Coaching Global Software Development Projects

Maria Paasivaara

Software Business and Engineering Institute
Department of Computer Science and Engineering
Aalto University
P.O.Box 19210, 00076 Aalto, Finland
Maria.Paasivaara@tkk.fi

Abstract— **This paper presents a multiple-case study on how three globally distributed software development projects from a large Scandinavia-based IT organization introduced agile practices with the help of a company internal coaching team. The data was gathered by ten semi-structured interviews: we interviewed four coaches and six persons from the coached projects. We describe how the coaches cooperated with the case projects, helping them to adopt agile practices. We present the challenges the projects faced, as well as the benefits they gained. Our results show that when coaching globally distributed projects it is especially important to gain executive support from all the sites, to involve all sites in the change process, to build a common vision in a collaborative workshop, to invite coaches as early as possible, to aim for a long-term coaching relationship, and to remember that the project team owns the change, coaches are there just to support the team.**

Keywords- Agile coaching; agile software development; global software development

I. INTRODUCTION

In collocated agile development, coaching has been recognized as useful in helping organizations adopt and sustain the use of agile methodologies [2][3]. For collocated development, case studies and experience reports have been published, but the literature on coaching globally distributed software development is still scarce. As global software development (GSD) is more challenging than collocated development, the need for coaching in such projects, which are often faced with serious issues related, e.g., to communication and trust, can be even greater.

The agile coaches working with the team can either be external consultants, or internal agile experts. Companies often use a combination of both, with external consultants doing initial training and helping to kick-start agile development, as well as helping to initiate the development of internal coaches that later take over the coaching [2][5][7][11]. A good agile coach strives to make him or herself unnecessary as quickly as possible [3].

In this paper, we describe how three distributed software development projects from a large, global Scandinavia-based IT organization took agile practices into use with the help of a company internal coaching team. First, we present the challenges the case projects faced. Second, we describe how the coaches cooperated with the projects in adopting agile practices and supporting GSD practices. Third, we present how the projects benefitted from coaching. Finally, we discuss lessons learned.

The paper is structured as follows: Section II presents a brief literature review on agile coaching, Section III describes the research methods, Section IV presents the results, and finally Section V discusses the results and the limitations of the study, as well as presents proposals for future research topics.

II. PREVIOUS WORK

Adopting and sustaining the use of agile methodologies can be greatly facilitated by the use of agile coaching. An agile coach is an experienced user and teacher of agile methodologies, who can take on many roles, such as teacher, facilitator, coach-mentor, conflict navigator, collaboration conductor, problem solver etc. to help teams adopt and improve their use of agile methodologies [3].

While much of the focus in the literature has been on the mentoring and teaching aspects of agile coaches, there is also an emerging understanding of the "life-coaching" role an agile coach sometimes need to take [3], as well as attempts to develop coaching frameworks based upon sports coaching analogies [11].

Benefits of coaching include improved understanding of agile practices and ways of working [2], better teamwork [10], higher product quality [13], and lower overall project cost [13].

While an agile coach strives to teach a team to work independently as quickly as possible, at the organizational level there can often be a need for permanent, or at least long-term, availability of coaches to help roll-out, support and reinforce the use of agile practices. Thus, organizations often opt for developing internal coaches that combine an in-depth understanding of the organization, its customers, and processes with coaching skills and an excellence in the use of agile methodologies. Internal coaches can be developed through co-coaching with experienced, sometimes external expert coaches, as well as by providing coaching training. [2][5][8].

Existing literature on agile coaching describe the roles and ways of working of agile coaches, experiences in building agile coaches and coaching communities within organizations. A number of tutorials and workshops on agile coaching have also been arranged at various conferences [14][15][16][17][18][19]. While these reports are interesting, there is very little literature

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on the particulars of coaching and building coach communities for globally distributed software development projects.

In [7], the authors describe how they used remote mentoring to overcome problems with varying skill levels, building trust, and selling distributed agile development to management. Skillful persons at the main site were given the role of remote mentor. The role of the mentors were both to help guide the remote team, as well as monitor things the local team did that could have an impact on the remote team. Mentors reserved 20% of their working time for mentoring. In addition to the mentors on the main site, the local team also had local mentors that communicated actively with the remote mentors. Communication tools used included wikis, instant messaging, and Waccplanner.

III. METHODOLOGY

A. Case Study

This study is based on a qualitative multiple-case study approach [1]. We used a case study approach since we wanted to get an in-depth understanding on how globally distributed projects are coached in practice. The studied coaching team was selected purposefully, i.e., we chose an information rich case [12] based upon availability.

The projects were purposefully selected, by the researchers and coaches. We selected projects that had ongoing or recently finished coaching efforts. Some projects were selected based upon researcher familiarity based upon an earlier study.

B. Case Organization

The case organization is a Scandinavia-based IT company providing software products and services. It has development centers both in Europe and in Asia. Typically, the development projects are distributed between two or several locations.

The studied coaching team is located at a large software development center in an Eastern European country. All the projects coached by this team have at least part of the personnel located at that center. All the chosen three case projects were distributed between two sites: one project between the Eastern European center and Finland and two projects between the Eastern European center and Norway.

C. Data Collection

The data collection method was semi-structured interviews. The researchers and the case company representatives discussed the interview goals and choosing the interviewees. We wanted to interview both case project representatives and coaches to understand the projects and coaching from both viewpoints. The final selection of the interviewees was made by the coaching team. We interviewed four coaches, including the coaching team leader, as well as six persons from three coached projects, i.e., two persons per project. The interviewees from the coached projects were persons who had worked closely or quite closely with the coaching team members. From each project we interviewed the local project manager / team leader and one senior developer, both located at the Eastern European site.

All interviews lasted 1-2 hours, and were carried out in English. None of the interviewees or the researchers were native English speakers. The two researchers were present in all the interviews, one being the main interviewer, the other one presenting supporting questions and taking detailed notes. All the interviews were tape recorded.

The interviews were relatively loosely structured and conversational in order to maintain adaptability to the individual experiences and projects. All the interviews were performed during one week in May 2010.

D. Data Analysis

All the interviews were transcribed by a professional transcription company. The first round of analysis was made based on the interview notes. Based on this analysis categories for coding were created. The transcribed interviews were then coded using the created categories. Finally, the data was extracted from the coded interviews under 16 categories, such as problems in the case project, changes suggested by coaches, collaboration with coaches, and benefits of coaching.

IV. RESULTS

A. The Coaching Team

At the time of the interviews, the coaching team had existed for five years. During this time the team had grown from two to eight coaches, and had altogether coached over 50 projects. In approximately half of the projects the coaches had been involved only for a brief time, e.g., by assessing the project and at the same time mapping their problems and giving the project guidelines on how to improve. The second half of the projects had built a long-term coaching relationship with the coaching team, which meant the involvement of the coaches in most cases for over a year.

The coaching team had not actively marketed their services, since they were constantly offered more work that they could handle. Most contacts were taken informally, in trainings or workshops given by the team, or even when meeting in the corridors. The management sometimes contacted the team as well, involving them in troubled projects. Quite often, projects request only "a little bit of help", but soon the need of help and coaching activities gets broader and broader. Typically, when the coaches are contacted, the project is in a crisis.

The coaches aim to work in pairs as much as possible to be able to discuss the challenges and solutions of the case projects together, since cases are always different and very challenging, so no standard solutions are available. Junior coaches are trained by working in pairs with more experienced senior coaches. According to the interviewed coaches it takes approximately one year to train a junior coach, before he or she is ready to work as a primary coach. The background of the current coaching team members was technical; before joining the coaching team, they had all worked in development projects, many of them in distributed projects.

The coaching team teaches their customer projects agile and lean ways of working, thus they feel it important to use the same practices they teach to the case projects also inside their

own coaching team. In their team they use weekly iterations, starting on Mondays with "Iteration Planning and Assessment Meeting" and ending on Friday afternoons with "Retrospective Meeting". By working as a team and changing pairs the coaching team tries to maximize the learning and knowledge transfer inside the team.

The coaching team has a "deep and narrow" approach, which means that they prefer taking a long term responsibility of the case project: They help the project to identify improvement needs, and create an improvement roadmap. They support each step of following the roadmap, until the project can gradually follow continuous improvement steps on its own. During the most intensive coaching phase the case project receives daily support from the coaches: facilitation of activities, such as planning, estimation, retrospectives and daily meetings, as well as support for problem solving and answering questions. The coaches "live" with the case project: they participate in meetings, and give advice and feedback after the meetings. More information on how this coaching team works can be found from our earlier article [21].

At the time of the interviews the coaching team provided their services for free, since they were paid from the company common budget. However, there was discussion whether this service should be paid by the projects.

B. Case Projects

Facts of our case projects are collected to Table 1.

Table 1. Case projects

Case	Banking	Telecom	Energy
Customer industry	Bank	Telecom operator	Energy companies
Project type	Customer specific application, change from 16 to 32 bits	Development and maintenance of a customer specific software	Development and maintenance of a legacy software product
Distribution (#personnel min-max)	Finland (6-15), Eastern European country (6-10)	Norway (7-15), Eastern European country (10-16)	Norway (15-30), Eastern European country (6-30)
Project length	2004 - ongoing	2007 - ongoing	1980's - ongoing (Transfer during 2009)
Coaching period	2008 - ongoing	2007-2010	2009- ongoing
Situation when coaching started	Challenged project	New collaboration starting	Challenged project, transfer to other site planned
Process change	From waterfall to RUP	First Scrum, then "Scrumban"	From waterfall to Scrum

A description of each case is given in connection with the results in sections C, D and E. In each of those sections we present the results of one case, starting with a presentation of the case project and the challenges it faced when the coaches were contacted. Then, we present the solutions that were applied with the help of the coaches. Finally, we discuss the benefits of coaching and the lessons learned.

C. Banking Case

1) Case Description

This case project, distributed between Finland and the Eastern European software center, was doing a conversion from 16 to 32 bits to a large legacy banking application. The project was sold to the end customer, a bank, in phases. After each phase the customer could decide whether to continue the conversion or not.

The Eastern European team invited coaches to help them, after discussing the problems with coaches during coffee breaks and learning that coaches might be able to offer some help. The local project manager was especially hoping that the coaches could offer support in creating processes for their development, since at that moment they felt that they basically did not have a process. The coaches were involved in the project from the end of the second phase, when the project was in serious trouble.

2) Challenges

The challenges of this project date, at least partially, back to the project sales phase when the amount of the work, and thus the costs, were clearly underestimated. This led to other problems, since cost cutting, including savings in testing, was taken as the guiding principle by the Finnish managers:

"The first phase being, well, the disastrous phase. And from the disaster, which meant that the costs were over budget and the quality was not enough, they [Finns leading the project] started to focus on these things. And the second phase was nicknamed the quality improvement phase and the third phase was nicknamed cost-reducing phase." –Project team member

Waterfall type of process model was used. Specification, analysis and design were done in Finland, after which the development took place in the Eastern European center. Finally the testing was performed in Finland and the end customer took care of the acceptance testing. The work was divided into separate phases with not much overlap:

"And actually, when we started to cooperate with the coaches almost all the specification for all the applications which we have implemented until now had already been written. So, there was no way how to change the whole process of creating a new application, because specification had already been done for the most parts." – Project team member

This caused also other problems for the development team, since many of the persons who had done the analysis and design were no longer working for the project when the development took place. Thus, there was no-one to ask, but a lot of questions. The conversion was agreed to be "as is", but there was a mismatch: The 16 bit application was not always behaving according to the specification, so the developers were wondering which one they should follow, the old application or the documents. In spite of the "as is" deal the customer wanted to have some changes, as well. Moreover, there were no acceptance criteria, so developers were not sure what the customer would finally want and accept.

Since the project had serious challenges, the Finnish project manager was changed four times during the first three phases. This of course showed as discontinuity to team members, when all new project managers tried solve the challenges in the project by different means, without clear successes.

3) Solutions

Iterations, planning and assessment meetings. The first change the coaches introduced to the Eastern European team was four-week iterations with planning meetings in the beginning and assessment meetings in the end. At that time, the case company was using iterative RUP model as a new recommended process model, thus this was a model that affected on the recommendations by the coaches. The coaches helped in creating and taking into use new ways of working, as well as new tools, e.g., to set up JIRA to support the new processes. Moreover, they helped in quality improvements, e.g. in improving the quality of code, as well as to set up a testing team and automated testing at the Eastern European site.

Vision for continuous improvement. The coaches created together with the Eastern European development team a vision and process for continuous improvement:

"We had a vision what to do. We had some end point where we would like to come. But it takes quite a long time. So we were all the time or by small steps doing all these small increments. So it was continuous work. Using coaches is not for one or two months. You can do it this way, but still, it's better in some longer time." - Project team member

One team. The coaches suggested that the project personnel should behave as a one team, not as two separate teams, one in Finland and the one at the Eastern European site. However, this was not so easy to accomplish. One of the efforts towards this goal was that the Eastern European team members started to give iteration demos directly to the Finnish end customer. This practice was quickly stopped by the management decision that the Finns should give the demos. The explanation to this was that the end customer feels more comfortable when being able to speak Finnish. The Eastern European team members did not like this decision:

"Definitely that's a bad decision, because the team should have some feedback from the customer. That's actually one of the basic points of agile way of working, which has been decided to be implemented at [the Eastern European site] as a process. It was a bad decision, but we couldn't do anything about it." – Project team member

The Eastern European team members suspected that the reason for this decision might have been their quite direct comments to the end customer:

"That we mentioned at the last demonstration which we had with the customer, that the application is not very well tested, because there is much more code implemented than the testers are able to test." – Project team member

The Eastern European team members felt that the lack of testing capacity was the biggest bottleneck in the project and had discussed this several times with the Finns without satisfactory results. The decision regarding demos cut this first direct contact between the Eastern European team members and the end customer. Instead, they had to communicate with the end customer through a "Finnish proxy", i.e. the Finnish project manager. The Eastern European team members felt that this communication was not good enough:

"We got a feeling that he is not telling us everything, and not telling us everything that the customer thinks or what we should know, but also not telling everything what we are saying to the customer. (...) It is important that the project manager, who is our proxy in this case should tell us everything." – Project team member

The aim, one distributed team, was still quite far.

Selling changes to the other site. In the third phase, the project faced another serious drawback, when the Eastern European developers had made some changes to the architecture on their own:

"We tried to make the architecture better so we could work more efficiently and make also the maintenance easier." – Project team member

However, the Finnish site was not happy about these changes. Instead, they required all the changes to be removed. Thus, basically everything achieved at the Eastern European site during that iteration had to be rewritten and the team had nothing to deliver to the end customer. There were rumors about stopping the whole project. The Finnish project management travelled to the Eastern European site. The Eastern European team decided to involve the coaches in the discussion on how to continue the project and the cooperation between the sites. The coaches helped, e.g., by showing the Finnish project manager, project owner and branch manager the development process the Eastern European team was using:

"And the process how we are doing things was explained to the Finnish side, because until that time, it was not absolutely clear for them how we work. And they maybe imagined it in different way. So, coaches helped with explaining things." – Project team member

The meeting was successful:

"Almost all of what we proposed or what we hoped we could get for the rest of the third phase was approved or agreed." – Project team member

The main success of this meeting was of course that the project continued. Besides that, the meeting resulted in other beneficial things to the project and especially to the Eastern European site: more communication between the sites and more power to the local project manager. At the time of the interviews, when the fourth phase of the project was about to start, the iterative process, already taken into use at the Eastern European site, was planned to be taken into use at the Finnish site, as well. Moreover, the plan was that the Eastern European team would be able to meet and stay in frequent contact with the end customer. Thus, besides supporting the changes, the coaches helped in selling the changes.

The interviewed Eastern European team members did not yet regard this as an agile project, but saw that the improvements planned for the fourth phase will take the project already much closer to agile.

4) Collaboration with Coaches
The main collaboration forum in this project was a regular one-hour weekly meeting between the coaches and a few senior Eastern European team members. In the beginning of the collaboration, this meeting was more like a training of agile principles and practices and how to implement them. Later on it became a collaboration forum to discuss specific issues and improvements in the project:

"We were using coaches not as teachers to tell us, ok, do it this way, but all the time we are chatting, ok, we have got this problem, and they say maybe you could try to study and look at this, or we can tell you how some other project has done or something like this. So, really continuous work. And when the problems came we were solving them." – Project team member

At the time of the interviews there were plans to involve the whole Eastern European team into close collaboration with the coaches:

In the beginning, the coaches supported the team by participating in the team meetings, such as planning and assessment meetings, and taught the team how to run these meetings.

5) Benefits of Coaching

Our interviewees were very satisfied with the help from the coaches and even commented that coaching saved the project.

"Almost all new things which are at the moment on the project came from the coaches or from our chat with them." – Project team member

The quality improved significantly and bug fixing times dropped. The new processes helped the Eastern European team to work transparently, and thus build trust with the Finnish site. The end customer started to receive deliveries once a month and was able to run tests already during the development, thus being able to take the application into production use earlier.

Our interviewees suspected that without the help from the coaching team they most probably would have made some architecture related improvements and taken some new tools into use, but probably not made any process related improvements, e.g. iterations. One of our interviewees described how the project would most probably look like at the moment if the coaches had not been invited:

"So having real waterfall (…) and the quality would be really bad, and the customer would be so disappointed that there wouldn't be a chance of starting phase four. I think we would have ended the project at April last year." – Project team member

6) Lessons Learned

The project was close to a catastrophe, when the coaches came into the picture. Even though the coaching most probably saved this project, this case clearly demonstrates that coaching only one site in a distributed project is not very effective. The biggest problems in the project involved both sites: lacking and ill functioning processes and the lack of collaboration between the sites. Thus, solving these problems by coaching only one site is impossible. However, in this case the Eastern European team and coaches finally managed to involve the other site, as well. Thus our interviewees were at least somewhat hopeful regarding the future of the project.

D. Telecom Case

1) Case Description

This case is about building and maintaining a customer specific application for a telecom company. The case is a continuum of projects between the customer, a Norwegian branch of a Scandinavian telecom company, and the Eastern European software center of our case company. In this case, the relationship between the partner companies started as a one-year long development project of a component to larger application developed by the Norwegian customer company. The Norwegian customer had own developers, but in this project the whole development work was done by a 16-person development team from the Eastern European software center, with support of two architects and a project manager from the customer company. After the component was finished the collaboration between the companies continued: a few developers from the Eastern European team participated in the maintenance of the application. After a few months, the Norwegian customer wanted to broaden the collaboration again to consist of maintenance and further development of 15 services and applications. At this time also the development was distributed between the sites. Two distributed teams, each of them having two developers from the Eastern European center and 4-5 persons from Norway, had their own subprojects. In addition, four Eastern European developers concentrated on maintenance work and two Eastern European testers served both development and maintenance. In this paper, this whole continuum of projects is dealt with as one case.

In this case the coaches were briefly involved already in the beginning of the first project, when the local project manager asked for their advice, as he was new in his role. Frequent collaboration started after a couple of months and continued until the end of the one-year project. During the following year, the collaboration was infrequent until the case organization wanted to change the contract with the end-customer as service based, which required some changes in the ways of working, as well. Thus, coaches were invited to assist in this.

2) Challenges

The project team of 16 developers from the Eastern European center was created almost over-night when the project started. The team members did not know each other previously. The team was quite inexperienced in many aspects: most of the team members were juniors, their English skills were not very good and none of them had previous experience of Scrum. The customer was using Scrum and thus requested the team to use Scrum, as well.

3) Solutions

Agile trainings. In the beginning the coaches arranged short basic agile trainings to the Eastern European development team to introduce them to agile and Scrum.

Co-located kick-off and knowledge transfer period. The coaches suggested that the project would start by a collocated working period. Thus, the Eastern European team members moved to Norway for one month to work with the customer's people, to get acquainted with the product and to start with knowledge transfer. The developers were given an opportunity to meet some final users of the system, as well as customer's marketing personnel.

Ambassador. The coaches suggested that an ambassador or bridge, a member of the Eastern European development team would move to Norway to be a contact person at the customer's site. In the beginning, this ambassador concentrated especially on facilitation of communication between the sites; he helped in solving problems and finding correct persons to answer questions coming from the Eastern European team, he solved misunderstanding and helped in language difficulties by communicating in English with the customer and explaining the communication in his own language to his team members. Later on, when communication started to run more and more on its own, the ambassador has

concentrated on maintaining the backlog. He collects tasks from the customer organization and participates in customer's meetings where the backlog items are prioritized.

Penalty points for lack of communication. The contract with the customer was based on delivered story points. During the couple of first iterations the Eastern European development team was able to deliver as planned, but then problems started to add up. The main reasons were the long response time of customer's personnel to the questions coming from the team and the problems with customer's testing environment. The coaches were asked for help. The solution to long response time was defined penalties to support fast responses from the customer. If the team had to wait for more than eight hours for an answer, they got one story point, which was then converted to money. The same solution was applied to customer's testing environment. If a component was not running for more than eight hours, the team got one story point. To easily measure the delays in communication, they introduced a new issue type to Jira, called question. Whenever somebody in the development team had a question to customer personnel, he or she put that to Jira, as an issue.

Kaizen workshop. In the last studied phase of this collaboration the case organization wanted to change the contract with the Norwegian customer as service based. At this phase the collaboration included both maintenance, as well as small scale development activities. The line manager from the Eastern European delivery center contacted the coaching team. The coaches suggested starting with process changes. According to them Kanban could be a better match than Scrum for a service level agreement. The first step was to arrange two "Kaizen workshops" led by the coaches. The workshops had participants from both locations: a couple of representatives from the Eastern European team, as well as a couple or architects and a couple of business managers from Norway. In the first workshop the root causes for the problems were cooperatively found and solutions drafted. The first version of the collaboration interface between the companies was defined. The decision about taking Kanban into use was made and a rough definition of the process was drafted. After one month, in the second collaborative workshop in Norway, the Kanban process was established.

Scrumban. The process used at the time of the interviews was called "Scrumban" by our interviewees, since main part of the Scrum still remained: iterations with related meetings, as well as Daily Scums. Kanban board, with related stages in Jira was taken into use. The managers were not yet ready to give up iterations, since they were afraid that they could not be able to have enough control in pure Kanban.

Distributed Daily Scrums. The distributed projects have a daily scrum meeting over Skype with a camera. It is a stand-up meeting around one computer in at both sites:

"On one screen we have this Jira plug-in and see the Kanban board and on a different screen we have the video conference, so we can see the people. It's better, because we feel that we are together. It's important to have this feeling, I think we are one team, not that there is somebody in [city in

Norway] and somebody here in [city in the Eastern European county] ." – Project team member

Collocated iteration planning. Both maintenance and development projects have still iterations and in the beginning of the iteration the Eastern European team members usually travel to Norway for a planning meeting.

Rotating ambassador. The ambassador sitting in Norway wanted to concentrate more on development, thus in a Kaizen workshop the role of a rotating ambassador was created. This role is divided between two members of the Eastern European team. One person at a time spends a few weeks in Norway and then a few weeks at the home site, before the next one travels to Norway for a few weeks.

4) Collaboration with Coaches
In this case the collaboration with the coaches was partially irregular. In the beginning of the project the local project manager asked one of the coaches for advice, when he was starting in a new role, in managing a distributed project that would be using Scrum. However, at this point "official" coaching did not yet start. After a couple of months, when the project faced problems, the project manager discussed with that coach again. A regular 2-hour weekly meeting cycle was established between the coaches, the local project manager and a couple of senior team members. In the beginning, these meetings were more like trainings facilitated by the coaches. Later on the emphasis changed, mainly the current problems and possible solutions were discussed. Between the meetings the project team worked on implementing the solutions. When this first project ended and maintenance phase started, the collaboration changed to irregular again. The two Kaizen workshops were the next major collaborative effort, after which this case continued in self-improvement phase.

The coaches explained that this case has not been high priority for them, since it is going fairly well, and they have other more business critical cases. However, this case has been important as a learning experience for the coaches, since in this case the people were open to new things. Thus the coaches could experiment with new ideas, e.g. regarding Kanban, which they could later on use in other cases.

5) Benefits of Coaching
Our interviewees gave only positive comments regarding the collaboration with the coaches. They believed that even without coaches they would have tried Scrum, since customer requested that, but would have been more difficult:

"I think that without those coaches, of course we would try to find a way how to fix the things ourselves, but if you don't have experience from tens of projects and you are not specialized for the processes and so on, it's hard to see all the consequences of the ideas you have." – Project team member

After the first couple of months the project faced challenges. The coached were asked to help. The penalty point system that they suggested proved to be successful:

"(...) we where in red numbers (...) and then it switched, and at the end the project was very successful on all, (...) the customer was very satisfied. (...) we absolutely saved a lot of money after all those improvements were implemented." – Project team member

The Kaizen workshop arranged by the coaches was seen by our interviewees as one of the biggest benefits of coaching:

"I think it was this first Kaizen workshop. It was the major benefit and also contribution to the project (...) because they really (...) inspired the customer about changes." – Project team member

Even though the Kaizen workshop was already a success, one of our interviewees suggested how it could be even further improved:

"So probably a good idea is that all of them [developers] will be participating in the Kaizen workshop. Because after that, we have to as developers try to explain the changes. And it's not like when explained by the coaches." - Project team member

6) Lessons Learned
In this case collaboration with the coaching team started already in the project planning phase, thus the coaches could influence already the first decisions regarding the practices used in the project. They, e.g. suggested ambassador role and collocated working period in the beginning. Thus, serious mistakes were avoided. Moreover, the coaches followed the project quite frequently, thus problems could be solved, before they grew too big, e.g. the problem of long response time from the customer could have caused serious consequences, if not solved. The coaches facilitated two Kaizen workshops, in which representatives of both parties of this distributed collaboration searched the root causes of challenges and drafted solutions. These workshops proved to be very successful in unifying the views of different parties and led to the implementation of the new Kanban process.

E. Energy Case

1) Case Description
This case is about the transfer of the main part of development and maintenance activities of a 15 year old legacy energy sector software product from the case company's site in Norway to the same company's software center in the Eastern European country. This product had been mainly developed and maintained in Norway by a 30-person team following a waterfall process. At the time of the transfer, the project had already employed during a couple of years a small team of around seven developers in that Eastern European center working with one area of the application. The transfer, which happened for the cost reasons, required the Eastern European software center to hire over 20 persons to the project, partially internally, partially externally. In the beginning, the idea was not to change the process model simultaneously with the transfer, even though agile processes interested project members in Norway and the local project manager in the Easter European center had already experience from a couple of agile projects.

The Eastern European project manager contacted the coaches, who had helped him already in one of his previous agile projects. For the project manager, even though somewhat experienced in agile, this was the first ramp-up, and the first highly distributed project. Thus, he did not know what kind of problems to expect. The coaches came up with the suggestion of taking agile processes into use during the transfer ramp-up. After some selling work the suggestion was accepted.

2) Challenges
The project was challenged before the transfer. It was losing money. The production process was not in a good shape, the project suffered from bad quality, repetitive error corrections and late deliveries. The application was old and messy, the code was not well documented, and standards were not used. Partial reason for these last problems was probably that several third party companies had been involved in the implementation earlier, all doing things a bit differently. New developers joining the project complained that it takes a lot of time to study and understand the application before being able to implement anything new.

The main challenge for the transfer project was to carry out both a transfer and a process change to agile while keeping the production up and running.

3) Solutions
Agile transformation combined with transfer ramp-up. The first major suggestion made by the coaches was to change the waterfall process model to agile and do it right away, at the same time with the transfer of the main part of work to the Eastern European software center.

Agile trainings. The project members in Norway were interested in agile and wanted to participate in an agile training. This was a selling opportunity for the coaching team. Thus, one of the coaches travelled to Norway to give an agile training. After the training the Norwegian team leaders were so excited about agile, that their project manager agreed with the suggestion made by the coaches on the agile transformation while the transfer ramp-up. Later on, the coaches arranged a few more agile trainings to educate all project members at both locations.

Distributed teams. All teams formed around six product areas were designed to be distributed both during the transfer, and after that. Namely, the Norwegian team members were very experienced; they knew the application, as well as the customers. Thus, all direct customer communication was planned to be taken care of by the Norwegians, also in the future, whereas the main part of the development and maintenance work was transferred to the Eastern European software center. All the distributed teams had at least a Norwegian team leader, as well as a Norwegian Product Area Manager, which was the main role in taking care of direct customer communication.

A series of co-located hands-on knowledge transfer periods. The transfer was started by the Eastern European team members spending a couple weeks in Norway. During the next three months they travelled back and forth. From every team the Eastern European members visited Norway 2-3 times for a couple weeks at the time and between the trips worked a couple of weeks in their own office. The knowledge transfer was based on hands-on work on the application.

Two pairs of coaches "living" with the project teams. Four coaches supported the project during the first few months of the transfer. The coaches worked in pairs, each pair supporting

a few teams. The coaches helped the teams in everything, from carrying out the daily Scrum meetings to taking coding standards into use. After the first few months, the teams needed less support, thus the coaches gradually moved to the background.

Distributed Daily Scrums, planning and assessment meetings. Since all teams were distributed, all the team meetings were normally distributed, as well. Both teleconference and videoconference was used. Especially in the beginning, the coaches participated regularly in most of those meetings to help the teams:

"They kind of started to participate in those meetings with us to see how we are doing and give ideas what you can do better in those meetings to make them effective, to see more problems. (...) And they were kind of monitoring the progress, if we are doing better and better each time, and trying to see the good points, the bad points, telling us the good points and the bad points. (...) and if we had a struggle with any of those processes (...) then we would ask them and they would say ok, now you do this and this and the outcome of that should be like this. And so, they were really like guides following your work, but not disturbing you." – Project team member

Team leader meetings. The team leaders and project managers had weekly distributed teleconference meetings, where the team leaders were sharing what had happened during the week and what everyone was struggling with. The coaches participated in those meetings, as well.

"Pointing out problems is ok". The coaches helped in visualizing the problems and creating a feeling in the project that it is ok to find and point out the problems. Our interviewees from the Eastern European center explained that the mentality in their country has been that:

"If there's a problem just be quiet, don't tell anyone, try to solve it on your own, and don't point yourself out by saying somewhere is a problem." - Project team member

The interviewees explained that this mentality comes from the history, the country has often been under the power of some other country and if you were a "troublemaker" there was a risk that you ended up to jail. Thus, earlier the practice had been to try to solve problems on your own somehow, so that the upper management would not see the problems. This caused a lot of stress and people were exhausted. The coaches helped in visualizing the problems and creating the atmosphere of sharing and discussing the problems:

"And they helped us learn that if you don't say it, you still have it, and you'll never get rid of it. (...) You feel better in the workplace now. (...) So it really helped to open up the atmosphere, to stop being afraid to say something, so it helped to solve the problems." – Project team member

Travelling coach. During the intensive transformation phase the coaching was concentrated in the Eastern European development center. Since the teams were distributed there was a need for a coach counterpart also in Norway. A person for that role had already been chosen from the Norwegian site, but due to his other obligations, this person finally refused the role. Therefore, it was decided that one of the Eastern European coaches would spend 1,5 months in Norway. His goals were to first understand how people were working there and second to assist them to solve their current challenges, such as improvement of the estimation process and setting up the Team Foundation Server.

4) Collaboration with Coaches

In this case the collaboration with the coaches was really intensive during the first few months of the transformation. The project had four coaches supporting the teams almost full-time, as described earlier. During these first months the coaches participated in most of the team meetings and helped the teams step by step to improve their ways of working.

"They are doing it all the time step by step. 'Ok, now you learned something, now let's focus on the next step to make it even better.'" – Project team member

The coaches participated in the weekly team leader meetings, as well as had a weekly meeting with the local project manager to follow-up the transformation progress.

When the intensive phase was over, the coaches gradually moved on to support other projects, while only one coach remained. His job was to support the teams in continuous improvements. Teams could contact him whenever having problems, and time to time he dropped in to the team meetings to see how they were doing. At the time of the interviews, the project was working to reach CMMI level three, with help of this coach. After reaching this target, the plan was that the project would move to self-improvement phase and also the last coach would leave.

5) Benefits of Coaching

The project benefitted greatly from the coaching, which in this case was very intensive. The coaches supported the teams in taking the agile practices into use, and visualizing and solving the problems, as soon as they occurred. Without coaching, according to our interviewees the project could look like this:

"The project would be still the same and struggle with the same problems. (...) it's faster when somebody who understands these new things help you, than that you have to struggle on your own (...) I would say maybe, it takes maybe four, five times longer [without coaches]. (...) because of the project size, because you have to learn how to do it, but even then you are not sure if this is correct way. Then there are misunderstandings. Then you have to learn based on your failures. And it can be even more than five times, so..." – Project team member

6) Lessons Learned

In this case, the coaches were invited already before the transfer project started, which gave them a good possibility to influence on some important decisions. They, e.g. successfully sold the idea of combining the transfer with agile transformation to the project leaders. Moreover, in this project both sites, as well as the project leaders were involved in and committed to coaching already from the beginning, which made a very good starting point for coaching.

The development work of a project being in red number was transferred reasonably fast to a new site and at the same time the process was changed from waterfall to agile. This does not seem like an easy task. This project might well have ended up as a catastrophe, but it did not. Thus, most probably many

things were done correctly and the support by four mentors certainly helped tremendously.

V. DISCUSSION AND CONLUSIONS

A. Cross-case summary

This paper presented a study on three distributed projects all taking into use a new, more agile software development process supported by a company internal coaching team. In all the cases the process model taken into use was different. In the banking case the change was from waterfall to iterative RUP model. In the telecom case Scrum was taken into use first, since the customer required it and later on, in connection to a contract model change to service level agreement, started a change towards Kanban. In the Energy case the waterfall model was changed to Scrum, while at the same time transferring most of the work to the other site.

The Banking project, was seriously challenged already before the process change. In this project the coaching concentrated on the Eastern European site, where also the process transformation took place. The Finnish site was not really involved in the change. Thus, it seems that in this case the process changes and coaching did not help the project as much as it could have. In the other two cases both sites were involved in the change already from the beginning, thus in these cases the agile process was really used in the collaboration between the sites. In these two cases the coaches participated in planning GSD practices for supporting the collaboration between the sites, which certainly benefitted the cases, as well.

The Energy case differed from the other two cases in that the agile transformation was combined with the transfer of the major part of development activities to the other site. This very challenging combination succeeded, at least partially because the coaches invested in this case more time than they normally do. The other cases were supported by one or two part-time coaches, while in this case four almost full-time coaches were involved during the first few months.

B. Lessons Learned

In this section we summarize the most important lessons learned from our case projects on coaching globally distributed software development projects:

Ensure executive support from a high enough level and from all the sites. The higher management finally decides if the project is allowed to make process changes and use resources to this change. The Banking project did not have that kind of support from the management of the Finnish site, thus the Czech site had to fight to be able to do changes.

Involve all distributed sites in the process change and ensure their commitment. Coaching only one of the sites and changing process only there, might be better than doing nothing. However, really taking agile process into use in a distributed project should include all the sites. Namely, in a distributed project the most difficult problems are most often between the sites, e.g., in communication and collaboration between the sites. Earlier studies have showed that agile processes, such as Scrum, improve communication and add visibility across the sites. However, to reap all the benefits, all the sites need to be using the same agile practices.

Involve coaches in "selling" the changes to the other sites and the management. Coaches have experience from several projects and from several change processes, thus they can help in explaining why changes are needed, what they mean in practice and what the consequences are. As outsides to the project, coaches will provide an objective view to the project, which might help, as well. In our case projects the help from the coaches in "selling" the changes both to the other sites and the management was highly valued.

Ensure that coaches have knowledge of successful GSD practices. As noticed in our case projects, besides helping in taking the agile practices into use, the coaches suggested and helped the projects to take into use many successful GSD practices, such as ambassador, and collocated working periods. Moreover, in distributed projects agile practices need to be applied, so that they can be used in spite of the distribution, thus coaches' experience from GSD projects is essential.

Involve coaches already in the planning phase of a new project. By involving the coaches early, they can help in planning suitable processes and GSD practices for the project. Thus, unnecessary mistakes could be avoided. One of our case projects, the Telecom project, involved the coaches in planning the practices before the project even started, which proved to be a good decision. In the Energy project, the coaches were involved before the planned transfer of development to the Eastern European site and the change to agile with very good results.

Start the change by arranging a collaborative workshop with coaches and representatives from all the sites to create a common vision. It is important to involve both development personnel, as well management and business people to this workshop. In one of the cases, the Telecom project, a couple of these kinds of workshops were arranged, during which the participants unified their views on the root causes of the challenges, and agreed together on new processes and action steps. The interviewed coaching team members told us that these "Kaizen workshops" are nowadays their standard tools that they use in most of the coached distributed projects. The interviewees from the Telecom project suggested that inviting everyone from the project team to the workshop would make it even more useful. However, in large projects that might not be possible.

Agree on regular meetings with coaches. Our case projects had regular, mostly weekly 1-2 hour meetings with the coaches, which they found very useful. During these meetings progress and problems were discussed and solutions created together.

Aim for a long-term coaching relationship. Our interviewees emphasized that a long term coaching relationship is beneficial. In all case projects the coaching relationship had lasted at least one year, often longer. Even though the most intensive change period is over, having a regular contact with

the coaches helps to ensure that processes do not start to deteriorate, continuous improvements are made, and problems are solved as soon as they occur. Coaches are in this self-improvement phase a kind of back-up who can be asked for advice when team faces problems.

Remember that the project team owns the change – the coaches cannot make it happen on behalf of the team. Our interviewees found it as important that the whole project team is involved and engaged in the change, the coaches are there just to help and support them. Moreover, even though the coaches were supporting mainly the project manager, they cannot take over that job.

C. Limitations

As a multiple-case study of three distributed projects coached by one coaching team working for one company the generalizability of the results of this study is limited.

Even though the interviewers had previous experience from two of the interviewed three case projects, the interviews of the current study provide a limited view on the case projects, as only two persons per project from only one site were interviewed. Thus, additional interviews, especially from the other sites could have provided additional insight. Moreover, the coached projects and the interviewees were not selected randomly, which might bring some bias to the selection.

D. Future Research

In the future, we are planning to augment this study by collecting quantitative data on the success of coached and non-coached case projects to be able to quantify the benefits of coaching.

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