and working environment	13; 14; 17; 57; 44; 75; 89; 45; 58; 76; 90; 46; 59; 35
Business and technical contexts	15; 36; 16; 37
Project visibility	28; 29; 38
Information management	9; 10; 11; 12
Competence transfer	47; 48; 60
Workload	18; 19
Sense of responsibility	69; 70; 71
Sense of trust	77; 91; 78; 92; 79; 93; 72

Appendix 3: Example of a survey questionnaire

#	Background information	Variable definition
1	What describes best your main role during last 6 months	Categories of the valid roles
2	How long have you been in the role selected in previous question (also in previous organization)?	Category of valid time range
3	How long have you been working in the organization	Category of valid time range
4	What is your main physical location during last 6 months	Categories of valid locations
5	What is technical area you were working during last 6 months	Categories of valid technical area
6	Have you travelled to remote site during last 5 years?	Dichotomous category
7	On average with how many people from YOUR SITE you communicate weekly in person (mails to DG are not counted)?	Category of valid range
8	On average with how many people from OTHER SITE you communicate weekly in person (mails to DG are not counted)?	Category of valid range
	Think about how your work has been organized… in general	
9	Please, select the type of information you need to do your job effectively	List of relevant types of information
10	Please, select the type of information you obtain from written documents rather than from other sources	Same as above
11	Documentation of the following information is of very good quality. (you trust the content, it is up-to-date, it is clear, etc)	Same as above
12	Please, select the type of information you document yourself from time to time	Same as above
13	Please, select the communication media you use for sending	List of relevant

	information	communication media
14	Please, select the communication media you use for receiving information	Same as above
15	I have enough information about my customer to do my job effectively	The agreement type of 4 points Likert scale
16	I have enough technical information to do my job effectively	Same as above
17	Quality of communication tools which I use is sufficient to do my job effectively	Same as above
18	The load of my work is at appropriate level	Same as above
19	I able to manage information I receive daily	Same as above
	Think about how your work has been organized… in your site	
20	I have enough information about my organization management activities to do my job effectively	Same as above
21	I have enough information about my organization plans and strategy to do my job effectively	Same as above
22	I am appropriately involved in decisions that affect my work	Same as above
23	I have an opportunity for personal development and growth in my organization	Same as above
24	When I do excellent job my accomplishments are recognized	Same as above
25	I am doing something worthwhile	Same as above
26	I am proud to work for my organization	Same as above
27	My manager knows about problems relevant to my job	Same as above
28	I have enough information about neighbouring teams from my site to do my job effectively	Same as above
	Think about how your work has been organized… towards other site	
29	I have enough information about neighbouring teams from other site to do my job effectively	Same as above
	Think about level of cooperation... in general	
30	I believe that all my colleagues performs their duty as good as they	Same as above

	can	
31	I had a case which made me hard to trust my colleague	Same as above
32	I had a case when my colleague tried to control me	Same as above
33	I have been punished for a mistake	Same as above
34	Sometimes I afraid to press "ENTER"	Same as above
35	If I/my team organize a meeting, key persons usually attend	Same as above
36	It has happened that my team did not complete an item due to misunderstood requirements	Same as above
37	It has happened that my team did not complete an item due to missing relevant technical information	Same as above
38	It has happened that my team did not complete an item due to missing information about other team's progress	Same as above
	Think about level of cooperation... within your site	
39	I always understand a written message from colleagues from my site	Same as above
40	I always understand an oral message from colleagues from my site	Same as above
41	When I speak to colleagues from my site I am often interrupted	Same as above
42	I believe that colleagues from my site are ready to cooperate	Same as above
43	I don't mind working with colleagues from my site on common tasks	Same as above
44	Sometimes I have difficulties to concentrate on my own work because of external noise	Same as above
45	I receive a feedback from colleagues from my site	Same as above
46	Results from meetings organized by colleagues from my site are always visible to me	Same as above
47	Induction program has been effective	Same as above
48	Competence transfer on my site has been effective	Same as above
	Think about level of cooperation... with other site	
49	I always understand a written message from colleagues from other site	Same as above
50	I always understand an oral message from colleagues from other site	Same as above
51	When I speak to colleagues from other site I am often interrupted	Same as above
52	I believe that colleagues from other site are ready to cooperate	Same as above
53	I don't mind working with colleagues from other site on common tasks	Same as above

54	I never receive unethical message from colleagues from other culture	Same as above
55	Colleagues from other culture use appropriate for my culture format of a message.	Same as above
56	I feel comfortable communicating with colleagues from other site.	Same as above
57	I am satisfied with speed of reaction from colleagues from other site	Same as above
58	I receive a feedback from colleagues from other site	Same as above
59	Results from meetings organized by colleagues from other site are always visible to me	Same as above
60	Competence transfer from/to other site has been effective	Same as above
	Think about your own level of cooperation… in general	
61	When I don't understand something during a meeting, I tend to figure it out myself later	Same as above
62	My written English language skills are sufficient for my duties	Same as above
63	My oral English language skills are sufficient for my duties	Same as above
64	My presentation skills are sufficient for my duties	Same as above
65	My listening skills are sufficient for my duties	Same as above
66	When someone speaks too slow I tend to help him/her to complete his/her phrase	Same as above
67	When I communicate with someone I put myself in his/her shoes	Same as above
68	When I communicate with someone having different role, I adjust my vocabulary.	Same as above
69	It has happened that I made an effort to investigate a fault even if I knew it is not my responsibility area	Same as above
70	I would undersign a warranty for the whole Product if it would exist	Same as above
71	Do you agree with following statement? "Sense of responsibility is when one do the utmost possible for the best quality Product"	Same as above
72	I am aware about at least one own weakness	Same as above
	Think about your own level of cooperation… with your site	
73	I find it easy to express my thoughts to colleagues from my site in written	Same as above
74	I find it easy to express my thoughts to colleagues from my site orally	Same as above
75	I give a feedback to colleagues from my site	Same as above

76	If I am invited to a meeting organized by colleagues from my site, I always attend.	Same as above
77	I am comfortable admitting own fault to colleagues from my site	Same as above
78	I am comfortable asking help from colleagues from my site	Same as above
79	I am comfortable proposing a new idea to colleagues from my site	Same as above
	Think about your own level of cooperation… with other site	
80	I find it easy to express my thoughts to colleagues from other site in written	Same as above
81	I find it easy to express my thoughts to colleagues from other site orally	Same as above
82	If consider same culture, I would prefer working with people technically very competent but located in other site	Same as above
83	I use public holiday calendar when planning meeting with colleagues from other site	Same as above
84	When I am in a country with different culture, I behave differently as I would do in my home country.	Same as above
85	I would like to make a business trip to other site for a month (even if it will not include financial benefits)	Same as above
86	When I communicate to other culture, I adjust the way I put my message.	Same as above
87	I am generally aware about other culture's communication style	Same as above
88	In same site I would prefer working with people technically very competent but from different culture	Same as above
89	I give a feedback to colleagues from other site	Same as above
90	If I am invited to a meeting organized by colleagues from other site, I always attend.	Same as above
91	I am comfortable admitting own fault to colleagues from other site	Same as above
92	I am comfortable asking help from colleagues from other site	Same as above
93	I am comfortable proposing a new idea to colleagues from other site	Same as above