Summary

Problem statement
Due to a lack of inter-functional coordination and communication many new products either fail to meet market needs or do not fit the means of the organisation to develop, produce, and deliver them. The research objective of this study is to contribute to a solution to this problem by developing a new method for the conceptualization of new, technology based services. The method is directed at project managers and endeavour to aid them in coordinating project teams. This involves integrating the knowledge of different team members in order to create a shared reality or, in other words, a joint perspective of the new product development project. Creating a shared reality requires the exchange of information between team members. Hence, the research question is how information and communication technology can facilitate coordination by structuring and supporting the communication process in project teams.

The cornerstones of the C3 method
The method developed in this study is called the “C3 method”. The three C’s stand for “cooperative”, “computer augmented”, “concept development” and denote the cornerstone of the method. The word “cooperative” reflects the use of cross-functional teams of which, so called, “lead users” are an integral part. The term “computer augmented” indicates that information technology is employed as a primary means of improving the communication between team members. Two forms of information and communication technology support the creation of a shared understanding of what the new product concept has to look like, namely
group support systems and multimedia systems. The term “concept development” indicates that the method is focused on the conceptualization phase of the design process of new products.

The figure below displays the elements in the C3 method. A project team in which lead users participate goes through a quick succession computer-mediated meetings in which market needs are translated into technical specifications. The ensuing conceptual design of the new product is consequently prototyped and tested. At the start and the end of the conceptualization process the project’s strengths and weaknesses are assessed using a project evaluation tool.

Defined as a way of thinking, working, modelling, and support, the method not only describes the steps in the conceptualization process but also specifies the worldview, models, and tools to be used. The method has been designed and tested
in the course of nine case studies using a "design approach". Below the C3 method will be outlined in more detail while presenting some of this study's conclusions.

**Way of thinking**
An important starting point of this study is that having a project team go through one and the same process is the best way of creating a shared reality regarding the new product concept. In practice, however, a number of dilemmas emerge. Although a “one for all process” is important for creating a shared reality it also means that team members sometimes have less to contribute and as a result feel they are wasting their time. Another dilemma concerns the issue of team composition. Large teams are more difficult to manage but are inevitable as matching market needs and company means requires a broad variety of expertise. Another dilemma concerns the fact that organisational support for the product concept is not maximized as team members are primarily selected for their expertise and not so much for the organisational weight they carry.

This study has demonstrated the enormous appeal of user participation in new product development, especially as an objective "evaluation mechanism" for internal decision making regarding marketing issues. On the other hand, it has been troublesome to find and involve expert users in the development process. The conclusion seems justified that user participation requires a long-term investment in the development of partnership relations and should not be implemented on a project basis.

**Way of working**
The C3 method prescribes ten pre-planned meetings with the project team. Six out of ten meetings are computer-mediated and three out of ten meetings involve users as experts regarding market needs. The first meeting is used to kick-off the project and to assess its strengths and weaknesses using a project evaluation system. The second meeting is used to pinpoint the critical success factors of the project, to determine the characteristics and needs of potential target groups and to identify market trends. These market trends are consequently used to select
users that are ahead of a need-related trend, after which these lead users are invited to participate in the development process. The third meeting is used to enhance the insight into the user context by describing the customer’s internal processes, identifying bottlenecks in these processes and evaluating the customer’s current solution to his problems. The fourth meeting is used to analyse what functions the product needs to perform. The fifth meeting is used to complete the functional analysis and to generate design specifications. The sixth meeting is used to generate design alternatives and the seventh meeting is used to make a section out of these design alternatives. The eighth meeting is used to deal with the remaining issues in order to prepare for the creation of a virtual prototype. The ninth meeting is used to test the virtual prototype. The tenth meeting is used to evaluate the project and to plan next steps.

In the approach described above, the project manager is responsible for managing the process while the other team members’ involvement is limited to sharing their knowledge and experience during meetings. Combined with the fact that all meeting are pre-planned, this means that potential team members know beforehand what they commit themselves to. The fact that the participant’s roles and time-investment are clear thus makes it easier to involve otherwise already over-taxed experts. Although this so called “clean desk” approach has been praised for its speed and efficiency, it has also become clear that more team member involvement in between meetings would increase commitment and would allow for additional information to be gathered in-between meetings.

Way of modelling

The way of modelling describes how team members integrate their knowledge into a shared vision of the new product concept. One of the most important assumptions underlying the C3 method is that together team members possess all the information necessary for the conceptualization of the new product. In practice, however, information is sometimes missing and best-guessed. As a consequence the design is partly based on assumptions. The more assumptions the less confidence team members have in the product concept. The obvious danger of making too many
assumptions is that in the end everything is viewed as an assumption, open for change and not really grounded in reality.

**Support**
The C3 method comprises three types of support systems: a project evaluation system, a multimedia system and a group support system. The project evaluation system is used to assess the strengths and weaknesses of the project and consequently to predict the product's success in the market place. Projects are tested both at the beginning and at the end of the project. The first test constitutes a concrete first step in the project and helps to make team members realise that most aspects of the project are uncertain and open for discussion. The second test concludes the project and indicates areas for further improvement.

The multimedia system is used to create a virtual prototype of the new product concept. The virtual prototype explicates the design specifications in a holistic way and helps to give a quick but in-depth presentation of the design specifications. Furthermore, the existence of a virtual prototype clearly marks a milestone and brings about a feeling of accomplishment. On the other hand, the creation of a virtual prototype takes a lot of time and is quite expensive.

The group support system is used to structure and support the problem solving process of the project team. Physically a group support system consists of a number of networked computers situated in a so called "group support facility". The software enables participants in a meeting to simultaneously and anonymously generate, organise, and evaluate ideas. Moreover, the information entered by the participants is saved in an electronic memory and displayed on a centrally placed screen. The fact that ideas can be processed simultaneously adds tremendous dynamics to a session and truly stimulates people to participate. On the other hand, it may also lead to "information overload". The anonymity of the system reduces evaluation apprehension on the part of team members, particularly of users. On the other hand, however, anonymity makes it difficult to pinpoint the experts in a discussion. The electronic memory mainly supports the aftermath of a
meeting, when the results are analyzed and the outcomes are disseminated. Moreover, an electronic memory is helpful in getting new team members up to date. In this study it became clear that as a medium for information exchange, GSS is less appropriate if communication takes the form of “one-to-many” as opposed to “many-to-many”. In one-to-many communication the media speed of computer-mediated communication is too slow for one person to convey all his or her knowledge to the group.

Overall conclusions
Applications of the C3 method have to a large extent been a positive experience. However, a comparison of the project assessments done prior to and after the project suggests that the C3 method has had no significant improvement on product success in most of the cases. On the other hand an explanation is offered by the fact that team members tend to start out over-confidently with a project, not fully realizing the product idea’s imperfections in terms of market and technological feasibility.

The C3 method is an eclectic method that has been developed for the conceptualization of new technology-based services. This study shows that the method works well for breakthrough and platform projects and is less appropriate for research and enhancement projects. Furthermore, one case study suggest that at least some of the elements comprising the C3 method can be used successfully in other phases of the product development process. Hence, one of the directions for further research concerns the method’s extension to other phases. Another interesting research topic deals with new ways of finding and involving lead users.

One of this study’s contributions has been the integration of many existing concepts, methods and techniques in the field of new product development. Although many questions remain unanswered it has, at least to some extent, succeeded in translating universal “truths”, such as “early involvement prevents re-work” and “user participation improves product quality” into practical guidelines for project managers how to succeed in concept development.