UNIVERSITY OF GOTHENBURG

Critical elements of communication in cross-functional software development projects

Lufthansa Program case study

ALENA IPANOVA

Master in Communication Thesis

CONTENTS

UNIVERSITY OF GOTHENBURG

ABSTRACT

Understanding communication aspects in cross-functional software development teams is important for managing a software development process. The recent researches in this area give a conceptual model based on the managers' perspective, while employees' perception is not analyzed. This study aims to cover this gap and explore communication not only from managers', but from employees' point of view.

The research is based on the six criteria got from the theory review: task orientation; cooperative communication; interpersonal relationships; knowledge management; communication outcome and project characteristics influence on communication. Following these criteria we implemented our research in Jeppesen[*], where communication in Lufthansa program[**] (LH program) was studied. Data collected from 3 interviews with managers and 90 employees' responses to the online survey based on findings from the managers' interviews, confirmed a critical value of such communication elements as awareness and responsibility for communication; knowledge about the program and competences of other colleagues; attitude to official meetings; motivation status and content.

The study contributes to the existent literature by practical implication of theoretical concept highlighted in prior researches, as well as reflects on the employees' perspective of communication, while only managers' perspective was represented in prior researches in this area. Another contribution we see in modifying a model of communication based on the case study conduction. Hence, in the result of the study, the importance of certain communication criteria was confirmed or eliminated, as well as additional criteria emerged. The findings represented in the current paper contribute to managers' and employees' understanding of the critical elements of communication in cross-functional software development teams. Practical implications and directions for further research are discussed as well.

Key words: cross-functional communication, software development project, case study.

---

[*]Jeppesen Gothenburg office is a part of Boeing, an American company, and is specialized in navigational information, operations management, optimization solutions and crew and fleet services

[**]Lufthansa program in Jeppesen addresses customization and implementation efforts for replacement of Lufthansa (LH) existing Crew Management System (CMS) with integrated standard software solution based upon the new Jeppesen CMS platform

1. INTRODUCTION

Cross-functional communication has a critical value in any organization where professionals with different backgrounds work for one project and contribute to the final outcome (Clark and Wheelwright, 1992). Cross-functional project work allows releasing the final product in a shorter period of time with fewer costs, though the outcome depends on the effectiveness of communication in a cross-functional project team. Cross-functional project teams are defined as teams composed of individuals from various functional units who possess knowledge and skills relevant to the completion of the project (Witt et al., 2001).

Different project roles and backgrounds might make the subgroups of IT professionals have different individual goals in addition to the project goals (Linberg, 1999; Pee et al, 2010). As well, complexity of communication in cross-functional project can be defined not only by different professional backgrounds of team members or different roles as managers and employees, but also by structural division within the project. For example, several departments within one project might work on different stages of product development and contribute to the final result. Hence, good task orientation, understanding of individual contribution to the project as a whole, as well as vision of the final outcome is of a high importance for collaborative cross-functional software development team work. It makes communication more complex and crucial in the cross-functional setting. Thus, the attention to the quality ensured and reliable communication within the project increases (Fall M., 2012).

The research interest to software development teams' communication can be explained by the high technology state that demands broader knowledge about cross-functional software development project team work (Ghobadi Sh., D'Ambre J., 2012). This research area is quite young and mainly focuses on the conceptual study of cross-functional relationships in software development teams, rather than on empirical study. The target group of the researches done in this area is managers leading software development projects, while employees working in project teams lack the research attention. Therefore, the novelty of our research is in the cross-functional project team communication study with the focus not only on managers, but on employees involved into the project work. It allows us to reflect on the quality of information exchange, its perception and understanding of project goals by individuals with different professional backgrounds and different roles within the project. The study aims to contribute to employees' and managers' understanding of communication and its influence on the project work and its outcome. As well, by conducting our research, we aim to give a representation of critical communication elements to managers, working with the software development project teams, for their further consideration. It is worth to mention that when talking about critical elements of communication we mean those factors that might have positive or negative influence on communication and are seen as important in project teams' work.

Hence, the aim of our study is to discuss communication in cross-functional software development project teams from managers and employees' perspective based on the criteria defined from the previous researches review. Hence, the research question is: *What are the critical elements of communication in cross-functional software development project teams from managers and employees' perspective?*

The remainder of this research paper contains the following parts. First, the overview of researches on cross-functional software development project teams' work is presented. Second, the research question is postulated to test limitations and expand the field of previous researches on the topic. Then the methodological instrument of the study is described. In the following sections the results of the study are presented and discussed. Theoretical and practical study implications, as well as limitations, are represented in the discussion section. The final section of the research paper contains conclusions, summary of contributions and directions for future

research. Attachments include the interview guide for managers, the list of statements for the employees' online survey, the transcripts of the interviews and thesaurus containing explanation of terms specific for a software development team work.

2. THEORETICAL FRAMEWORK

2.1. Theoretical framework consideration

This section aims to represent the base for the current research structure and development. Starting with the position that the topic "communication in cross-functional software development project teams" has in the research field, it is worth to mention that it lacks the empirical study. There are not so many researches reflecting on the cross-functional teams in Information Technology field. Therefore, we implemented the following strategy to build up and develop our study on the topic: first we defined a general problem which refers to communication in cross-functional software development teams; then we did an overview of the researches done in this area in order to explore the possibility to cover some of their limitations by our study. To provide the balance between theoretical and practical contribution of our study we selected several research papers which content was close to the problem we investigated. Our purpose in the theoretical revision was to extract valuable for our study criteria which could help not only structure our research work, but give it more value in the meaning of empirical implication of conceptual models, identified in the previous researches.

Therefore, six criteria related to communication in cross-functional project development teams were defined and used as a base for the current research. Hence, the role of the theoretical framework represented in this section is not only to provide a theoretical base for the research topic, but to fulfill the function of the research core (where the criteria extracted from the previous studies on the topic were combined and used in the current research design and analysis).

2.2. Theoretical overview

Cross-functional software development team is in the center of a recent research done by Ghobadi Sh. and D'Ambra J.paper (Ghobadi Sh., D'Ambre J., 2012). In the research paper "Coopetitive relationships in cross-functional software development teams: How to model and measure?" the authors represent the results of the study of software development teams based on two processes: cooperation and competition. The data for the research were collected from 115 software development project managers in Australia. The authors develop conceptual model of cross-functional coopetitive behaviors in software development teams by measuring their constructs with the help of Likert scale and analyzing the constructs validity with the help of confirmatory factor analysis (CFA). The authors claim that after studying a wide range of definitions of cross-functional cooperation three major categories can be formed: (1) cooperative task orientation that presumes collective spirit and support in the team; (2) cooperative communication that involves social interactions and knowledge sharing; (3) cooperative interpersonal relationships containing mutual respect (Ghobadi Sh., D'Ambre J., 2012). In the cross-functional competition Ghobadi and D'Ambra define such functional units as (1) tangible resources that involve personnel and organizational capital; and (2) intangible resources such as strategic power, time and attention (Luo et al., 2006).

The authors point out the lack of research attention to cross-functional cooperation and competition and criticize representation of the above constructs as only reflective measures of cooperation and competition, while they consider it important to treat them as forming

dimensions of cross-functional coopetition where communication is a decent part of it. The main contribution of the research is in the conceptual cross-functional coopetition model representation that helps managers to understand and measure different cooperation and competition constructs within the software development project team work. Though, it is important to note such research limitations as data collection involving only one party of software development team: managers, while the opinions of other team members could open another perspective of cross-functional behaviors in software development project. Therefore, we see it relevant to involve not only managers, but employees as participants of our research in order to reflect on their perspective. Hence, the contribution of this research paper into our study we see in defining the target group for our research, as well as some of the criteria for empirical analysis.

After reviewing Ghobadi and D'Ambra's conceptual study on the topic of cross-functional software development teams, we defined the following criteria relevant for our current research. The first one is *task orientation* which presumes that cross-functional project members accomplish common tasks while working in the project. As well, we see it in relevance with the importance of keeping in balance individual and project goals that influence communication and outcome of the project work (Linberg, 1999; Pee et al, 2010). The second criteria that we defined is *cooperative communication* as far as cross-functional project work involves communication of teams' members related to task completion. And the third criteria is *interpersonal relationships* that presumes mutual respect, social ties and connection that project teams members have (Song et al, 1997). We do not consider tangible and intangible resources as criteria for our research, as far as they form competition construct, while our interest is in the cooperation communicative process to which chosen criteria belong.

Further research implemented by Ghobadi and D'Ambra concerns communication in cross-functional setting. The research paper "Modeling high-quality knowledge sharing in cross-functional software development teams" reflect on the software development as a collaborative process where efficient information exchange and knowledge sharing is of a high importance for the project success. In this research the authors operate with the data collected from the previous research, but apply empirical analysis using cooperative model of knowledge sharing (Loebecke, Van Fenema, & Powell, 1999) and social interdependence theory (Deutsch, 1949).

The study contributes to academic and practical fields by representing insights into the process of stimulation effective knowledge sharing in cross-functional software development project teams. The authors use the conceptual model of cooperation and competition, presented by them in the prior research, but integrate it with the cooperative model of knowledge sharing using such constructs as task orientation, communication and interpersonal relationships. In the frame of social interdependence theory the authors give their preference to the comprehensive categorization of social interdependences offered by Johnsson and Johnsson (2006). The model operates with such constructs as (1) outcome interdependence that involves goal and reward interdependence; (2) means interdependence consisting of task, role and resource interdependence; (3) boundary interdependence that is represented by sense of identity and interpersonal relationships (Ghobadi Sh., D'Ambre J., 2013). The relevance of this theory the authors explain by its reliability in cross-functional collaborative context where cooperative and competitive communications are combined. Likert scale was used for the coopetition model conceptualization and a semantic differential scale (from very low to very high) was applied when analyzing knowledge sharing within the model. Beside the constructs mentioned above, the study revealed number of factors playing important role in the process of knowledge sharing: (1) communication medium satisfaction, (2) organizational importance of the project, (3) project complexity, (4) project size, (5) project duration and (6) project cross-functionality (Ghobadi Sh., D'Ambre J., 2013). The authors claim that among project characteristics influencing knowledge sharing, the project importance is the most influential one. In the result

of the study the authors confirmed the need for the managers to keep outcome, means and boundary interdependences at a high positive level for effective knowledge sharing in cross-functional team.

As well, the authors suggest the informal communication mechanism as a regulator of collaborative cross-functional communication and encourage managers to establish healthy methods of creating political environments where visibility of ideas, sharing best practices, responsibilities can be incorporated in organizational knowledge management systems (Ghobadi Sh., D'Ambre J., 2013). The study is limited by targeting project managers as the key respondents without taking into account other team members opinions. Another limitation is in the fact that knowledge sharing and information exchange analysis was applied to the project work as a whole, without taking into account dependency of cross-functional communication on the stage of the project work.

This study contains the aspects relevant for our research work and reflecting on communication in cross-functional software development teams. We consider the concept of *knowledge management* important to study communication connected with knowledge sharing and information exchange within the project. Another criteria is *communication outcome* that is connected with tasks and goals of team members. Taking into account the previous research findings related to the project importance, size, duration and cross-functionality, we suggest combining them in the criteria of *project characteristics.*

Hence, in the result of the review of the previous researches done on the topic of cross-functional software development project teams' work, we defined six key criteria for our study. These criteria we combined into one model in order to give a graphical representation of our research.
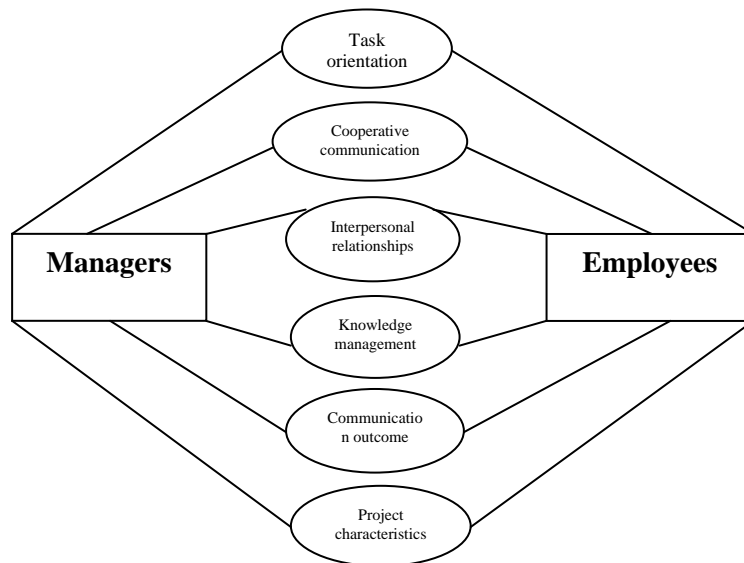
Model 1. *Theoretical representation of a cross-functional software development teams' communication criteria from managers' and employees perspective*

Therefore the model represents managers and employees, working in cross-functional software development project, as the target groups of our study. By performing our research we aim to explore the following criteria in order to find out the critical elements of communication existing in cross-functional software development project teams from managers and employees' perspective:

(1) Task orientation –understanding of tasks and the final result, attitude to tasks communication and accomplishing;

(2) Cooperative communication – discussions and communication on problem solving, finding solution, etc. at work and out of working environment;

(3) Interpersonal relationships – mutual respect and close connection that influence the work process;

(4) Knowledge management – information exchange and knowledge sharing related to work issues;

(5) Communication outcome – the result of interactions at work in group and individual discussions etc;

(6) Project characteristics influence on communication – the value that the status of the project and its particular characteristics gives to cross-functional software development project teams and communication

3. RESEARCH METHODOLOGY

3.1. Scope and participants of the study

To explore critical values of communication in cross-functional software development project teams we use a case study approach. Case study is defined as a study investigating individual or multiple case to answer specific research question. By individual case, a study of any organization or group is presumed. Multiple case study involves study of several organizations, groups, professions. On the first stage of investigation work a research question might be loose to start with. Therefore, case study aims to extract "evidence from the case setting, which has to be abstracted and collated to get the best possible answer to the research question" (Gillham B., 2005). One more fundamental characteristic of a case study, according to Gillham, is that case study doesn't presume a research work starting with the theoretical application, as far as theories to be applied for further analysis can be defined only after results collection depending on the research context. Though, in our case we started with the prior researches revision in order to build a theoretical framework for our study and take into account limitations stated in previous researches on the topic.

The current study was held in Jeppesen – an international company located in Gothenburg. Therefore, it is an individual case study. Jeppesen Gothenburg office is a part of Boeing, an American company, and is specialized in navigational information. The pre-study "Communication problems analysis and suggestions for future actions" organized in Jeppesen internally in 2012, indicated the need to work on communication improvements within LH (Lufthansa) program. Therefore, the current research was implemented to study communication within LH prgram from the academic perspective.

LH program can be defined as a cross-functional project, that when initiated in 2009 was built on involvement of IT professionals and managers withdrawn from different organizational units in order to accomplish the tasks needed for the project completion. Hence, we see it relevant to test our research question on LH program case. Currently LH program involves 11 managers and 150 employees working on different stages of the product development. LH project includes such phases as core development, customization and deployment. Each phase presumes cross-functional teams work on accomplishing specific tasks in order to produce a final product that is

delivered to a client after getting through all the project phases. Effective cross-functional communication within the project is one of the factors that can ensure the quality of a final product delivered to a client.

Participants of our study are managers and employees working within LH program. Thus, the target group is defined by the project frame. By managers in our research we mean people who are responsible for planning, controlling and administrating the work of the whole program or its particular parts. By employees we mean individuals working cross-functionally within LH program, and involved into several subprojects, accomplishing tasks related to product development and contributing to the final result.

3.2. Data collection

To collect data for the current study we used combination of qualitative research method, such as in-depth interviews; and quantitative research method, such as on-line survey in the form of a Likert scale. It is important to mention that though we refer to the online survey as to a quantitative research method, we use interpretation for its analysis, which gives it a qualitative nature. In-depth interviews we applied to managers and on-line survey – to the employees working in LH program.

The choice of different methods for data collection for managers and employees can be explained by different number of individuals in each category. We consider it appropriate to held in-depth interviews with managers as far as they are less in number as compare to employees and more convenient to cover. In-depth interview provides empirical qualitative data that allows examining interviewee's experience in details (Hennink et al., 2011). Interviews with managers allowed us to reveal important check points for their further consideration in formulating statements for employees' online questionnaire. Three managers working on different levels within LH program were interviewed. The choice of interviewees was done based on such factors as work in different departments and on different levels of LH program, as well as work experience. Three managers available for the interview in the nearest time took part in the interviews. We consider three interviews to be enough, as with the help of them we managed to collect enough information to reflect on the six criteria of communication in cross-functional software development project teams.

We see it important to reflect on the method consideration to give a full picture of the process of data collection. When interviewing managers, in order to create comfortable atmosphere for them, we organized interviews in the company office where they work. We booked interviews using internal calendar, access to which we got together with the internal email address, which made communication with managers very convenient. Each interview last 45 – 50 minutes. Each of the interviewees got an explanation about how the data got from the interview will be used in the research and with which purpose. All the interviews were audio-recorded with the agreement of the interviewee. Then, interview transcription was sent for verification to each interviewee. In the meaning of ethical consideration we saw it important to check up with the managers whether all the information is displayed correctly and there are no misunderstandings. No changes in the interviews' content were done, just some minor elaborations in one of the interviews. Further, the information got from the interviews was used to shape reflective and critical statements for the employees' online questionnaire. Talking about the anonymity of the interviewees, it is worth to mention that despite the fact the managers were open with displaying their names in the interview transcripts; we saw it ethical to keep their anonymity. Therefore, managers' names are not mentioned in the attached interview transcripts.

The data from employees were collected with the help of the on-line survey. Before launching the survey in LH program, the managers informed the employees about the study and the

importance of their participation in it. In the online questionnaire form we gave an explanation of our research and its purposes, so the employees could get a better understanding of what for and how the data got from their answers will be used. The questionnaire was opened during one week and two reminders from the manager were sent in order to reach the higher percentage of responses.

Taking into account the fact that 136 employees are involved into LH program, we considered it relevant to involve all of them into our research, which was possible when using on-line questionnaire. We didn't use interview as a method of data collection from employees, as far as it would allow us reflecting on opinions of only several individuals, though on a deeper level, when our concern was to get a general picture of communication assessment by employees working in cross-functional project. Therefore, first we implemented interviews with managers, and then, based on the interesting for the research findings from these interviews, built the questionnaire for the employees, reflecting on the findings from managers' interviews.

We consider this approach helpful in displaying how managers see communication within the cross-functional project and how employees reflect upon it. It is important to mention that both, interviews and questionnaire, were structured based on the six criteria of software development project teams work, defined in the theoretical framework section of our study and used to reveal critical elements of communication in LH program.

3.3. Research design and data analysis

In order to held interviews with managers working in LH project, the interview guide was designed. The interview guide involves six themes which are identical to the criteria of cross-functional software development project teams work, defined by us in the theoretical framework section. Each theme, except the last one, consists of four questions that aim to explore the relevant criteria from communication point of view (Attachment 1). The last theme "Project characteristics influence on communication within the LH program" contains only one open question related to the characteristics of LH program. We considered it relevant and interesting for the theme content to be filled in by the managers' assumptions. And it was fairly covered by one broad open question. The following themes are represented in the interview guide:

(1) Task orientation

(2) Cooperative communication

(3) Interpersonal relationships

(4) Knowledge management

(5) Communication outcome

(6) Project characteristics influence on communication within the LH program

The questions we used in the interview guide are mostly open questions that allow us to get a broader scope of information from the interviewee. As well "yes/no" questions were used sometimes, but they were always followed by specifying follow up questions. It is important to note that when interviewing several persons on the same topic, the researcher is flexible to modify each following interview raising up interesting for study points, emerged in the previous interview. Hence, analysis done already in the process of data collection can contribute to the study results and interpretation (Miles M.B. and Huberman A.M., 1994). Therefore, we implemented interview analysis as an ongoing process, using for the upcoming interviews interesting questions raised in each previous interview.

The data, got from managers' interviews, were analyzed with the help of the structure suggested by Gorden R., where we extracted the key phrases from the interviews transcripts and

formulated key findings (Gorden R., 1992). Further, based on the findings from managers' interviews, questionnaire for the employees was done in order to reflect on the relevant to the research question points. The questionnaire for the employees was based on the Likert scale method where the same six criteria, as in managers' interviews, were represented by four statements each, except the last criteria "Project characteristics influence on communication". This criteria we considered to be fairly covered by two statements. All the statements were formulated in accordance to the findings from the managers' interviews with reflection on the cross-functional software development project teams communication criteria, and were measured with a 4-point ranging scale from "strongly disagree" (1) to "strongly agree" (4) (Attachment 2).

Despite the fact that classical Likert scale consists of five points: strongly disagree; disagree; neither agree nor disagree (neutral); agree and strongly agree; we excluded the neutral point from our ranking. Allen et al. (2007) states that even-point scale can be used, where the middle option of "neither agree nor disagree" is not available. In this case it is called a "forced choice" method which we see as a relevant for our study, as the research interest is in defining critical elements of communication. Therefore, we were interested in getting critical opinion.

Further, the analysis of the managers' interviews was accomplished by means of grouping the findings we got into the general themes and discussing them in connection to each other. The discussion of the results from the online survey for the employees we organized according to the similar principle: we defined the general themes that emerged and discussed them paying attention to the contradictions occurred in the employees' evaluation of the questionnaire statements. Thereafter, the main points got from the analysis of managers' interviews and the employees' online survey were integrated in order to formulate conclusions about the critical elements of communication in LH program to answer the research question of our study.

4. RESULTS

4.1. Results from the managers' interviews

To classify the data that we collected from managers' interviews, we did the interviews' transcription (Attachment 3). The codes/findings from the managers' interviews were extracted from each of the six interview themes reflecting on the six criteria of cross-functional software development project teams' work that we defined in the theory part of our research paper. It is important to mention that findings presented below are extracted from all three interviews. We didn't aim to compare managers' interviews, but rather use them as a whole to create a base for the employees' online questionnaire. Hence, in the result of managers' interviews the following findings were determined:

(1) Task orientation criteria presumes understanding of tasks and the final result, attitude to tasks communication and accomplishing, as stated in the theory part. These aspects have been studied from the perspective of LH program vision, roles and responsibilities and tasks regulation that appeared in the managers' interviews. Here the following findings were defined:

Short term vision of LH program causes a low information level about the final result. In the managers' interviews all the interviewees mentioned related to short- and long term LH program vision aspects. The managers confirmed the fact that there is no clear enough vision of LH program as a whole. Though, the interviewees mentioned that they *"implement attempts to communicate the program long term vision in Show and Tell and All Hands Meetings"* that are organized on the regular basis for all the employees working in LH program. One of the managers supposed that the way meetings are organized allows to see only short term results: *"I think such meetings are very good, but then you always see just teams' presentations about what*

has been done lately, and don't see the long term perspective. Are they done with this or not yet, and if not, what will it be when they finish?" In relation to this the importance of employees' awareness about the final product characteristics and the contribution of each team and employee's task into it were raised by the interviewees as well. The interviewees stated that influence of too complicated messages on the program vision that employees have, as well as the fact that often the employees do not ask questions after meetings: *"it is possible to find information later on the slides, but it's more important to communicate. People shouldn't wait with questions if they have ones"*. Though, the interviewees noted the role of feedback questions that they ask in order to make sure that the employees understood the information they got.

The roles and responsibilities are not clear. Task responsibility and roles was not explicitly communicated by the interviewees and there were not many key words related to this found in the interview transcription. Though, we consider it important, due to the contradiction occurred from the managers' interviews. One manager stated that there is no problem of roles and responsibilities, while two others noted that this is one of the major problems in LH program. As well, one of the interviewees mentioned that not having a clear vision of roles and responsibilities, *"one employee can be assigned to two different tasks by two different managers at the same time which can cause the problem of setting priorities by the employee"*.

Hierarchical communication and role of a scrum master in tasks regulation is critical. Interviewed managers mentioned such ways of tasks fulfillment regulation as hierarchical communication: *"we try to communicate with employees by means of hierarchical structure that we have in the program and use line managers for this"*; as well as scrum teams work, when teams plan their work for each sprint that lasts two weeks and analyze the results of each sprint in the end. One of the managers pointed out the importance of a scrum master in tasks regulation, as it is the role of the scrum master to take care that employees are not overloaded with tasks and do everything according to the plan: *"a scrum master has a facilitating role, this person makes sure that the team follows the processes, figures out the problems to solve, not only technical problems, but other types of problems"*.

(2) Cooperative communication criteria involves communication in relation to problem solving. Hence, the information got from the interviewees in relation to cooperative communication in solution finding and problems prevention, allowed to point out the findings presented below:

Cooperative communication is forced on the product delivery stage. There was a contradiction found in the managers' interviews related to the nature of cooperation. Two of the interviewed agreed that cooperative communication is especially strong on the delivery stage when the employees don't have another choice than to cooperate in order to deliver a good quality final product to a client: *"one indicator is a delivery stage, when we get closer to delivering the final product, then I can see how employees communicate and try to reach each other to get the information. So our deliveries are indicators of how people work in order to get something done"*. Though, one manager stated that the employees are aware of cooperation from the beginning of work: *"we try to cooperate before we start doing things, so we won't run into too many problems... it's tricky to build software and even if you work so many years there are problems"*. The influence of not enough knowledge about roles and responsibilities of others with whom teams or team members should communicate in order to produce the product was mentioned as one of the factors that prevents cooperation.

Communication within LH program is silo mental. The term silo mentality is used in relation to management systems, when it is incapable to collaborate with related information systems, so the "silos of knowledge" occurs (Sharma R.S., Bhattacharya S. (2013). In our case it is communication between departments and project teams within LH program. Interviewees underlined the difficulties in finding the information needed, whether it is in company's intranet

or in face to face communication. In this case lack of knowledge about each other's competences brings to a long communication line in order to get the information needed: *"we lose information on the way, have too long communication lines sometimes"*. Interviewed managers mentioned blaming as existing in LH program issue: *"Some employees tend to blame others, for example core and customization where there should be better understanding of why core did changes and how it can influence customization"*. At the same time, one manager stated that *"mixed teams of customization and core are created to test the customizability of what is produced by other teams. It makes it easier to work with the product on the next stage"*. All managers agreed that more emphasize on the cooperative work and its benefits, as well as the display of the internal connections in LH program is needed in order to work in more open environment.

(3) Interpersonal relationships criteria involve such aspects as mutual respect and close connection influencing the work process (Ghobadi Sh., D'Ambre J., 2013). These aspects were represented in managers' interviews in relation to formal and informal communication, as well as employees' openness based on trust. Hence the following findings emerged:

Many problems are solved in informal communication. Good interpersonal communication between the employees was mentioned by all the interviewed as helpful and important for problem solving at work place: *"if you meet for an afterwork every day then most probably the issues or problems you have at work will be solved in this everyday communication"*. In relation to this, interviewed supposed that good social interactions outside work environment positively influence employees' commitment to tasks when they deliver the results of their work to the next stage, to the person whom they know and have good interpersonal relationships with: *"when you have good interpersonal relationships with someone you are more likely to stick to your commitment related to the task you and this person works on"*. Interviewees assumed that some of the problem issues can be rather solved in informal setting than on formal meetings.

Good social connection positively influences professional communication. From the interviews with managers, the fact that good social connection between the employees positively influences work process and communication has been raised: *"... if you meet up with a person, spend some time to socialize, then you are more likely to stick to your commitment when you know who is that person on the other side of the electronic tool. Then you know that if there is a thing with the bug in it and you will try to fix it. Social contact is important"*. Though, one of the interviewees shared the opinion that it would be ideal if professional communication could work even when employees don't have any social connection.

(4) Knowledge management criteria involves information exchange and knowledge sharing related to work issues (Ghobadi Sh., D'Ambre J., 2013). The following findings were defined in managers' interviews based on the knowledge management aspects:

There is no good-structured knowledge exchange system within LH program. Talking about the role of LH program in Jeppesen, managers agreed that more or less *"everyone is aware of the importance of LH program, though we don't discuss how exactly it is important for the company"*. One manager stated the problem that not all the decisions done are brought up back to the employees, which causes an information block: *"the decision could be taken over lunch and then you don't get back to the information discussed on the meeting. Communication is not always brought back to all who work on the product"*. The issue of information exchange between two departments, core and customization, was raised in the interviews: *"working in the core we don't know a lot what is going on in customization"*. All managers noted that there is no any knowledge exchange system within LH program. One of the managers pointed out that fact that on Show and Tell meetings only short-term knowledge is presented, which is enough to see the processes on the current stage, while the long-term vision of the project is not displayed:

"Show and Tell is good but you see just what is done lately, but you don't see the full picture, is it 5 % that they showed, what about other 95%?"

Extra knowledge is acquired only when it is needed. By need-based knowledge we consider knowledge that employees acquire only when there is a need for this. When discussing knowledge sharing, the interviewees noted that one of the solutions to obtain knowledge, needed for task completion and more productive cooperation could be changing of physical location of employees: *"the solution might be to move employees around and place them into different formations"*. One of the managers mentioned that there is a special room with all the graphs and processes where employees can find the information they need in relation to their work, though the information presented there might be not always reliable.

(5) Communication outcome criteria has been defined in the theory part as the result of interactions at work in group and individual discussions, etc. (Ghobadi Sh., D'Ambre J., 2013). Information that we got from interviewees, related to communication outcome, was connected with the issue of employees' role in communication, as well as combination of individual and project goals. In the result the following findings were defined:

Communication outcome is not always relevant to the employee's role. Talking about communication outcome, the interviewees supposed that not all the employees understand their role on the meetings: *"sometimes people don't see reasons to be on the meeting or might think that the meeting was not necessary for them"*. One of the managers defined it as a result of not clear formulation about purpose and outcome of the meetings or communication: *"we don't often set purpose and conclusion, in most cases we just jump in to the subject"*. In this case different vision of managers in relation to the meetings was presented: some stated that *"meetings is the way of work"*, and others - that *"it's not necessary to have meetings so often, when the teams use backlog where all the tasks are updated, so the employees can follow that tasks relevant to their role in the project"*.

Employees are responsible to make sure that their individual goals are realized together with project goals. Talking about individual and project goals managers expressed two opinions. The first one is related to direction of individual and project goals with the help of communication structure: *"we have the line managers and they are responsible to communicate such things with the employees, they reflect on their goals and then I think it would be reflected in the project. It's maybe not so obvious individual goals, but the line is to make sure that people develop new competences in the project"*. Another opinion states the role of an employee in regulating own goals: *"I think it's a lot up to you to make sure that you realize your individual goals. In my case, for example, I work in different areas, and I think it is possible to suggest tasks and positions for yourself. It is possible but I'm not sure that people dare to sell their own ideas. Some of them do, but some prefer just to do what they are doing, and they like it"*. In the meaning of goals representation, one manager mentioned that *"well structured roadmaps giving representation of the whole picture of the product employees work on, could help in displaying individual tasks and goals function within the whole project"*.

(6) Project characteristics influence on communication criteria is defined as the value that the status of the project and its particular characteristics gives to cross-functional software development project teams and their communication (Ghobadi Sh., D'Ambre J., 2013). The finding emerged in this interview theme is related to the stimulation function that LH program status has in relation to communication within the program:

LH program characteristics stimulate communication within the program. Discussing the influence of LH program characteristics on the way employees communicate and fulfill their tasks, the interviewed managers mentioned that such characteristics as LH program size, challenges, work on new platform positively influence employees work and willingness to communicate with each other: *"LH program is a project of a higher priority working with high*

tech things"; "LH is a big project and has many challenges. I would definitely say that I would like to be a part of this"; "It is a new platform". Though, it was pointed out that not all the employees know the role of LH program for the whole company: *"people in Jeppesen still ask questions what we do in here, though LH program is almost a half of the company".*

The findings defined from the managers' interviews made a base for structuring the online questionnaire for employees. The schema of the statements for the online survey for employees is represented in the *Table 1*.

Table 1. *Statements for online questionnaire for employees based on findings from managers' interviews*

| Criteria (interview themes)	Findings from managers' interviews	Statements for online questionnaire for employees
Task orientation criteria	Short term vision of LH program causes a low information level about the final result The roles and responsibilities are not clear Hierarchical communication and role of a scrum master in tasks regulation is critical.	1. I am aware of the importance and outcome of the task which I'm assigned to complete. 2. My manager/scrum master does a good job in protecting me from tasks overload 3. I am informed and aware of how my work tasks contribute to the whole LH program 4. I feel personal responsibility for success or failure of the project
Cooperative communication criteria	Cooperative communication is forced on the product delivery stage Communication within LH program is silo mental	1. I am aware of the competences of other people in the program. I know exactly who can help me with specific questions. 2. It is my responsibility to communicate with other parts of the program in order to deliver best quality product to the client. 3. I tend to blame others when the work they did prevents me from fulfilling my work without problems 4. Not having clearly defined roles in LH program has negative impact on effective problem solving
Interpersonal relationships criteria	Many problems are solved in informal communication Good social connection positively influences professional communication	1. I tend to collaborate more with colleagues whom I have social connection outside the work environment with. 2. When I deliver my part of work to the colleagues whom I personally know, I spend more time to verify the quality of my work. 3. I receive more information related to the program and tasks during informal communication with colleagues rather than during official meetings. 4. During social events organized in LH program I usually stick to the people I know, rather than joining other groups
Knowledge management criteria	There is no good-structured knowledge exchange system within LH program	1. I possess/know where to find additional knowledge I need to complete my work/tasks 2. I communicate with people from other projects in

	Extra knowledge is acquired only when it is needed	order to exchange experience and provide more value to LH program 3. Long-term changes of physical location in the office could help gain more knowledge and establish communication with new people 4. There is a lack of the common platform for knowledge and information exchange across the whole LH program
Communication outcome criteria	Communication outcome is not always relevant to the employee's role Employees are responsible to make sure that their individual goals are realized together with project goals	1. Many meetings I participate in don't provide benefit for my daily work 2. Achievement of the project goals contributes to the achievement of my personal goals 3. I have a clear understanding of LH program directions, where we are now and where we are going to be in a year 4. It would be more practical to have Show and Tell meetings in the form of discussions and team to team communication, rather than just presentations of what each team has done.
Project characteristics influence on communication criteria	LH program characteristics stimulate communication within the program	1. I feel proud working in LH program 2. I know how LH program contributes to Jeppesen

4.2. Results got from the online survey for employees

The online survey was launched in Jeppesen on April 10, 2013 and last till April 18, 2013. All the employees were informed about it on All Hands meeting where the information about the survey was represented by LH manager. As well, an official email to all the employees was sent and followed by a reminder. In the result of the online survey we got responses from 90 among 136 employees working in LH program, which is 66%. Employees evaluated suggested statements using the scale "strongly disagree; disagree; agree; strongly agree". The summary of the results from the online survey is represented in the *Table 2*. And below the detailed results representation is given according to the six criteria on which the current study is based. It is important to note that the percentage given is rounded till the next digit in case if it is equal or exceeds 5 (16,51% = 17%) in order to make the results more reader-friendly.

(1) Task orientation criteria was reflected by four statements. The first statement *"I am aware of the importance and outcome of the task which I'm assigned to complete"* got a high level of agreement. 44%, which is 40 out of 90 respondents strongly agreed with the statement and 48% agreed. 8% out of all the employees taking part in the online survey disagreed with the statement.
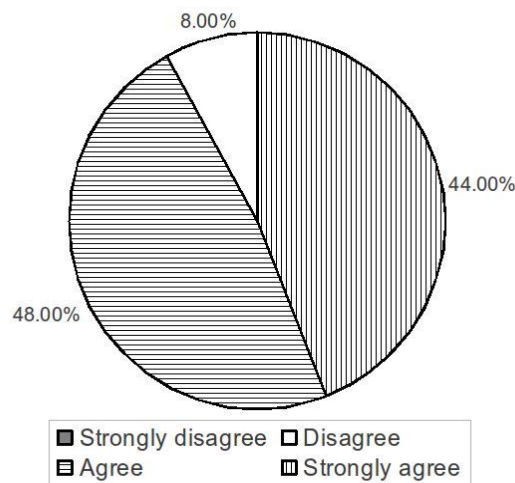
The majority of the respondents expressed agreement with the second statement related to the role of a scrum master in teams work *"My manager/scrum master does a good job in protecting me from tasks overload"*. 58% agreed and 13% strongly agreed with the statement. Disagreement was displayed by 21% of employees and strong disagreement – by 8%.

The third statement *"I am informed and aware of how my work tasks contribute to the whole LH program"* has a high level of agreement as well: 49% of respondents agreed and 21% strongly agreed with the fact that they are informed and aware about their contribution to LH program. Though, 27% of employees disagreed and 3% strongly disagreed with the statement.

Evaluating *personal responsibility for success or failure of the project* 51% of respondents agreed and 29% strongly agreed that they feel personal responsibility. Disagreement was expressed by 19% employees and one employee (1%) strongly disagreed with the statement.

(2) Cooperative communication criteria was represented by four statements reflecting on the nature of communication and silo mentality factor. Evaluating the first statement *"I am aware of the competences of other people in the program. I know exactly who can help me with specific questions"* the number of respondents who agreed and disagreed with the statement was almost

equal: 43% disagreed and 9% strongly disagreed, while 40% of respondents agreed and 8% strongly agreed.
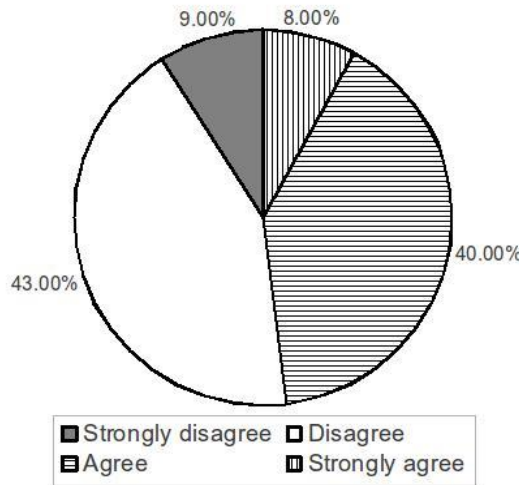
The second statement *"It is my responsibility to communicate with other parts of the program in order to deliver best quality product to the client"* is characterized by the high level of agreement among the employees: 61% of them agreed and 30% strongly agreed on the fact that communication with others working in the program should be an individual responsibility of each employee. Though, 9% expressed disagreement with this statement.

When responding to the third statement in cooperative communication part, 56% of employees disagreed and 20% strongly disagreed that they *"tend to blame others when the work they did prevents me from fulfilling my work without problems"*. Though, agreement with the statement was displayed by 21% and strong agreement – by 3%.

On the last statement in cooperative communication criteria *"Not having clearly defined roles in LH program has negative impact on effective problem solving"* 47% of the respondents expressed their agreement and 26% - their strong agreement. Disagreement with the statement was displayed by 24% and strong disagreement – by 3%.

**(3) Interpersonal relationships criteria** statements reflected on the role of informal communication and openness of employees working in LH Program. In the result of the first statement evaluation *"I tend to collaborate more with colleagues whom I have social connection outside the work environment with"* 50% of respondents disagreed and 20% strongly disagreed with the fact. Though, 28% agreed and 2% strongly agreed that social connection has an influence on collaboration between the employees.

As well, 54% of employees disagreed and 30% strongly disagreed with the next statement *"When I deliver my part of work to the colleagues whom I personally know, I spend more time to verify the quality of my work"*. Nevertheless, 13% and 2% of respondents accordingly agreed and strongly agreed with the fact that they treat work with more responsibility when they know that they have to deliver it to the colleague they have a social connection with.

47% of the employees agreed and 16% strongly agreed with the fact that they *"receive more information related to the program and tasks during informal communication with colleagues rather than during official meetings"*. Disagreement and strong disagreement with this fact was expressed by 36% and 2% of respondents accordingly.
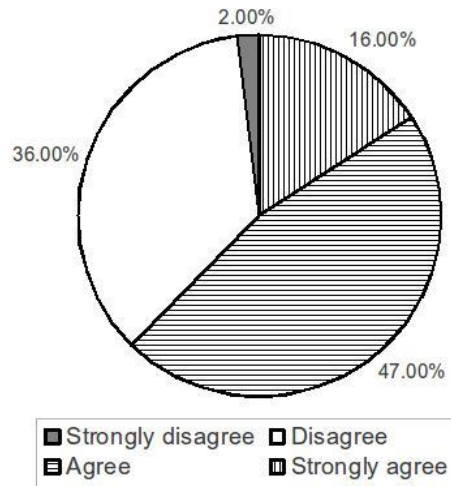
The majority of respondents agreed on the fourth statement *"During social events organized in LH program I usually stick to the people I know, rather than joining other groups"*: 60% agreed and 9% strongly agreed. Though, disagreement was expressed by 28% and strong disagreement – by 3% of respondents.

(4) Knowledge management criteria was explored from the perspective of knowledge and information exchange system within LH program. In the result of the first statement evaluation *"I possess/know where to find additional knowledge I need to complete my work/tasks"* the majority of respondents 52% agreed on the fact. Strong agreement was expressed by 12% of respondents. 28% of respondents disagreed and 8% strongly disagreed with the fact that they know the source of additional knowledge important for tasks completion.

As well the majority of respondents, 57%, confirmed that they *"communicate with people from other projects in order to exchange experience and provide more value to LH program"*. Strong agreement was displayed by 12% of all the employees. 24% and 7% of the respondents disagreed and strongly disagreed with this fact accordingly.

When evaluating the statement *"Long-term changes of physical location in the office could help gain more knowledge and establish communication with new people"* the majority of the employees agreed on this fact: 61% agreed and 9% strongly agreed. However, 27% of respondents disagreed with the statement and 3% strongly disagreed.
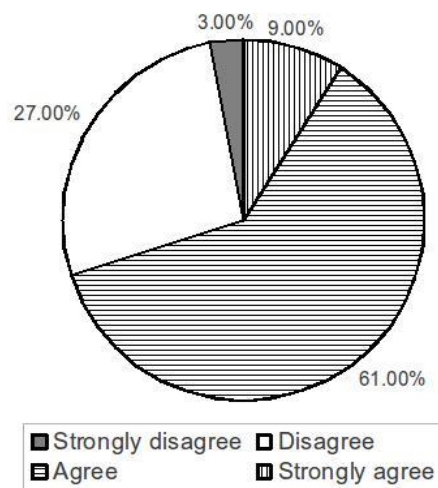
49% of respondents agreed and 23% strongly agreed that *"There is a lack of the common platform for knowledge and information exchange across the whole LH program"*. Disagreement was expressed by 27% and strong disagreement – by 1%.
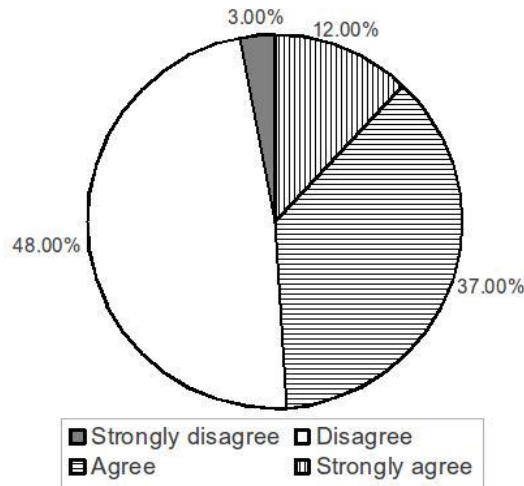
(5) Communication outcome criteria was represented in relation to employees' role and individual and project goals perspective. The first statement *"Many meetings I participate in don't provide benefit for my daily work"* gave 37% of agreement and 48% of disagreement. 12% of respondents strongly agreed and 3% strongly disagreed with the statement.

The second statement reflected on the direction of personal and project goals. 56% of the respondents agreed that *"Achievement of the project goals contributes to the achievement of my personal goals"* and 23% disagreed with this statement. Strong agreement was expressed by 17% and strong disagreement – by 4%.

Evaluating the vision and understanding of LH program that employees have, the majority of employees 53% disagreed on the statement *"I have a clear understanding of LH program directions, where we are now and where we are going to be in a year"* and 10% strongly disagreed. Though, 29% agreed on the fact that they clearly understand LH program directions, and 8% of respondents strongly agreed with the statement.
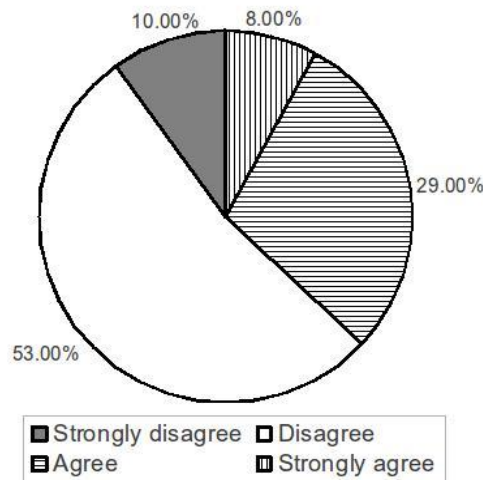
The forth statement *"It would be more practical to have Show and Tell meetings in the form of discussions and team to team communication, rather than just presentations of what each team*

20

has done" resulted in 53% disagreement and 37% agreement responses. Strong disagreement was expressed by 3% and strong agreement – by 7%.

(6) Project characteristics influence on communication criteria. The statements in Project characteristics criteria aimed to reflect on the stimulation function of LH program on the employees' attitude and communication. The first statement *"I feel proud working in LH program"* gave the majority of positive responses: 58% agreed and 24% strongly agreed with the fact that they are proud to work in LH program. Disagreement with this statement was expressed by 18% of respondents.

When evaluating the second statement *"I know how LH program contributes to Jeppesen"*, the majority of respondents agreed on this: 52% agreed and 37% strongly agreed. Disagreement was displayed by 10% of respondents and strong disagreement – by 1%.

Table 2. *Summary of the results of the online survey for the employees*

Criteria	Statements	Responses			
		Strongly disagree	Disagree	Agree	Strongly agree
Task orientation criteria	1. I am aware of the importance and outcome of the task which I'm assigned to complete.	0 (0%)	7 (8%)	43 (48%)	40 (44%)
	2. My manager/scrum master does a good job in protecting me from tasks overload	7 (8%)	19 (21%)	52 (58%)	12 (13%)
	3. I am informed and aware of how my work tasks contribute to the whole LH program	3 (3%)	24 (27%)	44 (49%)	19 (21%)
	4. I feel personal responsibility for success or failure of the project	1 (1%)	17 (19%)	46 (51%)	26 (29%)
Cooperative communication criteria	1. I am aware of the competences of other people in the program. I know exactly who can help me with specific questions.	8 (9%)	39 (43%)	36 (40%)	7 (8%)
	2. It is my responsibility to communicate with other parts of the program in order to deliver best quality product to the client.	0 (0%)	8 (9%)	55 (61%)	27 (30%)
	3. I tend to blame others when the work they did prevents me from fulfilling my work without problems	18 (20%)	50 (56%)	19 (21%)	3 (3%)
	4. Not having clearly defined roles in LH program has negative impact on effective problem solving	3 (3%)	22 (24%)	42 (47%)	23 (26%)
Interpersonal relationships criteria	1. I tend to collaborate more with colleagues whom I have social connection outside the work environment with.	18 (20%)	45 (50%)	25 (28%)	2 (2%)
	2. When I deliver my part of work to the colleagues whom I personally know, I spend more time to verify the quality of my work.	27 (30%)	49 (54%)	12 (13%)	2 (2%)
	3. I receive more information related to the program and tasks during informal communication with colleagues rather than during official meetings.	2 (2%)	32 (36%)	42 (47%)	14 (16%)
	4. During social events organized in LH program I usually stick to the people I know, rather than joining other groups	3 (3%)	25 (28%)	54 (60%)	8 (9%)
Knowledge management criteria	1. I possess/know where to find additional knowledge I need to complete my work/tasks	7 (8%)	25 (28%)	47 (52%)	11 (12%)
	2. I communicate with people from other projects in order to exchange experience and provide more value to LH program	6 (7%)	22 (24%)	51 (57%)	11 (12%)
	3. Long-term changes of physical location in the office could help gain more knowledge and establish communication with new people	3 (3%)	24 (27%)	55 (61%)	8 (9%)
	4. There is a lack of the common platform for knowledge and information exchange across the whole LH program	1 (1%)	24 (27%)	44 (49%)	21 (23%)
Communication outcome criteria	1. Many meetings I participate in don't provide benefit for my daily work	3 (3%)	43 (48%)	33 (37%)	11 (12%)
	2. Achievement of the project goals contributes to the achievement of my personal goals	4 (4%)	21 (23%)	50 (56%)	15 (17%)
	3. I have a clear understanding of LH program directions,	9 (10%)	48 (53%)	26 (29%)	7 (8%)

	where we are now and where we are going to be in a year				
	4. It would be more practical to have Show and Tell meetings in the form of discussions and team to team communication, rather than just presentations of what each team has done.	3 (3%)	48 (53%)	33 (37%)	6 (7%)
Project characteristics influence on communication criteria	1. I feel proud working in LH program	0 (0%)	16 (18%)	52 (58%)	22 (24%)
	2. I know how LH program contributes to Jeppesen	1 (1%)	9 (10%)	47 (52%)	33 (37%)

5. DISCUSSION

The purpose of our research was to discuss communication in cross-functional software development project teams from managers and employees' perspective based on the six criteria defined from the previous researches review: task orientation, cooperative communication, interpersonal relationships, knowledge management, communication outcome, project characteristics influence on communication. This part of our research paper contains the analysis of the findings from managers' interviews and employees' online survey which are correlated in the discussion part in order to answer the research question: *what are the critical elements of communication in cross-functional software development project teams from managers and employees' perspective?*

It is important to mention that as far as findings from the managers' interviews were used as a base for building the statements for the online survey for employees, we do not use a comparative analysis of findings from managers' interviews and employees' online survey. Therefore, our main focus is on the analysis of the results we got from the online survey which incorporate findings from the managers' interviews.

5.1. Analysis of findings from managers' interviews

Due to the fact that the findings from the managers' interviews are interdependent (eg. knowledge exchange system contributes to the vision the employees have about LH program and helps in understanding the employees role in the project, etc), we combined them into general themes for further discussion where the links between the findings are displayed. These themes are the following:

LH program vision communication is the theme that occurred in the managers' interviews. One of the findings states that the short term vision doesn't allow getting the full picture of the resulted product that teams work on. It is important to note that the vision defines the process of work and all the details that can be taken into account. Long term vision contributes to a better understanding of how the tasks fulfilled at one stage might influence other stages of project work (Ketelhöhn W., Jarillo J.C. and Kubes Z.J., 1991). In this sense long term perspective helps to avoid or reduce possible technical problems. It is worth mentioning that LH program managers are aware of the long term vision representation. All hands and Show and Tell meetings organized in the program aim to represent the complete program vision. Though, as managers mentioned, it still remains a problem despite the fact that structurally information is presented. In this case, we see it relevant to address to the content and strategy of the information representation. One of the managers shared the idea of implementation of team to

team representation and discussion on Show and Tell meetings, when employees could get an opportunity to get to know each team and use this social connection for future cooperation. Another fact that proves short term vision orientation is that project teams represent the current process of work in Show and Tell meetings, which doesn't give others an understanding whether it is the beginning or the end of the project and what would be its final result. Though, as it was mentioned by one of the managers, the need in the full vision is not equally important for all the employees and might depend on the particular work they do. As an example, core development teams can have a good job performance without having the full vision of the final product, but in case when a customer wants to have additional functions, it is important that the product vision brought back to the core development team, so they could develop more customizable product core. In this case awareness to the project needs and reliable information are of a critical importance. It means that the base for communication the program or project vision is in strategically shaped awareness and knowledge about all the links and connections within the program. It demands a well-structured knowledge system and long term proven reliability of the information exchange within the program which can be practically gained by constant practice (Ghobadi Sh., D'Ambre J., 2013).

The role of formal and informal communication has been raised by the interviewees. Managers expressed confidence in the fact that informal communication positively influences problem solving. In order to create positive social atmosphere within the program, there are social events and meetings organized for the employees. Though, as the interviewees mentioned, some of the employees tend to spend time with the colleagues whom they know, avoiding communication with other colleagues whom they have never interacted with. In this case, it is obvious that the management can only create conditions for out of work space communication, but the communication process and its result depends on the sociability of employees and their needs in social support (Lee Chang Boon P., 2004). Another important point, where the contradiction occurred, was the status and place of formal meetings in LH program. All the interviewees mentioned that they have particular meetings structure. Such meetings as All Hands and Show and Tell are regular and for all the employees, as well as Stand up meetings that take place every morning for each team working in the program. Other meetings that occur in the program are need based. Though, as the interviewees mentioned, not all the employees see their relevance and particular role on the meeting. Hence, the result is that official meetings might be taken as a waste of time for some employees. Contradiction occurred in the interviews was between the opinion that official meetings is the way of work and the point that there should be less meetings and more practical work, as far as all the information is available in back log for the teams using scrum. The difference in the managers' opinions can be explained by the fact that they belong to different departments in LH program, core development and customization. Core development department uses scrum method to structure and control team work, and customization relies more on meetings communication. This can be the reason of different perception of the formal meetings' role in LH program. The fact of intensive communication between the teams before the delivery stage can be explained by the common goal and dead line when the final product should be delivered. On this stage collaborative communication is stronger, as the interviewees stated. Though, it was mentioned as well that the employees are aware of the importance of cooperation with each other and try to communicate in advance in order to avoid possible problems. In this case, we can note dependence of collaborative

communication in formal or informal setting on the individual and team awareness. The fact that the employees are more open to discussions in informal setting rather than in formal can be explained by the trust they have to the manager and to each other (Mackenzie M.L., 2010). Another reason may be the structure of the meetings and the creativity of material representation. In this case, variety of the meetings might have a positive influence on the employees' attitude and involvement to the discussions in the frame of official communication.

Knowledge management within LH program was represented in the managers' interviews from several perspectives. One is the general knowledge about the program and its role in the company. As managers noted, the employees are aware of the importance of the LH program for the company, but have the low level of knowledge about why it is important. This we can relate to the LH program vision communication as far as knowledge about the program and its role for the whole company is aimed to be represented on Show and Tell and All Hands meetings. Another perspective of knowledge management system is knowledge about *roles and responsibilities* that employees have. First of all there should be an understanding of own role in the team work, as well as knowledge about other colleagues roles and responsibilities. High level of knowledge and awareness about competences of others make communication and work process smooth and efficient (Ghobadi Sh., D'Ambre J., 2013). According to the work bound communication theory the following elements should be fulfilled for efficient communication process: who works with what and whom, for what reason/purpose, when, in what manner and with which result (Allwood J., 2012). Relating this theory with the concept of knowledge management, we can define that lack of knowledge about responsibilities and competences of others diminish the function of the first elements in the chain (who works with what and whom), though, the reason and the result wanted might be clearly represented. And the manner of work in this case is rather situational, than structured, as far as in order to reach the result one should first get a clear picture about the first elements of the work bound communication chain. Hence, the fact that this knowledge are not clearly represented in LH program, might cause confusion and slow down the process of work.

There were two contradictive points expressed by the interviewees in relation to roles and responsibilities: the problem stated to exist in customization department, but not in core development. We can explain it by different methods of work that the departments operate with. One of the interviewees noted that using scrum method helps in effective tasks sharing and understanding of who is responsible for what in the team. The problem that occurred in this case was the communication between the departments, core development and customization. The knowledge exchange system between the departments is not developed and information exchange is mainly need-based. Managers mentioned that there were experiments with changing the physical location of the employees and placing them to other teams and departments in order to stimulate knowledge exchange. The feedback got from this initiative was positive, though there were no further implementations. In this case a systematic application of initiatives that brought positive results might be one of the strategies to follow in LH program.

Silo mentality of communication in LH program is a general definition that involves social contact, knowledge exchange system, understanding of roles and responsibilities. Silo mentality is defined by Macmillan dictionary as "an attitude within an organization when the different sections or departments do not share information properly with the result that the organization is not efficient". According to our findings, managers are aware of the fact that there is no good

knowledge and information exchange within LH program and communication outcome may be not always relevant to the employees' role. Though, structurally information exchange is well-organized. The company has various meetings for small teams and for all the employees in the program. There is an intranet, where employees can find information about specific things. Though, the lack of knowledge about roles and responsibilities and competences of other colleagues might slow down the process of work when the problem solving involves the employees from different teams and from different departments. One of the silo mental problems is that communication within LH program is mainly need-based, which we do not see as a problem, as it is obvious that when problem occurs employees tend to communicate as they have a common ground such as the problem to be solved. Another aspect of silo mentality is the general attitude, involving social needs and self-development of the employees working in LH program. The attitude is shaped by company's values and the opportunities for self development can be created externally by the company in the form of trainings and courses, as well as internally, when employees set their individual goals in a line with the project goals.

Taking into account the aspects discussed above we can conclude that there is no common platform for knowledge and information exchange within the LH program, therefore communication is silo mental. Despite a good meetings structure social contact between teams and departments is limited by project presentations and cooperation in problem situations. Though, not enough knowledge about roles and responsibilities of others may slow down this process as well. Attention to such internal factors as awareness and motivation stimuli should be paid. We can suppose that if in the situation with a good structure of the meetings there is still silo mentality, there should be changes in the meetings content and strategy implemented. As well as strategic knowledge management system may contribute to communication efficiency and increase innovation capability within the program (López-Nicolás C., Merono-Cerdán A.L., 2011)

5.2. Analysis of findings from employees' online questionnaire

When analyzing the results from the online questionnaire for the employees, we defined general themes that emerged from the questionnaire statements. These themes are discussed below. It is important to mention that when giving percentage of the respondents we represent the numbers in two categories: agree, that involves percentage of those respondents who agreed and strongly agreed with the statements; and disagree, that involves the total percentage of those who disagreed and strongly disagreed with the statement. Operating with only two categories, agree and disagree, we aim to give a general overview to the results we got and to their discussion.

Awareness is the theme confirmed by several statements in the online questionnaire. The majority of the employees (92%) stated that they are aware of the importance and outcome of the tasks that they should complete. As well as the majority of respondents underlined that they have knowledge about the contribution they do to the whole program. In this case awareness is connected with the roles and responsibilities and knowledge about other colleagues' competences, as work in LH program is characterized as a team work, not individual work. In this point contradiction occurred as the majority of the employees (52%) stated that they do not have knowledge about competences of others in the program and not always know who can help them with specific questions. This fact proves silo mentality of communication in LH program (Sharma R.S., Bhattacharya S., 2013) and is confirmed by the employees' agreement with the

statement that not clear enough roles in LH program negatively influence problem solving process (73%). Another contradiction to the fact that employees stated their understanding of their tasks contribution to LH program is that at the same time, the majority of respondents (63%) stated that they don't have a clear understanding of LH program directions, its current state and future perspective. It contradicts to the expressed awareness of an individual contribution to the program as a whole, as it is hard to evaluate one's contribution to the project with unclear vision (Ketelhöhn W., Jarillo J.C., Kubes Z.J., 1991).

Individual responsibility in relation to tasks fulfillment and communication within the program was expressed by the majority of the employees. The majority of the respondents (80%) stated that they feel personal responsibility for success or failure of the project and 91% noted that it is their personal responsibility to communicate with other teams and departments within the program. By this employees demonstrated the high level of awareness about their personal responsibilities in LH program work. The majority of the respondents rejected the fact that they tend to blame other colleagues when the work they did negatively influence their tasks fulfillment (76%). This also confirms the awareness the employees have about their personal roles and responsibilities. Though, absence of knowledge about the roles of other colleagues creates a silo mentality effect (Sharma R.S., Bhattacharya S., 2013). As well as we can't ignore the fact that 24% of the employees confirmed that blaming exist in LH program, which might influence communication between the employees. Hirschhorn explains it by the fact that when feeling anxious employees tend to blame colleagues they should cooperate with to reduce uncertainty state that they have (Hirschhorn L., 1990). Hence, awareness and responsibility for communication in problem situations is the key solution.

Cooperative communication has more of professional than interpersonal characteristics, according to the survey results. The majority of the respondents disagreed with the statement that they tend to collaborate more with colleagues they have a social contact with (70%) which means that at work they rely more on the professional contacts rather than on personal. This fact was confirmed by another statement where the respondents rejected the dependence of their more responsible attitude to the task fulfillment when they know that the colleague they are in a good relationship with will work on this task further (84%). In this case we see it important to mention a high percent of the employees that strongly disagree with this fact (*Table 2, Interpersonal relationships criteria, Statement 2*). This aspect is another confirmation of the dominance of professional cooperative communication over interpersonal cooperative communication. Though, Hargie mentions the fact that interpersonal communication influences professional communication, and moreover is a part of professional communication at work place. By that the author means that all verbal and non-verbal communicative acts, persuasive tactics, etc. are involved into interpersonal communication which is used in every day work (Hargie O., 2011). In this case we should mention that the statements in employees' questionnaire reflecting on social contact influence on the attitude to tasks fulfillment might cover only one side of communication in LH program. In order to display the role of interpersonal communication in professional setting we suggest formulating statements reflecting on the techniques or methods that employees use in communication with their colleagues at work (eg. persuasive communication).

Informal vs. formal communication occurred as a contradictive factor to the previous aspect discussed. Despite the fact that the nature of cooperative communication is proven to be rather

professional than interpersonal, the majority of the respondents stated that they get more information from informal communication rather than formal (63%). This fact gives more importance to the interpersonal communication between the employees where the information exchange takes place. Though, it is important to take into account the definition of informal communication, as far as informal communication doesn't mean that it can't be professional at the same time as formal structure can be integrated with informal networks (Rank O.N., 2008). In the frame of our research we didn't represent the definition of informal and formal communication to the employees when launching the online survey. Hence, we can assume that formal communication is associated more with official meetings and informal with communication beside the meetings. And in both cases communication can remain professional.

Status of the meetings is another important theme that emerged from the results of the online survey. In this case nearly equal division in responses took place. 51% of respondents confirmed that the meetings in LH program benefit to their daily work, though 49% stated that the meetings are not beneficial for their work tasks. In this case, the fact that 63% of the employees agreed that more valuable information they get from informal communication rather than from meetings, confirms the need for the better management and definition of purpose and outcome of each meeting, in order to bring an understanding of how the information the employees get on the meetings is relevant to their role and tasks to fulfill. Another interesting point related to the organization of Show and Tell meetings was that quite high percent of employees (44%) agreed that it would be more practical to have such meetings in the form of discussion and team to team communication, rather than just presentation of what each team has recently done. Though, another 56% disagreed with this statement. In this case we see it relevant to implement different forms of Show and Tell meetings organization as it might be helpful in defining effective strategies depending on the stage of the project work (Jack H., 2013).

Knowledge management in LH program can be characterized by the lack of common platform for knowledge and information exchange which was confirmed by 72% of the employees. Moreover, 69% of the respondents stated that they communicate with colleagues from other projects in order to exchange experiences and provide more value to LH program. This fact is related to the individual responsibility and awareness about individual and team performance dependence on the level of information and knowledge one has. The lack of knowledge platform proves silo mentality of communication within the program and demands structural changes that can improve knowledge exchange between individuals and teams (Sharma R.S., Bhattacharya S., 2013). One of the solutions represented is a long term changes of physical location in the office that could help to gain more knowledge and establish communication with other colleagues. 70% of the respondents supported this statement which means that they see it as a practical solution of the silo mental communication in LH program.

Motivation stimuli is the theme we defined based on the internal and external motivation factors displayed in the online survey. Though, motivation as a factor was not represented in the survey statements, we see it in relevance with the employees' personal goals that are reflected in the online survey statements. Hence, 73% of the respondents agreed that achievement of the project goals contributes to the achievement of their personal goals. We see two main reasons for this: one is in a good management when the employees are assigned to the tasks they would like to do or they have high motivation for; and another is in the individual awareness and goals, when even if being assigned to the task the employee wouldn't deal with according to personal

preferences, the employee still sees it as a challenge or finds in it positive aspects that will help him/her to develop professional and personal competences. Another interesting point was that 82% of the respondents stated that they are proud to work in LH program and 89% noted that they know how it contributes to the whole company. The fact that LH program is characterized as a new platform in Jeppesen obviously has a positive influence on the employees' attitude to work and motivation. Though, the contradiction between not clear LH program vision and at the same time good knowledge of LH program contribution to Jeppesen confirmed by the majority of the respondents, questions the nature of motivation it gives to the employees. According to Moynihan and Pandey the concept of motivation involves internal factors that impel understanding and action, and external factors that fulfill the role of an inducement to it (Moynihan D.P., Pandey S.K., 2007). In this case, we presume that motivation is mainly built on the vision represented to employees, where the main idea is to communicate that the program is important for the company and has a status of a new platform operating with new technologies. Though, the details of the program contribution to Jeppesen and its future perspectives are not represented which leaves a good structural representation without the content.

To summarize the main discussion points from the employees' questionnaire analysis, we can state that the main problem is silo mental communication that when having a good structure, the program doesn't have related content. In LH program case study silo mentality is connected with the knowledge management and mainly related to the fact that the majority of employees don't have enough knowledge about the program and competences of colleagues working in LH program. Lots of contradictions emerged in the employees answers confirm the absence of a common vision and understanding of LH program state and contribution to the whole company. Though, the awareness about individual responsibilities and individual tasks fulfillment in the team work was proven to be on a relatively high level. Therefore, we see it important for the management to work with the strong sides of the program and to fill in a good program structure with various contents.

5.3. Critical elements of communication in LH program

As we mentioned in the method part of our study, we do not aim to compare the results got from managers' interviews and employees' online survey, as far as we used the findings from managers' interviews in order to formulate the statements for the online survey for the employees. Moreover, one of the main points of our research was to reflect on the employees' perspective of communication in cross-functional software development teams, due to the fact that it hasn't been done in the previous researches on this topic. Though, we see it important to relate the findings from the managers' interviews and the employees' online survey discussed above in order to define and give a better understanding of the critical elements of communication in LH program. Therefore, after integrating the findings from managers' interviews and employees' online survey we defined the following communication elements that are critical in LH program communication:

(1) Individual awareness and responsibility for communication is generally high. Awareness and understanding of the tasks and responsibilities was brought up in managers' interviews and the results from the employees' questionnaire confirmed that the employees are aware of the tasks they are assigned to complete. Moreover, the majority stated that they take a personal

responsibility for communication with their colleagues working in LH program. Individual awareness is a positive aspect revealed in LH program. Though, for effective and efficient communication there should be a combination of individual awareness with knowledge and consequent actions. Having individual awareness one should also have a complete understanding of own role in the team work and in the project which can be facilitated and supported by the program management. In this case we can talk about the LH program vision that occurred to be rather short-term, which might also influence the work process even when the awareness is on a high level. Hence, individual awareness and responsibility for communication we see critical in LH program teams' communication.

(2) The level of knowledge about the LH program and competences of other colleagues is generally low. The results got from the online survey for the employees confirmed managers' opinion that there is no common platform for knowledge sharing and information exchange. Despite the fact that the majority of the employees confirmed their awareness about their work and its contribution to the program, the level of knowledge overall the program was stated to be low. Though, discussing about the LH program short and long term vision, managers shared that there are attempts to communicate the full program picture in Show and Tell meetings, but obviously other communication strategies are needed in order to develop the knowledge and understanding of the LH program and its future perspective. Not having enough knowledge about the responsibilities and competences of other colleagues working in the program, prevents from efficient problem solving, as the employees displayed that they have difficulties in defining whom they can turn to with specific questions. In this sense knowledge related not only to work tasks, but to competent communication is of a critical importance as it can slow down or activate the work process.

(3) The attitude to official meetings in LH program is contradictive. Contradictive attitude to the meetings' status occurred in managers' interviews and in the results of the online survey for the employees. Managers represented two opinions about the meetings in LH program: meetings as the way of work and meetings as not necessary so often when scrum is successfully used. In this case our conclusion was that different departments in LH program use different methods of work. When scrum is applicable in core development department, it is not used in customization. Knowledge and best practices exchange we see as an option to organize a more effective and consequent work in both departments. As the result from the employees reflection on the statement about how beneficial are meetings for their daily work, we got nearly equal division of those who doesn't see meetings beneficial and those who see them helpful in daily work. Therefore, we see it important to point out official meetings' status as one of the critical elements of communication in LH program as far as it may drastically influence the employees' performance.

(4) Motivation is based on status rather than on content of activity. Motivation as a work component was not directly raised up in managers' interviews, but appeared in the context when we discussed relevance of project and individual goals and the influence of LH program status on communication. From the results of the employees' survey it became clear that though the respondents don't have a clear vision of LH program and its future directions, the majority is still proud to work there. According to the managers' opinion the reason for it is the status of LH program as a new platform and a new initiative in Jeppesen that involves high technologies. We see the contradiction between being proud to work in the program, but not having its vision and

not knowing the program future perspectives, as a cover motivation without content. Of course, individual motivation should be taken into account, as every employee can internally drive it. Though, based on the results we got from our research, we can conclude that in order to provide external motivation for the employees, there should be more content behind the vision of LH program, not only the status of its importance should be communicated, but the details and examples of why it is important.

It is worth to mention the fact that the influence of interpersonal relationships on the work flow, mentioned by managers, was not confirmed by employees' answers in online survey. Based on the statements evaluation, the majority of employees rely more on professional contact with their colleagues. Hence, we could consider this contradiction as one of the critical elements in LH program. Though, we don't point it out as a critical element of communication, due to the fact that there were no contradictions in employees reflection on statements related to social contacts influence on communication at work, and comparative analysis of managers' and employees' answers was not the aim of this study. Though, we find the fact, that the majority of employees declined the role of social contact on their work process and communication, surprising and interesting for further study, as far as interpersonal relationships is a part of every work place and can influence group dynamic and communication (Mark L., Knapp and John A. Daly, 2002).

5.4. Theoretical and practical implications

In our research we discussed communication in cross-functional software development project teams from managers and employees' perspective based on the following six criteria: task orientation, cooperative communication, interpersonal relationships, knowledge management, communication outcome and project characteristics influence on communication. In the result of our research four critical elements of communication in LH program emerged. After incorporating them into the Model 1 we got the following representation of the model of cross-functional software development project teams' communication:
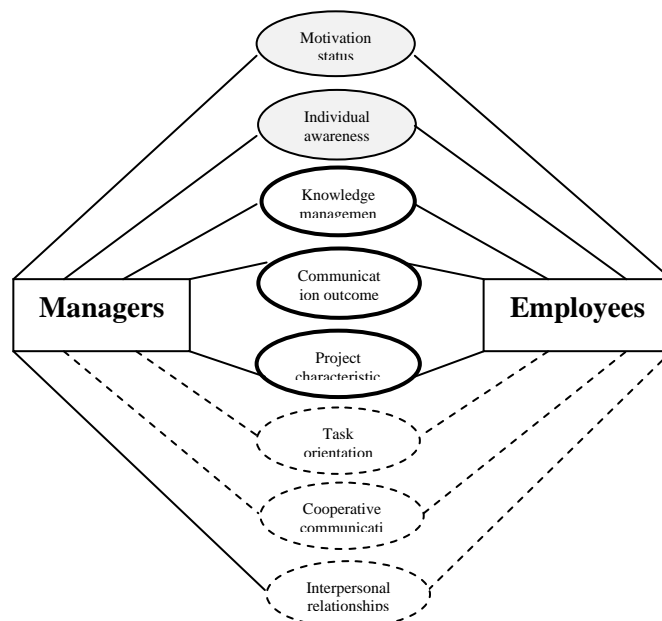
Model 2. *Representation of a cross-functional software development teams' communication criteria from managers' and employees perspective defined in our research.*

Referring to the theoretical background of our research we can define that the importance of such criteria as knowledge management, communication outcome and project characteristics influence on communication was confirmed by our case study. It is worth to mention that project characteristics criteria was one of the findings emerged in Ghobadi and D'Ambre study (Ghobadi Sh., D'Ambre J., 2013) which the authors claimed to be influential, though admitted that it hasn't been covered by their study. By involving this aspect into our research we confirmed that project characteristics influence is one of the criteria defining communication in cross-functional project teams. Such criteria as task orientation, cooperative communication and interpersonal relationships didn't prove to have a major influence in LH program, though we would not suggest eliminating these criteria in further researches in this area. The fact that we used a case study approach in our research explains the particularity of the findings that are hard to generalize for all cross-functional software development project teams.

Knowledge management criteria is one of the critical criteria and involves information exchange and knowledge about LH program, its vision and competences of others working in the program. Communication outcome includes such critical element as communication of the meetings' purpose and status in relevance to the employees' roles. These aspects studied by Ghobadi and D'Ambre in their work "Modeling high-quality knowledge sharing in cross-functional software development teams" (2013) were confirmed by our case study which gives a possibility to apply them in relation to cross-functional software development teams in general.

Motivation status and individual awareness and responsibility for communication are criteria that emerged in the result of our study and that define the theoretical contribution of our research into the cross-functional software development teams' communication topic. Though, motivation status is closely related to the project characteristics' influence on communication, we considered it critical as the status of motivation in LH program proved not to have related content (eg. being proud to work in LH program, the majority of employees don't have enough knowledge about the program, it's vision and reasons why it is important). Individual awareness and responsibility for communication we defined as important criteria to work with, as we consider it to be a good base for communication improvements in LH program.

In the meaning of practical implication, our research directs managers and employees, first of all to understand which communication aspects in cross-functional setting are critical for the work process and its final result. When having a better understanding employees can pay more attention to the certain communication aspects, especially due to the fact that their individual awareness is on generally high level. By reflecting on the employees' perspective we gave a broader picture of communication in LH program. It is important to note that the power to make structural changes belongs to the managers. In this case, managers can use our research to define the directions for further work with communication within the program, concentrating on the critical elements we defined in the result of our study. The further work with communication in LH program can involve the following aspects:

- Communication of a long-term vision of LH program and explanation why exactly the program is important for the company and what role every individual plays in it. We see it in connection with motivation stimuli and suppose that clear long term vision and understanding of "why" factor in LH program in relation to the project importance,

meetings, tasks, etc may positively influence motivation of people working in the program;

- Exchange of best practices between core development and customization departments (eg. using scrum as a method of work core development department eliminates the problem of roles and responsibilities. Scrum is not implemented in customization department);

- Different forms of meetings should be used (eg. Show and Tell meetings can be organized not only in the form of presentations where each team represents their work, but in the form of team to team representation. In this case teams get to know each other and get information about each other competences which might be helpful for future cooperation and knowledge exchange). Different forms of meetings organization have a psychological effect as well, when the variety of meetings can positively influence attitude to them (Jack H., 2013);

- Regular change of physical location of employees working in different teams and different departments within the program (this practice was admitted to be effective by the majority of the employees, though it was just one time experiment with no further actions. We suggest applying this practice on the regular basis with voluntary involvement of employees.);

- Regular small online surveys related to certain aspects of LH program work. It will help to take into account employees needs and put them in one direction with the meetings and other activities organized in LH program. It is important to give a brief feedback after such surveys in order to make the results and actions in reply to these results visible. We consider it helpful for the LH knowledge platform development.

5.5. Limitations

Our study represents analysis of communication in cross-functional software development project teams and reflects on the perspective not only managers, as it was done in previous researches, but also employees working in one program. Though, there are some limitations that we would like to point out. Due to the fact that the topic of communication in cross-functional software development project teams is quite new in the research area, there is not enough literature to study on this topic. Therefore our research is limited by few research works done in this area before. But, while being a limitation, at the same time this fact underlines the novelty and relevance of our research and its contribution.

Another limitation we see in the number of respondents. There were three managers interviewed, though there are eleven of them working in LH program. Hence, there might be different opinions occurred in case if we took more interviews. Though, due to the fact that our main purpose in interviewing managers was gaining the material to formulate statements for the online questionnaire, we don't consider it being critical for the data we got. But we are aware of the fact that only three interviews might allow us to reflect on a limited number of aspects, which can be covered by further studies in this area. From the total amount of employees, we got only 66% who took part in the online survey. The reason for it might be a comparatively

short time when online questionnaire was available. Though, due to the time limitation for our research we could have the questionnaire open for the period of only one week, which probably should be extended in further similar studies.

When formulating statements for the online questionnaire for the employees, it would be more valuable for the analysis to have several statements in each theme reflecting on the same meaning, but formulated in different way. In this case it could give us a chance to enrich the discussion of critical elements of communication. Though, we can say that our online survey contains such statements, but not in strategically built formulations. Hence, we see it relevant to use different formulations of one meaning in case when hypothesis is to be tested. As far as in our research we didn't have any hypothesis to test, we consider the data we got from the online survey to be efficient for the analysis and conclusions done.

In the meaning of scientific contribution, our research is limited by the fact that it is a case study in one company that gives quite a subjective picture, though is makes it more valuable for the company. Probably, if involving employees and managers from different companies working in cross-functional setting, we would manage to represent a more objective picture. It is worth to mention that from the planning stage of our research we were aware of the importance to keep it as objective as possible.

Speaking about cross-functional project teams as a term, we haven't specifically used it in our discussion due to the fact that it didn't appear among our findings as a separate element. Though, we don't consider it to be a strict limitation, due to the fact that cross-functionality is the reality of the project teams' work which is a default characteristic of LH program.

And finally, our research is limited by excluding cultural component that might influence certain aspects of communication in international company. The scope of our research covered a general perspective of managers' and employees on communication in LH program. And due to this fact together with the time limitation for the research, we didn't involve culture into our study.

6. CONCLUSIONS

6.1. Concluding points and summary of contributions

In our study we explored communication in cross-functional software development project teams from managers and employees' perspective using a case study approach. By implementing our research we covered one of the gaps defined in previous researches on the topic of cross-functional software development teams' work – employees' perspective on communication, as the prior studies are based only on managers' perspective.

In order to define critical elements of communication we interviewed managers working in cross-functional software development program, and based on the findings got from the interviews we formulated the online questionnaire for the employees working in the same program. While planning interviews and questionnaire we stayed at the company office and had a chance to integrate with people working there. We consider this opportunity to be helpful for our knowledge in relation to cross-functional software development teams. It is important to

note that being in a company while writing a master thesis there, may influence objectivity of the research process and the results. We were aware of this fact and our main purpose in integration was expanding the understanding of cross-functional team work and getting knowledge about specific methods and lexicon that software development teams use. It helped us particularly in the interview process where we spent a quality time discussing important points instead of asking managers to clarify basic terminology.

We constructed our research circle basing it on the existed theories and incorporating their components into a model on which we reflected after the research analysis (*Model 1. Theoretical representation of a cross-functional software development teams' communication criteria from managers' and employees perspective*). In the result we modified this model by confirming importance of some particular criteria and defining other criteria that emerged in the result of our research (*Model 2. Representation of a cross-functional software development teams' communication criteria from managers' and employees perspective defined in our research*). In this we see a theoretical contribution of our study.

After implementation and analysis of our research based on six criteria of cross-functional software development teams' communication (task orientation; cooperative communication; interpersonal relationships; knowledge management; communication outcome and project characteristics influence on communication within the LH program) we defined critical elements of communication in LH program. These elements are:

(1) Individual awareness and responsibility for communication is generally high;

(2) The level of knowledge about the LH program and competences of other colleagues is generally low;

(3) The attitude to official meetings in LH program is contradictive;

(4) Motivation is based on status rather than content of activity.

Hence, the answer to the research question stated in the introduction part of this paper was given. In relation to the results we got when implementing our study, the directions for future research are given in the section below.

6.2. Suggestions for future research

Taking into account the fact that the base for our research was the managers' interviews that we used to formulate the statements for the online questionnaire for the employees, for further research we can suggest to use a comparative analysis that will help reflect on the same aspects of communication by managers and employees independently. In our case, data got from managers' interviews was rather used as a part of online survey for employees, but not as an independent data to be used for comparison with the data got from the employees' online survey.

In order to give more clear conclusions related to certain communication aspects we suggest stating several hypotheses and using quantitative research method in order to test their significance. We see it important to study communication separately in different program departments. Our research showed that there are different methods of work used in different departments which influence communication and social needs of the employees. Therefore,

comparative study of communication in program departments could give a clearer picture of their needs in the meaning of communication and knowledge exchange within the program.

As well, we suggest studying communication aspects related to attitudes and perception in the frame of personality and culture, which may increase awareness among managers and employees about different cultures and develop integrative communication strategies at work place.

In order to provide more objective conclusions applicable for a wider specter of companies working in cross-functional setting, we see it relevant to implement similar study, involving employees and managers working in different software development companies.

ACKNOLEDGEMENTS

REFERENCES

Allen E., Seaman Ch. (2007). "Likert Scales and Data Analyses". Quality Progress, 64-65

Allwood J. (2012). Lecture "Work bound communication". Communication among professionals course. Gothenburg University

Clark K.B., Wheelwright S.C. (1992). Organizing and leading 'heavyweight' development teams. California Management Review 34 (3), 9–28

Deutsch M. (1949). A theory of cooperation and competition. Human Relations 2 (2), 129–152

Fall M. (april 2012). Pre-study "Communication problems analysis and suggestions for future actions", Jeppesen, Gothenburg

Ghobadi Sh., D'Ambre J. (2012). "Cooperative relationships in cross-functional software development teams: How to model and measure?" The journal of systems and software 85

Ghobadi Sh., D'Ambre J. (2013). "Modeling high-quality knowledge sharing in cross-functional software development teams". Journal of information processing and management 49, 138-157

Gillham B. (2005). Case Study Research Methods (Real World Research): 6. Paston PrePress Ltd, 1-9

Gorden R. (1992). Basic Inteviewing Skills. Itasca, IL: F. E. Peacock

Hargie O. (2011). Skilled interpersonal communication. Research, theory and practice. 5th edition

Hennink M., Hutter I. and Bailey A. (2011). Qualitative research methods, SAGE publications

Hirschhorn L. (1990). The workplace within: Psychodynamics of organizational life

Jack H. (2013). Communication, meetings and presentations. Chapter 8. Engineering, design, planning and management, 283–321

Johnson, D.W., Johnson, R.T. (2006). New developments in social interdependence theory. Genetic, Social, and General Psychology Monographs 131 (4), 285–358

Ketelhöhn W., Jarillo J.C., Kubes Z.J. (1991). Turnaround management is not Rambo management. European Management Journal 9 (2), 117-120.

Lee Chang Boon P. (2004). Social support and leaving intention among computer professionals. Information and Management 41, 323–334

Linberg K.R. (1999). Software developer perceptions about software project failure: a case study. Journal of Systems and Software 49 (2–3), 177–192

Loebecke, C., Van Fenema, P. C. and Powell, P. (1999). Coopetition and knowledge transfer. The Database for Advances in Information Systems, 30 (2), 14–25

López-Nicolás C., Merono-Cerdán A.L. (2011). Strategic knowledge management, innovation and performance. International Journal of Information Management 31, 502–509

Luo, X., Slotegraaf, R.J. and Pan, X. (2006). Cross-functional coopetition: the simultaneous role of cooperation and competition within firms. Journal of Marketing 70 (1), 67–80

Mackenzie M.L. (2010). Manager communication and workplace trust: Understanding manager and employee perceptions in the e-world. International Journal of Information Management 30 (6), 529-541

Macmillan dictionary http://www.macmillandictionary.com/

Mark L., Knapp, John A. Daly (2002). Handbook of interpersonal communication. Sage Publications Inc.

Miles M.B. and Huberman A.M. (1994). Qualitative Data Analysis: An Expanded Sourcebook, 2nd edition. SAGE publications

Moynihan D.P., Pandey S.K. (2007). Finding workable levers over work motivation: Comparing job satisfaction, job involvement, and organizational commitment. Administration & Society, 39

Pee L.G., Kankanhalli A. and Kim H.W. (2010). Knowledge sharing in information systems development: a social interdependence perspective. Journal of the Association for Information Systems 11 (10), 550–575

Rank O.N. (2008). Formal structures and informal networks: Structural analysis in organizations. Scandinavian Journal of Management 24, 145-161

Sharma R.S., Bhattacharya S. (2013). Knowledge dilemmas within organizations: Resolutions from game theory. Knowledge-Based Systems 45, 100-113.

Song X.M., Montoya-Weiss M.M. and Schmidt J.B. (1997). Antecedents and consequences of cross-functional cooperation: a comparison of R&D, manufacturing, and marketing perspectives. Journal of Product Innovation Management 14 (1), 35–47.

Witt L.A., Hilton T.F. and Hochwarter W.A. (2001). Addressing politics in matrix teams. Group & Organization Management 26 (2), 230–247

INTERVIEW GUIDE

(for managers' interview in LH program)

(1) Task orientation

1. How do you make sure that employees under your management do the things they are supposed to do? (Do you think employees have a clear understanding of what they should do? why do you think so?)

2. Do you discuss with employees how their work contributes to the whole project? (in which way you do this? Do they understand the importance of each task they are being assigned?)

3. How do you reflect on each employee's role in success or failure of the project?

4. What factors influence employees' tasks completion in the project?

(2) Cooperative communication

1. How can you describe communication within the project? (Which channels of communication are used, ect.)

2. What indicators of cooperation at work can you mention?

3. How often do you get questions from employees (questions related to their understanding of tasks or requests for additional explanation asked not only on the meetings, but in everyday work situations)

4. What communication problems exist in the LH program (what do you think is the reason for these problems?)

(3) Interpersonal relationships

1. In your opinion how valuable to the success of the LH program are the interpersonal relationships (on social level) between the employees within the program?

2. How tight do you think the connection is between the employees (do they socialize at work and out of the work environment?)

3. What is done in LH program in order to strengthen interpersonal communication between the employees?

4. How open are employees to discuss with managers technical and personal problems that they have at work?

(4) Knowledge management

1. How do you see the quality of the information exchange within the LH program?

2. Can you remember any idea that an employee recently expressed in formal or informal setting? (What happened with this idea afterwards? How often it happens that employees shares their ideas related to improvement, creative ways, etc.?)

3. What are done to expand employees' knowledge about the LH program, projects and the company as a whole?

4. Please, give an example of internal and external communication in LH program when it is helpful for information and knowledge exchange?

(5) Communication outcome

1. How do you communicate the purpose and conclude the result on each meeting with employees?

2. What is your opinion about the general feeling that employees have in the end of the meeting, do they understand the relevance of the meeting agenda to the position they have within the program?

3. Do you think the achievement of the program goals contributes to the achievement of employees' personal goals? What indicates this?

4. How does communication between the employees influence problem solving? (It helps to solve problems, it raises confusion, etc)

(6) Project characteristics influence on communication within the LH program

What LH program characteristics influence communication within the program? (Mention positive and negative influences)

ONLINE QUESTIONNAIRE FOR EMPLOYEES

Online questionnaire created according to Likert scale method and is used in order to find out critical elements of communication in the LH project from the employee's perspective. The statements for the questionnaire were formulated based on the finding from the managers' interviews. The statements are grouped based on the criteria of communication in cross-functional software development project teams that we got from the theoretical review.

(1) Task orientation

1. I am aware of the importance and outcome of the task which I'm assigned to complete

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

2. My manager/scrum master does a good job in protecting me from tasks overload

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

3. I am informed and aware of how my work tasks contribute to the whole LH program

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

4. I feel personal responsibility for success or failure of the project

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

(2) Cooperative communication

1. I am aware of the competences of other people in the program. I know exactly who can help me with specific questions.

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

2. It is my responsibility to communicate with other parts of the program in order to deliver best quality product to the client.

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

3. I tend to blame others when the work they did prevents me from fulfilling my work without problems

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

4. Not having clearly defined roles in LH program has negative impact on effective problem solving

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

(3) Interpersonal relationships

1. I tend to collaborate more with colleagues whom I have social connection outside the work environment with

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

2. When I deliver my part of work to the colleagues whom I personally know, I spend more time to verify the quality of my work

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

3. I receive more information related to the program and tasks during informal communication with colleagues rather than during official meetings

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

4. During social events organized in LH program I usually stick to the people I know, rather than joining other groups

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

(4) Knowledge management

1. I possess/know where to find additional knowledge I need to complete my work/tasks

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

2. I communicate with people from other projects in order to exchange experience and provide more value to LH program

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

3. Long-term changes of physical location in the office could help gain more knowledge and establish communication with new people

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

4. There is a lack of the common platform for knowledge and information exchange across the whole LH program

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

(5) Communication outcome

1. Many meetings I participate in don't provide benefit for my daily work

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

2. Achievement of the project goals contributes to the achievement of my personal goals

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

3. I have a clear understanding of LH program directions, where we are now and where we are going to be in a year

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

4. It would be more practical to have Show and Tell meetings in the form of discussions and team to team communication, rather than just presentations of what each team has done

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

(6) Project characteristics influence on communication

1. I feel proud working in LH program

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

2. I know how LH program contributes to Jeppesen

(1) strongly disagree   (2) disagree   (3) agree   (4) strongly agree

TRANSCRIPTION OF MANAGERS' INTERVIEWS

Interview 1

I = interviewer

R= response of the interviewee

Themes of the interview:

(1) Task orientation

(2) Cooperative communication

(3) Interpersonal relationships

(4) Knowledge management

(5) Communication outcome

(6) Project characteristics' influence on communication

Participants of the interview	Transcription
I	Could you please introduce yourself?
R	Ok. My name is (…). I'm 41 years old and I am a program manager here in Jeppesen responsible for Lufthansa Program which involves 150 people working with core development and customization
I	What work experience do you have in general and in particular in Lufthansa Program?
R	I held various positions during last 17-18 years. I started as a technical writer; I worked with the process development in the.... business and also as a group manager in Malmo. [pause] After that I worked in Volvo for 7 years as a business management consultant working with business management and business improvement in product development connected both with processes and people, and change management. And I have been here for one and a half year.
I	In Jeppesen you started from manager position?
R	yes, exactly!
I	How long have you been working in Lufthansa program?

R	For one and a half a year
I	Have you got involved into Lufthansa Program right when it started?
R	No, not exactly. It started 2008-2009 already and I started here in 2012. So it has been working for a couple of years before I got in.
I	Ok, thanks. I would like to talk about communication in LH program between employees and managers and employees. As a manager in Lufthansa program when communicating with the enployees how do you make sure that they understand and do things that they are supposed to do?
R	I try to make sure that they understand what I mean by asking some feedback questions and doing follow-ups. But most of people here are quite good in knowing their tasks and doing things and they also have their mind-set on how to do, so usually it is enough just to explain that this is a problem that we have and we have to solve it, and they have their own way of solving it. Each of them is a part of a solution.
I	How do you reflect on the contribution that each employee's work does to the whole program?
R	[pause] you mean how I communicate with them about it?
I	Yes, I mean communication
R	Yes, I try to communicate it, but maybe not open enough. There is a problem that some people don't see their particular role in the program and don't have a clear program vision. I can be sometimes tough for people dealing with development to see the whole picture. They just look into their tasks and work with what they usually do without seeing the full picture.
I	How do you try to represent the full picture to the employees if there is such a problem?
R	We try to communicate it in our All Hands meetings and Show and Tell meetings where we gather all the people. We also work on it in our communication plan and discuss it with other project managers on weekly meetings. So, we try to communicate by means of hierarchical structure that we have in the program. So I communicate it to the project managers who work with me and they communicate it to the employees further on.
I	What factors in your opinion do influence the employees' tasks completion in LH program?
R	One factor is technical problems that might occur before the product delivery, when they check something and it doesn't work and blocks the system. It can be also other priorities from group managers, from plan managers that are not in line with our program, so it can cause a conflict. It can be also a conflict within the program when the same person can be assigned to two different tasks at the same time by two different persons, so it makes it hard to prioritize sometimes.
I	What do you do when such situations happen?
R	We discuss the problem and see what we can do in the situation and find a good way of managing, but sometimes it's not enough just to discuss it, but you should practically see whether the conflict was solved.
I	Ok. How can you describe then communication in LH program in general?
R	We try to communicate as much as possible, but I think we make it a little bit too complicated, as

	we don't try to make it simple enough. Especially when we communicate things that are too hard to understand for a person that just comes in. Lufthansa program is a complex project and has complex communication, though we try to simplify the messages.
I	What communication channels do you use in LH program?
R	We use our intranet, confluence and we use our Stand up meetings, All hands meetings, Show and tell meetings, we use general project meetings. So we try to communicate a lot, but still we miss a lot also.
I	What indicators of cooperation in LH program could you mention?
R	One indicator is a delivery stage, when we get closer to delivering the final product, then I can see how employees communicate and try to reach each other to get the information. So our deliveries are indicators of how people work in order to get something done. We don't measure communication in this case, maybe we should, but we don't. Another situation is when you see that lots of emails with questions are coming and we have to do something to stimulate better cooperation.
I	How often do you get questions from the employees, maybe questions related to their understanding or request for additional information?
R	It happens couple of times a week
I	Are those questions related to technical things or maybe personal problems at work?
R	It is mostly personal and organizational things I should say
I	What other communication problems do exist in LH program in your opinion and what are their reasons?
R	yes, we probably don't have one understanding of what each person is responsible for, sometimes it depends on the way each of us does things, sometimes it depends on the level of knowledge we have. For example new contractors coming to the Program don't know how it works; they don't have enough contexts to understand what we discuss. We also use too much of complicated wordings maybe instead of trying to find easier words.
I	How valuable are interpersonal relationships in LH program for its success?
R	I think it's quite important. On the scale from 1 to 10 I would define its importance as 7. So it's of course important that we have a good communication between the people here.
I	Then how would you define the present state of interpersonal communication importance in LH program now?
R	I would say 4, as somewhere it works well, but somewhere it doesn't work at all.
I	How tight do you think is the connection between the employees? How they build their relationships at work and out of working environment?
R	A lot of them socialize, not all, but a lot socialize not only at work but outside of the office.
I	How does it influence the work they do in LH program in your opinion?

R	I think it's good and beneficial for their cooperative work in such cases.
I	How open are employees to discuss with managers technical and personal problems at work?
R	I think they are much better in discussing technical problems with their managers. If to take into account organizational problems and problem of roles and responsibilities, there are usually just a few people asking such questions. But I think it would be good if they could openly discuss such things as well.
I	What is done in LH program in order to strengthen interpersonal communication and relationships between the employees and between the employees and managers?
R	We try to empower people by communicating that they are free to come and discuss whatever they like, the same encouragement we try to give to all the managers. We also have some sort of gatherings like afterworks and other things outside the office where we can meet and socialize. And we also try to be a little bit provocative in discussions in order to get different opinions.
I	How often employees express their opinion and ideas knowing that you are open for this?
R	Not so often, I don't think so, just sometimes. Some people do it as they feel comfortable in their role, and those not so confident don't express exactly what they feel
I	What do you do in order to make people in LH program feel comfortable with expressing their opinions?
R	I discuss such issues with the managers and with line managers, so they can make it clear with the employees the responsibilities, roles and opportunity to openly express their opinions. I personally don't talk to many employees as there are so many people; I use the line managers in order to keep communication flow.
I	How do you see the quality of information exchange in LH program?
R	It is not in a good state. We came back to the problem of understanding, as for example they see a new presentation and there are several slides they might not understand new information that they see. And I can understand that as it's hard to look at new information all the time and it's not so easy to understand everything. So I think we are missing a little bit with having too much information in slides
	How do you get feedback about the understanding that employees have?
	It is more or less just a presentation, and then we ask in the end if they have any questions, but usually they don't have any. Nobody will stand up and say "I don't understand that"
	Why do you think it happens so?
	I haven't seen anyone doing this, and I haven't done it myself. I think in some cases it is influence by the human factor, and people just prefer to come back to the work they usually do.
I	How do you think it might influence the whole program work? Can it be crucial if employees don't understand and don't ask questions?
R	Sometimes it can, but they all know that it is possible to get the information later, in the confluence or through communication with each other. I can't say we are bad in this; rather we can improve a

	lot.
I	Coming back to the ideas expression, could you give an example when the idea expressed by employee was taken further?
R	There are lots of ideas from employees, sometimes these ideas are forgotten after a while, or we have them in our list and try to generate them into our work, though it is not obvious for the employees then. But we can't drive each idea making an action plan as it brings an overload of information. Usually these ideas influence the way I plan my future work.
I	What are done in LH program to expand employees' knowledge about the program and its role in Jeppesen?
R	We try to bring it up on the meetings that I mentioned before. It gives people a chance to understand what we are doing. We also have a room where we all can post graphics with the information, so everyone can see the process and the results. As well we have product trainings that are also helpful. But I have to say that it's still quite a long learning curve in LH program and each new employees should get through the learning process before actually start working. Sometimes it takes half a year. Though this curve could be shorten if we improve communication within the program.
I	What in your opinion can help to a better information exchange, what kind of actions can be implemented?
R	To move people around and to place them into different formations is an effective thing. We have social activities as LH fika every second week when all people gather for a cup of coffee and socialize. As well we have integrated project plan between different subprojects in LH program so they work together to reach the result.
I	How do you communicate the result and the purpose of work/meeting for the employees?
R	We don't do it so often. In most cases we just jump in to the subject. Maybe in this case we should be more clear, as Americans are when they say in the beginning that this is what we should try to do and this is the result. Maybe we could improve the culture of meetings in this case.
I	How employees perceive the relevance of the meetings with the agenda and their role on the meeting?
R	Sometimes people don't see reasons to be on the meeting, it doesn't happen so often. At the same time we should understand that meetings are our way of working, without them we can't do efficient job and get the information necessary. We can't do much being on our own, we have to meet and discuss things together
I	What is the employees' attitude to outcome of the meetings?
R	They often might think that the meeting was not necessary for them, so that they spent their time instead of working, though others see meetings as the place where they actually work while discussion relevant issues. Of course if an employee is needed only for 5 minutes during the meeting, we give a freedom to bring a lap top and do some own work at the same time.
I	Do you think the achievements of the program goals contribute to the achievements of personal goals of employees?
R	I think yes, as it's a big program involving many different people. We had for example a Cultural value assessment survey where employees reflected on personal factors. We try to be alined with

	other areas and make employees feel comfortable combining personal and working life and keeping it in balance.
I	If to talk about problem solving at work place, what influence communication between the employees has on this?
R	It gives a lot if they communicate. Though sometimes we have to make sure that people communicate to each other in order to solve the problem. We have a good opportunity to solve problem when people talk to each other. And we miss lots of opportunities when they don't communicate.
I	How the characteristics of LH program influence communication within the program?
R	Status and size of the program are two characteristics. Another thing is that we are cross-functional program working with integrated core, customization departments, and portfolio. In this sense the program is unique. As well we have eyes on LH program from Denver that controls the situation we have. This communication is positive I think and stimulates cooperation within the program. LH program is more stable now and has a status of a new platform.
I	Thank you for the interview
R	Yes, you are welcome

Interview 2

I = interviewer

R= response of the interviewee

Themes of the interview:

(1) Task orientation

(2) Cooperative communication

(3) Interpersonal relationships

(4) Knowledge management

(5) Communication outcome

(6) Project characteristics' influence on communication

Participants of the interview	Transcription
I	Could you please introduce yourself?
R	I am (…), I am 31 years old. Before I started working in Jeppesen I was working in Göteborgsspårvagen where I dealt with the planning of new tram lines as a corporate promoter. And then I've been working in Jeppesen since 2007. I was working with another product, not with the one I'm working with now. It was everything from presales, implementation, and customer support. And then I started as a project manager here in Lufthansa program a bit more than a year ago.
I	As a manager you work with people a lot in LH program
R	yes
I	How do you make sure that employees under your management do the things they are supposed to do? [pause] How you help them to get a clear understanding?
R	With most of them I have daily meetings and daily communication and I talk to them regularly to make sure that we are on the same track and have more or less the same understanding about our goals. My team works with global items, so they also have responsibilities to communicate it to other people, so it's important that we all have similar understanding of what we do.
I	How do you manage to reach this mutual understanding? What makes it work?
R	In most cases we manage, I think, but of course there can be some misunderstandings, and it shows the need to communicate more, to talk and discuss things more.

I	In your discussions with employees how do you talk about how their particular work contributes to the whole project?
R	Yes, for example we have test lead to check how fast something should work, and of course in this way it's easier to communicate to see the whole picture and we have to make sure that it doesn't take more than 10 sec to open and viewer and so on.
I	How aware are people about the final product characteristics and picture when they have to pass the part of their work to other people to finish it?
R	They should be aware of this and in most cases they are, as it's a team work.
I	How do you reflect on each employee's role in success or failure of the project? [pause] How you see the role of individual in the group work?
R	I think sometimes we have individuals who are very important, but at the same time even if one individual is so important, he cannot succeed in such a big program on his own, it's a team effort first of all. We have to be a team to succeed here.
I	So, there should be cooperation and team responsibility there?
R	yes, yes.
I	How would you describe communication in LH program?
R	Is it today's status or what I think it should be?
I	You can talk about both
R	I think it's important that we communicate to each other essential parts of our work and also be sure that every person in the project is responsible for their parts, and they work together to get this team feeling, the feeling that each individual has to contribute in order for the whole project to succeed.
I	And what is it now?
R	Now I think there are situations that we lose information on the way and in some cases I think we have too long communication lines, and sometimes we make messages too complicated. But also I think we are working on this on a daily basis and we are aware of it, so we can improve here.
I	You talked a bit about individual and group work. What indicators of cooperation between the employees working together you can mention?
R	Yes, for example it's a cooperation indicator when someone is explaining what they are working on and why it is important to others, and other people help to bring up this information filling in the gaps, so we all have a full understanding. And it really brings a good cooperation as people are in a line with each other and work together having a common goal. Another example is meetings that we have together with different teams working on one thing for example core and customization. So they discuss whether they have time to do this or that and how they can actually help each other in both directions.
I	In which stages of work do you think cooperation is extremely strong?

R	It has a lot to do with the core and too big projects I think. So when we define our need and see what should be done by core in order for us to work well. It's a sort of a trigger to come and sit together and discuss what should be done, what common goal should be reached. It's a good trigger for cooperation actually.
I	What other reactions it can trigger, maybe not only cooperation at once, but some questions or negative reactions?
R	Blaming is a situation as well. It's quite common that customization blames the core if they get something with which it's impossible to work further technically the blaming gets stronger near a deadline. But still we should understand that there is a problem to be solved and it will not disappear if we blame each other, so it ends up with cooperation needed for the problem to be fixed. And I think we are getting better with involvement of core to help us in solving such problems, so it is possible to work on the product further. And in this meaning changes are needed.
I	What kind of measures could help to erase this blaming factor and bring people to cooperation at once in your opinion?
R	I think we should be better in understanding why we have changes there, but the most important part as I see is for the core to know what customization need in order to work with what we get further, how the product that they have done will be used by customization, how they should actually write the code to make it understandable for others. Also there should be meetings on a regular basis with the reflection of what has been done in core last week and what customization should think about in order to continue working on the item successfully. Customization should be informed what kind of changes in the core have been made. And though at the moment we don't have it, but we discuss it as well, so we actually are trying to find the way to solve this problem.

And then I also think that cooperation should be something started from the beginning, but not when it occurs under the circumstances. We need to feel buying the product and it has to be buying from us as well. And we have to be aware of that. It also has to do with the acceptance of where we are in the project, even if we are late with it it's not the right thing to blame someone, it's a need to work together more. |
I	Ok, I see
R	I also think that the managers can talk more about the benefits that cooperative work brings, to show that we can actually influence the product development a lot with our needs. It's not ready, but we can still use it in order to improve
I	It is the matter of attitude maybe?
R	Yes, and it's hard to communicate and to change this easily!
I	What other communicating problems exist in LH program and what are their reasons?
R	We do have a lack of communication between the sub projects, I don't think that they always see the connection they have with each other though we all work in one program. So, it could be better if all could do a little bit more to get a general picture of what will be delivered to the customer in the end, but not only concentrate on their particular part of work. It's the matter of cooperation, and now it's not there where it should be. We're not fully there yet.

We also have a project backlog and team layer the description of what team should do, and the connection between these two things is not clear sometimes. It has a lot to do with the ability to see out of the box to make sure that they fulfill all the requirements from other parts. |
| I | Talking about communication how would you define the value of interpersonal relationships to the |

	success of LH program? You can also rank the value of interpersonal relationships from 1 to 10 in its present state and the value they should have in your opinion.
R	I think it is very important of course, and it should be probably 9 if you rank the importance. Interpersonal relationships can be both very good and very bad depending on what it's like. But in an ideal world it shouldn't be very important I think, as professional competence should be enough to manage tasks. The value we have at the moment is very hard to define, I think we should work more on the team spirit.
I	How tight at the moment are connections between people working in LH program, how they socialize at work and out of working environment?
R	It really depends. Some employees communicate in private life as well, but I think in many cases they like each other here, but they don't socialize outside in their private life.
I	If employees from different departments communicate out of the work environment, how do you think it might influence the work that they do in LH program?
R	Yes, it can be very helpful I guess. If you meet for an afterwork every day then most probably the issues or problems you have at work will be solved in this every day communication. And it will be easier to communicate as well, as the communication will be higher and it's a poor chance that there will be issues between these people at work as most probably they will be solved earlier in communication process.
I	Ok, and if we come back to your point that it should be possible ideally to work based on professional competence, but not on interpersonal relationships, would you still stay on this?
R	I don't believe that it can be actually this way, as for sure interpersonal relationships are very important and it can help the project, but I'm saying that it could be good if communication and cooperation work as good even if people don't socialize outside the work. That would be excellent I think. But I hardly believe that it can be the case in real life situation.
I	What is done in LH program in order to strengthen interpersonal relationships between the employees?
R	In LH program we have fika every second week, joint fika. We also have meeting for all the employees as Show and Tell where they can see what has been done and what we have at the moment. Then also sometimes we have an afterwork all together and go outside.
I	How many people are usually involved in socializing outside of work?
R	Half of them maybe.
I	How they communicate in this case? Staying with the people they know or communicating with new people?
R	It's very different from person to person and from group to group. There are of course groups that are pretty tight and they stick together, but quite a lot of us are interacting with new people we see, and I actually see it as a benefit to know "who are you and what are you dealing with in the program?", and to share what I'm doing there. I think it's benefitial both ways.
I	How often do employees discuss with managers technical and personal problems that they have at work?

R	I think it's very hard to answer this on the high level for everyone. As for me, I think it's very individual, as some people are very open-minded about this and others prefer to keep things to themselves.
I	Is it only personal thing you think?
R	No, of course not only personal, it has to do with the trust as well, the trust that employees have to managers. As if you have trust to the manager it's easier to talk about different problems, despite the personality one has.
I	How do you see communication in the meaning of information exchange? What is the quality of it in LH program?
R	I think this is the area where we have the potential to get better. As sometimes it's not so consistent, there can be discussion and then it's lunch time and the decision could be actually taken over lunch and then you don't get back to the information discussed on the meeting, as the meeting has been finished over lunch. And also it is not always visible what is communicated with the customer and that communication is not always brought back to all who work on the thing.
I	You mean that people might work on the product without knowing the customer needs, so it could be another thing in the end, different from what customer expects?
R	This should not happen. But, Yes, as there can be agreement with customer on this or that thing and it should be discussed with all people involved into work. We should point which area and what decision we discuss and how it can influence other parts of the project and other people involved. You are not always aware of that when you have a discussion with a customer, as we sometimes don't invite another person who works with technicalities. Sometimes you just don't know whom to inform or invite. This rarely occurs.
I	How do you think it can be solved? What do you usually do in this case?
R	When you face the problem and you don't know whom to involve, it's very hard and you try to find the way and the right people to solve it.
I	What relation this problem has to division of roles and responsibilities. How employees see this situation and know who is responsible for what in this or that case?
R	This is a problem as well, as often they don't know whom to turn to, but they know that they can always turn to the manager, but here can be the problem that the managers don't always know who is involved in this from other projects. But this problem is discussed on the managers' level as well to make sure that we are aware of what others are working with.
I	Is this possible to find the information in official document or web site about work and responsibility in the program or it's more on the level of general knowledge and experience?
R	It's written on high level, but I think it's not done for all team members, and then these items are more technical and if we work on them we know where to find information and we know how we do it, but we don't know who might need these data after and it is hard to define it as it can happen much later on in the project.
I	What influence it has on the final result? Does it cause a delay?
R	It depends; as if to talk about communication in this case, it's impossible to communicate everything and also most of the information is somewhere in confluence and here comes the

	questions of how to find it there. As people usually know how to find the information that they need in their daily work, but if it's something new, than it's harder.
I	How many people are actually using confluence
R	Quite many as now I'm actually dealing with updating confluence and I asked a question how often the confluence is used and the result is that about 100 or 150 people look-ups per day use it. So, it's quite a lot of people.
I	Talking about information sharing and ideas, how often it actually happens that employees express their ideas and what happens with these ideas after?
R	That's a tricky question! I think I have an example, it's a backlog, that was an idea suggested by one person last year and now it is used. But this is just one person item I don't know about other implementations, I need to think about it a bit. It's very often when we have a discussion about problem quite a lot of ideas come up and they can be very creative, so they all contribute to the solution.
I	What is this backlog?
R	It's the source that unites all the files items that we are working within the project. So we store all the information in one place. That is actually a big help in representing the whole picture. Before the information was kept in several places.
I	What is done in LH program in order to broaden the knowledge of people working here about the program and about Jeppesen in general?
R	That we try to communicate in All hands meetings that we have every other week and in Show and Tell meetings where we usually have the presentations on a high level where the full picture of what has been done and what is planned to be done is represented. But maybe they don't see the point for the whole company there. I don't think we have that anywhere. Only information related to the projects that we have in LH program is represented. I think everyone is aware about the importance of LH program, though we don't discuss how exactly it is important for the company in general, I'm not sure if everyone is aware of that.
I	Please, give an example of any internal or external communication in LH program when it is helpful for knowledge exchange.
R	Yes, one example is when we do the planning for one phase or for the whole project, we of course share and discuss the issues that pop up and it's of course important information exchange. In this case it's very easy to provide knowledge exchange. And I also think it's important when the developers are to start with developing one part of the product it is very important to share knowledge and gather information with the tech leader and requirements specialist, they can inform the developers what are the needs and to present the requirements of the customer, to discuss what is the value of this, what it will be used for and how it should be implemented. This is a very important knowledge transfer or information sharing.
I	When you have such meetings or discussions how do you usually conclude the result, and formulate the purpose with employees?
R	If to talk about the purpose of the meeting or discussion I always try to formulate not a strict agenda, but the general purpose as this is what we should solve or discuss and then it is followed. I usually try to bring up this information in the invitation for the meeting. And then the follow up, I think it depends on the outcome of the meeting. Sometimes the decision is taken on the meeting and then I summarize and say ok this is what has been decided, and if it's no decision taken, I

	summarize all the issues that haven't been solved and send them out in the invitation for another meeting.
I	How do you communicate to employees the relevance of their presence on the meeting with the meeting agenda? How they can understand what is needed from them on the meeting in the outcome?
R	mmm... if it's a small meeting where agenda is quite clear and the target is quite clear then I don't precisely state what each person should de, I think it's obvious, as they are all needed. And for example we had a workshop the other day and many people from different areas were invited. Then in order to let people know what is expected from them I reflected on their tasks in invitation. And I got some questions like "am I really necessary there?" so I answered why I think they are needed on the meeting. So, they are quite open with asking questions. At least this is my experience here.
I	Good interpersonal relationships!
R	Yes, exactly [both smiling]
I	Do you think the achievement of program goals contributes to the achievement of employees personal goals?
R	[pause] yeah [smiling], I'm also thinking that it can be other way around! mmm... I think it's both ways. And we also have the line managers and they are responsible to communicate such things with the employees, they reflect on their goals and then I think it would be reflected in the project. It's maybe not so obvious individual goals, but the line is to make sure that people develop new competences in the project.
I	Talking about the communication between the employees, what outcome you think it can bring to the problem solving at work.
R	It can help, but if for example personalities don't match and people can't get along, it can be crucial for the project as we should cooperate and communicate in order to do a good job in the project.
I	How would you comment on the phrase "the more we communicate, the more helpful it is"
R	yes, I agree with this for hundred percent
I	Why? What is the effect of communication in big amount?
R	What was the phrase again?
I	"the more we communicate, the more helpful it is"
R	ah helpful! Yes, [pause] it should be helpful in case if it is related to the work that they do, it shouldn't be just chitchatting about personal life. And sometimes you can't really just discuss things, but you need to do something in practice to see how it actually works. I mean in theory everything can be a problem, and sometimes it's better to get start working and stop the discussion at some point and test if it's really a problem.
I	So it should be combination of communication and work activities...
R	Yes

I	ok. Talking about LH program in general, what characteristics it has that actually influence communication within the program and motivate people to work here?
R	[pause] that was a tricky question again [both laughing] LH is a big project and it has many challenges. I would definitely say that I would like to be a part of this. It is a new platform that we are doing, that is one of the main points
I	If you recall to the feeling you got when you just started work in LH program, what was that? What information have you got?
R	Not exactly this that I mentioned. It was more or less communicated as a new project that needs resources. People still ask questions what we do in here, though it is almost a half of the company and new people are coming.
I	So, people are coming here because of the curiosity? [both laughing]
R	It could be the trigger though. But the main thing is the perspective to the future that the program has. Everyone knows that this is the future product, so the discussions are rather about how is it going and what we are doing here.
I	Ok, thank you, I don't have any more questions though I might turn to you if I have any while working on the material.
R	yes, of course!
I	Thank you for the conversation. it was very enjoyable!
R	yes, thank you too!

Interview 3

I = interviewer

R= response of the interviewee

Themes of the interview:

(1) Task orientation

(2) Cooperative communication

(3) Interpersonal relationships

(4) Knowledge management

(5) Communication outcome

(6) Project characteristics' influence on communication

Participants of the interview	Transcription
I	Could you please introduce yourself!
R	Yes, my name is (…), 45, and have been here in Jeppesen 12 years I think. Previously I was consultant in different companies and I'm working as a project manager for the last 3 years, before that I was working as a product manager and team leader, so I've been in the leading positions for the last 10 years already. So I don't work as a programmer anymore.
I	So, you have programing background.
R	yeah, I started as a developer here and then became a team leader and so...
I	What is the prehistory of you coming to LH program? How it happened?
R	[mmm] I was working with such things before, I was leading such types of projects with Lufthansa as a customer 5 years ago, or [pause] yes, something like that. And I was working as a manager before handling very small product in our company. And then I just asked for this assignments and applied for the project manager role.
I	So, you are in Lufthansa program from the beginning...
R	yes,
I	which year it started?
R	three years ago I started working here as a project manager. But it was not this Lufthansa program,

	it was not organized this way
I	you mean now it is different structurally?
R	yes...
I	ok, working as a manager in LH program with people, how do you manage to make sure that people do things they are supposed to do and understand their tasks?
R	well, we have [hesitation] I'm not sure if you know what is scrum?
I	yes, I know what it is...
R	good, so we have sprints that last for 2 weeks and we have a scrum box where there are all the tasks, so we discuss them when we plan sprint. Then we have Stand Up meetings every morning where we check the progress and discuss problems, and help each other if we need and can. So that's our follow up in short-term. And I am a scrum master and a project manager as well. And I'm in charge of long-term planning and I am to make sure that we have delivery in time as well. So, this things we discuss in our Stand Up meetings where everyone speaks in front of others and then I bring this information in the top level. [pause] Did I answer your question?
I	Yes, though I am also interested in internal processes, how you can define that employees do actually have common understanding about what they should do
R	Yes [pause] We have a scrum master which is a facilitating role, this person makes sure that the team follows the processes, figures out the problems to solve, not only technical problems, but other types of problems...
I	could you give an example?
R	[mmm] could be sitting, computers screen, or someone has suggestion "can we do this instead?" or "we can work smarter by doing this instead!", so, those types of problems. It also depends on other teams, do they deliver in time, or don't deliver. And I'm also analysis the results of the sprint, not only in the end of the sprint, but in the middle, and try to help the team to see where we are, if we are doing well or not. If we are doing really well we might need to add some new things, and if we are doing bad maybe we should communicate with other teams.
I	I see...
R	...and we have a "product owner" who basically dictates how this should be. Not exactly all the detail, but the most important tasks. This person gives the team the description of what should be done, and then the team discuss how much time will it be, how much we can actually commit to this, or [pause]. In most cases they come back to this person and say how will it be. It's usually the process of negotiation between the owner and the team, where they see what they want achieve for the period of two weeks
I	did I understand right, you work with core development?
R	yes, right!
I	How it works with the situation that after you develop something you deliver it to the next stage, customization [pause] how do you provide...
R	yes, actually one of my teams is a pure core team, the other is a mix of core and customization

	people. Their purpose is to provide test environment for the other teams, pure cire teams, as well as testing customization capabilities for other teams that will use it after. [pause] I don't know, whom have you talked with so far?
I	I interviewed people working in customization...
R	yes...so this mix team test and checks whether the thing works before delivering it to customization, yes
I	How beneficial it is to work in such teams in your opinion?
R	such teams make sure that things work and make it easier for people sitting up here, who actually do the customization. because when you get things from them, they are more mature, so to say mature in comparison with some things that delivered straight to customization and then it can be crap. But they still have to use it because of time line, deadlines and so on.
I	I see... if to talk about cooperation on this stage, how would you characterize it? [pause] is it need based or forced somehow? [pause] I mean if people cooperate only when there is a problem, or they actually try to cooperate before in order to prevent problems?
R	yeah, the team I'm talking about is trying to cooperate a lot... and try to prevent the problems [pause], so there's lots of cooperation between the teams. And it's very much appreciated by other teams. though sometimes they get complaints and so on. But they are all aware of if we don't do this test and deliver it up there like this, people up there will scream a lot, as we have deadlines with the customer and it's not good if they can't continue working on the product. It can be tough...
I	yes,
R	so I don't think we have to forced cooperation, people cooperate and quite happy with communication at least in core. I don't find it forced, i think even we can do it much better...or...
I	do you think that people cooperate more when there is an obvious need, when they face the problem that won't manage to solve if not talking to others, this kind of force...
R	yes, ok, ok, we try to cooperate before we start doing things, so we won't run into too many problems... it's tricky to build software and even if you work so many years there are problems. Sometimes it's not so easy to figure out exactly, and so on. But we are trying to figure out what to do together with people who want, at least, as certain as we can. ...like what they should start to use if in the end they want to deliver this thing.
I	ok, if you work just on one part of the product, how is it with the understanding of what it will turn to be in the end actually when there will be some other features added, and some preferences of the customer?
R	[pause] yes, we try to figure that out, if it has to be customized we should anyway know how they want to customize it as we can't start coding without knowing customization. Then it will be discussion as ok we want to deliver this and how you will customize it? This way or this? so we try to gather all the requirements and take them into account in core. So we try to figure out how they will use this stuff. So this knowledge is very important for the good business.
I	How it is actually communicated to all the employees involved, what will be the product and how and what for it will be used? I mean the long term perspective
R	here is a problem [pause]. We should have really good roadmaps on the architecture and product level where we can see how different pieces of product actually merge together and form the

	product. I think we lack a bit of that. We sometimes end with the parts of the product that is hard to merge together. It's hard to communicate how it should be sometimes.
I	What is your vision of how it can be solved?
R	I think we should work more on clear roadmaps of product and architecture.
I	what exactly you mean by work more?
R	mm..when for example feature X needs to be implemented using these means and these tools because otherwise X won't work with Y. And here come other problems like why X and Y should work together? Well, because together they can solve this problem, and they need to work both on windows box or mobile device, or... I mean this type of understanding
I	So you have lack of this now...
R	yes. It's getting better, but still it could be improved
I	If to take not only core, but LH program as a whole, how would you describe communication within the program, I mean?
R	[pause] in my position I know exactly what is going on with communication on this side, but I know too little what is going on on this floor.
I	aha...
R	and that I think is a problem, it shouldn't be like that...
I	But you have meetings with other managers from different departments, right?
R	yes, but not very good once...I mean we are not so mature yet project wise
I	how do you think it's possible to bring both sides together and to improve cooperation and information exchange between them?
R	I think it would be useful for teams up on this floor, customization teams to meet and communicate with teams on the core side and other way round.
I	I heard about the experiment here with moving people from different departments around, how do you think this method can influence communication and knowledge exchange if to have it on regular basis?
R	yes, i think it could be good and could help to improve the situation. It's a good initiative to be implemented. It could be good if teams working tight in different departments could meet sometimes over a cup of coffee...
I	What about Show and Tell and All Hands meetings where the teams actually meet?
R	there people just sit together and listen to different team members presenting what the team has done. But I'm not sure that average developer knows which are the team members who actually did this. We know that the guy presenting is in the team, but who else is there?

I	where can you get the information about all the team members to meet up, or maybe manager has this information?
R	I have no exact answer right now, i just think this idea is good as if you meet up with a person, spend some time to socialize, then you are more likely to stick to your commitment when you know who is that person on the other side of the electronic tool. then you know that if there is a thing with the bug in it and you will try to fix it. Social contact is important...
I	how is it going with the social contacts here?
R	Well, I'm trying to work on this to make it more mature. I know many people here cooperate and communicate, but there are some who try to avoid it?
I	What is the reason?
R	well, some people are very nice, but they prefer just do their work here, so they are not so social in this sense, want to work isolated...human nature...yes, anyhow if you have an eye contact with someone and you know this person works in LH program and if you don't do this and that this person will get all the shit, you wouldn't like to put this person into bad situation... you see what I mean?
I	yes, sure. There are also afterworks for people to socialize here, right?
R	yes, and quite a lot people do that. I think it has a good effect, people see each other. We have these afterworks once per month. It's for all, and there are some things done separately by each department, so it differs. It's hard to figure out how to easily introduce lots of things, we should know that actually people might dislike it and we can end up in the worse situation than before, if you try to force people to socialize... It's not easy.
I	In this case what is the reflection on what employees think, what solution they see or what ideas they have?
R	yes, in this case we have what you call retrospectives, where we work in small teams and try to figure out what goes well and what doesn't go well. Things that go well we try to keep and we try to improve the bad things we have. In many cases communication is the thing that pops up, for example "we should have checked it before we started" or we should have meetings with other teams earlier, so we could put the results in the needed direction. So all these is connected to communication as a ground, internaly in teams and between teams.
I	How much do actually employees know about LH program as a whole, but not only about the department they work at?
R	too little... I've been here for quite some time and I feel I know what we are supposed to do, i know the products... but I guess there are few people who are not aware of this and of the final result.
I	what does the company do in this case to give this information to people working here?
R	on the company level there are induction days where the company is represented and...
I	yes, I've been to the induction quite recently
R	well, yes, you know what I mean. There you get an overview on the product and so on...

I	is it possible to get and keep 100% of information? one might have so many questions after all?
R	yes, we have also Show and Tell meeting where we talk about things that have been done...
I	how useful it is?
R	I think it's very good, but then you always see just what has been done lately and don't see the long term perspective, as are they done with this or not yet, and if not, what will it be when they finish?
I	Are there any questions in such meetings related to this?
R	people ask if they are interested to know... I want to see the full picture, maybe that's why I'm a project manager. Some people don't care, they care about the small things, they care about the details about the stuff they are working at [pause] and that's totally fine, in many cases. If they understand about the environment and surrounding of what they do. Personally they might think more about how Lufthansa see the LH program, what Lufthansa thinks about it and so on...I think
I	Do you think that employees' self realization goes in line with the project goals, in the meaning of what competences they can develop except professional?
R	[pause] in some cases I think it's a lot up to you to make sure that you realize your individual goals. In my case for example I work in different areas, and I think it is possible to suggest tasks and positions for yourself. it is possible but I'm not sure that people dare to sell their own ideas. Some of them do, but some prefer just to do what they are doing, and they like it.
I	is it a matter of personality?
R	[pause] I'm not sure. We try to give people tasks they would like to do, but we can't sacrifice the team work when someone wants to do something more fun or so... we of course help with problems though...
I	How open are employees to communicate the problems?
R	They are very open. I don't think there is a problem to communicate ideas or problems to the project manager as we look for improvement area, we look for the opportunities and so on. So they are very open with this!
I	How is the situation with information and knowledge exchange then? How is it in the core and how is it in overall LH program? [pause] if tomorrow several people quit their jobs are there resources to keep the same tempo of work?
R	No, no, then we will have a problem. It's not only resource problem, we can't hire more people for budget reasons. And if people quit we can of course use someone from another project, but that someone is not likely to be skilled enough as we work on different product here...
I	I see that people is a valuable resource here. What is done to minimise such risks for people to have enough knowledge in case of such situation?
R	In teams, for example, we try to make sure that all people know what others dealing with. it's not that they know everything, but something about the specific area others work at. But anyhow when people quit we end up with a problem. We lose speed, but that is natural, as for any typical company

I	How the exchange of best practices is going, as I believe there are such in every department? How does it work between managers and between the employees?
R	yes, we try to get better in this in terms of sharing knowledge and so on, but it's time consuming and some things are mature in the way they are working, some things are not for various reasons and the gap might be quite big, so it can be years to have this mature relationships between teams. As, for example, it's easy when you start writing the code and you have a good environment and so on, or you have to use the code written 10 years ago in not clear way, but you don't have a chance to rewrite it all as it's so big, so you have to leave for the situation. So, we try to work with knowledge sharing. It's like when you have a new Ferrari and an old Ford, you still can be happy with that, but there is no chance that old Ford will be as fast as Ferrari. It's impossible, but it doesn't mean we can't use it and can't make money out of that.
I	What is the intention to work with this further, or?
R	Yes, we are trying to work on such things on the daily basis. And now there is, for example, automotive test, have you heard?
I	no, i haven't ...
R	if you use software and have one line of code, you can test it with this and it'll take care of any problem you face when using the code. If we don't have test lead, imagine we have million lines of code and something doesn't work. How to figure it out and see how this singular thing affects all the. And it might take year to find out the problem... did you get the idea?
I	yes, thanks. In general when people face the problem what is the general attitude, as you mentioned that in customization they might not like what you deliver them from core?
R	[pause] different, some of them are very committed to do their very best to meet the deadlines. They are very good at communicating the problems and so on. Some other teams are other way around, they want to take something that they see is good, and don't care why others have a problem with this.
I	I've got an impression of quite structured work here, though my interest is in how the outcome or the result is communicated to people here? [pause] do they see their relevance referring to the role and relevance of being on the meeting for example?
R	No, no, we finished with lots of meetings now, you can't always go to meetings, though some people only do meetings basically and some people always code. Before that was a situation. Now it's much better, we try to avoid that by communicating as much as possible. We have couple of meetings fixed, otherwise we have a product backlog
I	so you keep all the tasks there?
R	yes, and every team member can go there and see what is to be done and what is the process. Besides you will not find many meeting notes if you ask around. Or if there are, there is no guarantee that the decision hasn't been changed and so on...
I	How is it possible to get information from the meeting then?
R	it is possible to find slides..., but no more, if you miss a meeting, you miss a meeting. I don't think it can be crucial for something. It's much worse if you have a meeting notes which are not revised and with the changed decision...so you end up with information that is not valid

I	then it becomes too much of person to person information?
R	yes, at least you can talk to people who you remember were on the meeting. It works good enough. I think it's more important to communicate, but people shouldn't wait with questions if they have ones. There are clear roles of who is responsible for what, so people know whom to turn to.
I	so people know exactly each others roles and responsibilities?
R	In core they do, the thing we would like to know is how it functions here in customization, this is a bigger problem as we don't know how teams are structured and whom is working with what.
I	what could be done in this case in your opinion?
R	[pause] maybe teams should introduce each other on the meetings we have, just stand up and say their names and what they are doing, who is a tech leader, test lead, etc
I	Ok. Talking about LH program as a whole, what kind of characteristics it has that influence communication between people, motivation to work here, etc
R	My vision is that it is important to get away from all the communication problems, integration problems so that people can start working here as if it is a software production factory. If you work in LH program - you work in a high priority project, we provide high tech stuff. It has high attention to the fact how we are able to do things, how we cope. The project will not be down, so people feel safe working here. The downside of this is that we are in a constant delivery and deadline pressure, but it depends how people see it. It is challenging and there is lots of lots of room for improvement.
I	Thank you, I don't have any more questions, but if you'd like to add or ask something feel free!

THESAURUS

Phases of product development

Core development – is a development of the common part of the project which is to be shared between different customers/projects and which is the core that acquires different shape when customized

Customization – is a development of the additional functions/features which are customer-specific. E.g. depending on the customer request and needs the product got from core is developed further by adding specific features to it

Deployment – is the phase when the project developed is taken into a customer's production environment

Scrum method

Scrum – a strategy of a product development when the project team works as one in order to reach a common goal. Scrum involves such terms as scrum master, sprint, and backlog.

Scrum master – is a scrum process facilitator responsible for removing obstacles for the team to reach the goal. It is important to note that scrum master is not identified as a team leader, but rather as a buffer keeping team in focus and protecting from any kind of destructions.

Sprint – is a basic unit of scrum process development. The duration for each sprint is fixed and usually varies from one week till one month. Each sprint involves a goal that a team should reach in the end of the sprint.

Backlog – is the list of tasks/orders to be fulfilled in the project. Each team member deals with the assigned to him/her tasks. Backlog contains the requirements for the product to be developed using scrum method.

Meetings in LH program

Show and Tell meeting - is internal or external meeting aimed to introduce newly developed features to the stakeholders (customers, developers, sales etc.)

All hands meeting – is an information meeting for all employees working in the program

Stand up meeting – is a short periodic team meeting which usually aims to provide a status update for all the members in the team

Internal communication resources

Intranet – is an internal communication network that contains employees' profiles and information and documentation related to the projects the company works on.