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Master's Thesis

ASSESSMENT OF FACILITATORS' DESIGN THINKING

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ABSTRACT

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Meeting design is one of the most critical prerequisites of the success of facilitated meetings but how to achieve the success is not yet fully understood. This study presents a descriptive model of the design of technology supported meetings based on literature findings about the key factors contributing to the success of collaborative meetings, and linking these factors to the meeting design steps by exploring how facilitators consider the factors in practice in their design process. The empirical part includes a multiple-case study conducted among 12 facilitators. The case concentrates on the GSS laboratory at LUT, which has been working on facilitation and GSS for the last fifteen years. The study also includes 'control' cases from two comparable institutions. The results of this study highlight both the variances and commonalities among facilitators in how they design collaboration processes. The design thinking of facilitators of all levels of experience is found to be largely consistent wherefore the key design factors as well as their role across the design process can be outlined. Session goals, group composition, supporting technology, motivational aspects, physical constraints, and correct design practices were found to outline the key factors in design thinking. These factors are further categorized into three factor types of controllable, constraining, and guiding design factors, because the study findings indicate the factor type to have an effect on the factor's importance in design. Furthermore, the order of considering these factors in the design process is outlined.

TIIVISTELMÄ

Tekijä: Anni Karhumaa **Nimi: Assessment of facilitators' design thinking**	
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Hyvin tehty etukäteissuunnittelu on yksi tärkeimpiä ryhmäistuntojen onnistumistekijöitä. Sitä, miten se tehdään, ei kuitenkaan vielä täysin ymmärretä. Siksi tässä työssä esitetään deskriptiivinen malli ryhmäistuntojen design-ajattelusta määrittelemällä istuntojen onnistumistekijät kirjallisuustutkimuksen avulla ja tutkimalla, millä tavalla nämä tekijät huomioidaan käytännön istuntosuunnittelussa. Empiirinen tutkimusaineisto on kerätty monitapaustutkimuksena 12 istuntosuunnittelijalta. Tapaustutkimus keskittyy LUT:n GSS-laboratorioon, jossa GSS-tuettuja istuntoja on tehty 15 vuoden ajan. Mukana on myös kaksi vertailukohdetta vastaavanlaisista instituutioista. Tutkimuksen tulokset nostavat esiin sekä eroja että yhteisiä piirteitä erityyppisten fasilitaattorien istuntosuunnittelukäytännöissä. Koska erityyppisten fasilitaattorien design-ajattelun todetaan muistuttavan toisiaan, tärkeimmät suunnitteluun vaikuttavat tekijät ja niiden rooli suunnittelun eri vaiheissa pystytään jäsentämään. Esiin nousee viisi design-ajattelun päätekijää: istunnon tavoitteet, ryhmän kokoonpano, tukeva teknologia, motivaatiotekijät, fyysiset rajoitteet ja oikeat suunnittelukäytännöt. Nämä tekijät ryhmitellään edelleen kolmeen tyyppiin, kontrolloitaviin, rajoittaviin ja ohjaaviin suunnittelutekijöihin, koska tulokset viittaavat tekijän tyypin vaikuttavan sen tärkeyteen suunnittelussa. Lisäksi suunnittelutekijöiden huomioonottojärjestys suunnitteluprosessissa jäsennellään.	

PREFACE

During my last year of master's studies in industrial management, I got hooked on group support systems (GSS) as they almost seemed to have some magical power when used in our collaborative meetings in a GSS class. Soon, I found myself working as a research assistant, trying to figure out the essence of designing those magical workshops. Could I find the rules for the design of GSS supported meetings? Here, in this master's thesis, is what I found.

My project of writing this thesis was an extended story. I mean, the project lasted a little bit longer than planned and a lot more things happened in my life during the project that I could ever have imagined when starting. The project taught me a great lesson about my humanness but especially about the fact that my humanness is permitted. I am not sure if I fully learned my lesson yet, but this was a good start. Today, I am all smiles: happy about experienced difficulties and moments of success, about the sunny spring, and about this finished thesis. Smile.

I thank anyone who helped me to get to this point, including the Department of Industrial Management, above all my great circle of acquaintances including professor Markku Tuominen, my supervisors Kalle Elfvengren and Kalle Piirainen and my office neighbor Samuli Kortelainen. Special thanks also belong to my friends and family that gave me just the support I needed.

Collaboration is exciting – what about the design of it?!

When many work together for a goal,
Great things may be accomplished.
It is said a lion cub was killed
By a single colony of ants.
—Saskya Pandita

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ABREVIATIONS

CE	Collaboration Engineering
CSCW	Computer Supported Cooperative Work
DSS	Decision Support Systems
GSS	Group Support Systems
HSE	Helsinki School of Economics
KREC	Kouvola Region Expertise Centre
LUT	Lappeenranta University of Technology

1 INTRODUCTION

The introduction of many minds into many fields of learning along a broad spectrum keeps alive questions about the accessibility, if not the unity, of knowledge.
—Edward Levi

This study adds to the Collaboration Engineering research by exploring the design of GSS supported workshops. It is done by defining the key success factors contributing to the success of those workshops and assessing their role in GSS workshop design thinking. The empirical evidence is provided through a multiple-case study conducted among GSS workshop designers.

1.1 Overview and motives for the study

Facilitation and supportive technology such as GSS can improve the efficiency and effectiveness of collaboration (Fjermestad & Hiltz 2001). Collaboration researchers from different disciplines (e.g. Antunes et al. 1999; Clawson & Bostrom 1995; Hayne 1999; Niederman et al. 1996; Nunamaker et al 1997; Vreede et al. 2002) have found facilitation – especially the design task of facilitation – to be one of the most critical pre-requisites for meeting success. However, the use of facilitation support does not automatically guarantee improved collaboration, but the success depends on how the support is applied (Bostrom et al. 1993; Vreede et al. 2003).

As the valuable expertise of applying collaboration support tends to remain as a tacit knowledge of experienced facilitators (Kolfschoten et al. 2007a), Collaboration Engineering approach has been set up to develop and transfer guidelines and best practices for collaboration process design. Collaboration Engineering is an approach to design and deploy high-value recurring collaborative work practices for practitioners to execute by themselves without ongoing support (Vreede & Briggs 2005). In Collaboration Engineering, the role of the facilitator has been split into two: a collaboration engineer carries out the design of the collaboration process, while a collaboration practitioner facilitates the actual process according to the process prescription provided by the collaboration engineer (Kolfschoten et al. 2008). Through this role separation, high-quality process designs are documented for – and can also be applied by – less-experienced practitioners, enabling good collaboration practices to spread out more broadly.

Collaboration Engineering researchers use a Five Ways Framework (Seligmann 1989; Briggs et al. 2006a) to provide a structured description of the collaboration design approach by

- Way of Thinking (concepts and theoretical foundations)
- Way of Working (structured design methods)
- Way of Modeling (conventions for representing aspects of the domain and the approach)
- Way of Controlling (measures and methods for managing the engineering process)
- Way of Supporting (tools, approaches and techniques to support the designer).

This paper focuses on the Way of Working, stimulated by the idea that the significant amount of research done on the factors contributing to the success of collaborative meetings would add to Collaboration Engineering research if the role of those factors in the design of collaboration processes was better understood. Thus far, the Way of Working has been studied in the Collaboration Engineering community by presenting ThinkLets, codified facilitator interventions that aim to create desired patterns of collaboration (Briggs et al. 2003b; Briggs et al. 2001; Vreede & Briggs 2005; Vreede et al. 2006), and by exploring the strategies and techniques that facilitators or collaboration engineers apply during the design of collaboration processes (Kolfschoten & Vreede 2007;

Santanen et al. 2006). This understanding has also been applied to some (preliminary sketches of) tools, strategies, and techniques to support collaboration process design (e.g. Kolfschoten & Veen 2005), but more research is still needed in order to make the effective design practices wholly explicit and transferable (Kolfschoten et al. 2004; Kolfschoten & Rouwette 2006; Kolfschoten et al. 2007a). Therefore, a deeper understanding of facilitators' design process would provide a valuable input.

1.2 Objectives

The key objective of this study is to gain a better understanding about GSS workshop design and to analyze and prioritize success factors that must be considered during the design in order to build a successful workshop. The practical objective is to document facilitation (design) experience gained in the GSS laboratory at Lappeenranta University of Technology (LUT) during the past 15 years and to compare this experience with the experience gained in two other GSS laboratories. These objectives are met by presenting a model of collaboration process design thinking. Such a model is meant to

- provide design support for (novice) collaboration engineers,
- increase the insight in the critical factors to be taken into account in the design of collaboration processes,
- increase the insight how to emphasize the critical factors during different design steps,
- provide support for the creation of design support tools, and
- provide support for the training of collaboration engineers.

The research problem arises from the intersection of design science and group psychology as shown in Figure 1.

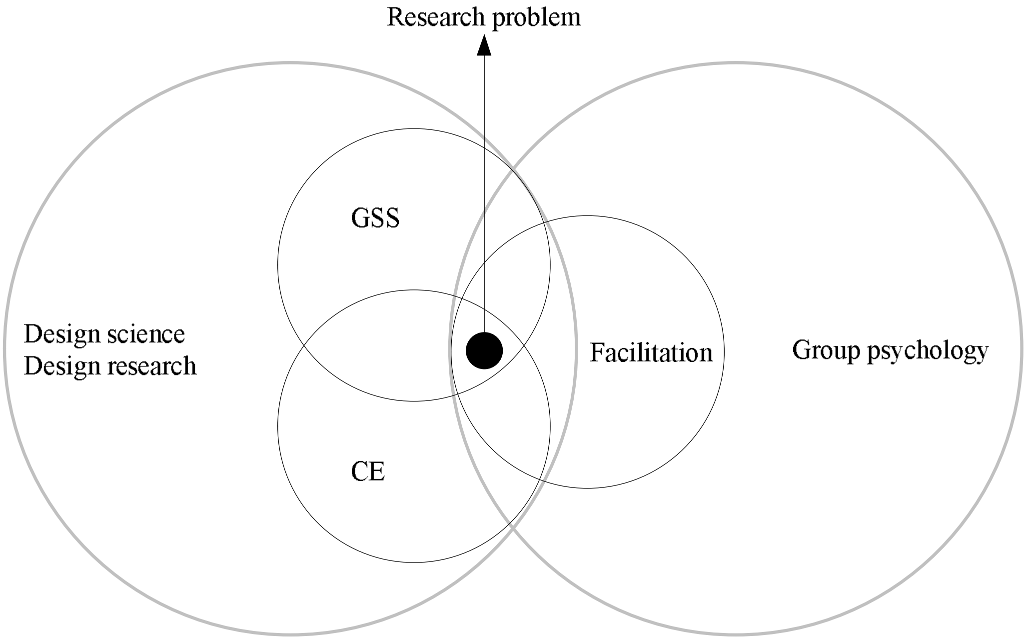

Figure 1: Literature framework encompassing the research problem

The key literature examined in this study comes from the research of Group Support Systems (GSS), Collaboration Engineering (CE), and facilitation. In design science, CE can be seen as a certain kind of a design theory as described in Walls et al. 1992 and Markus et al. 2002, because CE fulfills the basic conditions of a design theory by using group work research (kernel theory) and applying it through a process or a method (design theory) to GSS context (a class of systems). Group facilitation is explored in technology supported environments such as GSS but also in a broader context of facilitating communication in problem-solving groups and organizations. As mentioned in Introduction, some research has already been done about the tasks (activities, steps) facilitators accomplish during the workshop design as well as about the role of different stakeholders during the design, but this study tries to catch a deeper understanding about the *content inside the design tasks.* In a way, GSS design process is examined on a different layer as presented in Figure 2.

Figure 2: The layers of design

The research questions posed for this study are presented in Table 1. The main research question is ‘How to effectively design GSS supported workshops?’ where ‘to effectively design’ denotes ‘to design so that the design has an expected and intended effect’. Such an effect should focus on GSS supported workshops as exposed by the last part of the question. Therefore, *the problem is what kind of a design effort leads to workshop success.* To solve this, two supporting sub-questions were formulated: Sub-question 1 focuses on understanding the critical factors contributing to workshop success, while Sub-question 2 focuses on understanding the effective design effort by exploring facilitators’ best practices. The idea was to gather workshop success factors (Sub-question 1) by literature research and then to assess how those factors impact workshop design in practice (Sub-question 2) by an empirical case-study research. To further direct and focus the scope of the study, three propositions about the effective workshop design were made regarding to the content, importance, and order of the design factors. The propositions can be found in Table 1 below the research questions. They propose that the key workshop success factors gathered by literature research formulate the content of design, and that the factors have two special characteristics in design: they differ by their importance from each other and occur in a certain order.

Table 1: Research questions and propositions

Research questions	
Main question	How to design GSS supported workshops effectively?
Sub-question 1	What are the key factors contributing to the success of those workshops?
Sub-question 2	What are the best practices for workshop design used by facilitators?
Research propositions	
In effective GSS workshop design...	
P1: Content	The main factors considered are the key workshop success factors listed in Table 8.
P2: Importance	These factors have differing weights.
P3: Order	These factors are taken into account in a certain order.

1.3 Restrictions

This study explores the design of GSS supported workshops conducted in a face-to-face environment. Workshops conducted in different place and/or different time environments are thus beyond the scope of this study. Workshop examination is done in a general level: the type of workshops is not restricted, meaning that the goals of workshops may vary significantly. Therefore, this study will not reveal possible differences in the design of different types of workshops. Most workshops examined in this study are tailored for different needs of industrial companies. The researcher wanted to gain a general understanding about the real-life workshop design, which is why for example the workshops carried out in student-settings were left outside of the study. Collaboration and group behavior is examined only within the scope of basic Collaboration Engineering and GSS literature; the further examination of group dynamics is not included.

1.4 Research strategy and method

“A research design is an action plan for getting from here to there.” (Yin 1994, 19) In this thesis, the action plan of using case-study method was made because the main research question begins with “how” and the case-study method fits especially well with “how” questions (Ibid.). In addition, there were some practical reasons for the method selection: the practical goal of this study was to document the expertise gained in the GSS laboratory at LUT and the researcher was provided with a possibility to conduct in-depth interviews for the main facilitators of the laboratory. Due to a relatively small sample size, statistical approaches were not regarded applicable, and the case-study method was selected as a best qualitative approach. The research design of this thesis builds heavily on the design presented by Yin (Ibid.) who includes the following five important components in it:

1. a study’s questions,
2. its propositions, if any,
3. its unit(s) of analysis,
4. the logic linking the data to the propositions, and
5. the criteria for interpreting the findings.

Since Yin does not present the actual research process to be followed, Eisenhardt’s (1989) process of building theory from case study research has been applied in this thesis although Eisenhardt’s philosophy does actually not agree with shaping propositions before the data analysis. Eisenhardt avoids preordained hypothesis or propositions in order to retain theoretical flexibility but even she accepts a priori constructs (Ibid.). According to Yin (1994), propositions direct the attention to the topic that should be examined within the scope of the study. They may reflect important theoretical issues and point out where to look for relevant evidence. In this thesis, the propositions have been made especially for this directive purpose, and the research process applied looks as shown in Table 2.

Table 2: Process of building theory from case study research (applied from Eisenhardt 1989; Yin 1994)

Research phase	Step	Activities
Research design	Getting started	Definition of the research questions A priori constructs and propositions
	Selecting cases	Specified population Theoretical, not random, sampling
	Crafting instruments and protocols	Multiple data collection methods Preparation of the case-study protocol Finalizing the research design
Data collection	Entering the field	Conducting a pilot case study Overlap data collection and analysis, including field notes
Data analysis	Analyzing data	Detailed case-study write-ups from each site With-in case analysis Cross-case pattern search using divergent techniques
	Shaping propositions	Iterative tabulation of evidence for each construct Replication, not sampling, logic across cases Verification of a priori propositions
	Enfolding literature	Comparison with conflicting literature Comparison with similar literature
Composition	Reaching closure	Theoretical saturation when possible Composition of the case report

Multiple-case study typically provides a stronger base for theory building than a single-case study (Yin 1994), and replication logic is central to the method (Eisenhardt 1989). Therefore, a multiple-case study of four (4) separate cases was conducted, one of which was a replication case. The case studies were carried out by semistandardized interviews (Smith 1975) to which Hirsjärvi & Hurme (2001) refer as *theme interviews*. Theme interview is a semistructured method in a way that the subject matters, themes, are known but the form and order of questions characteristic of structured interviews are not pre-defined. The method fits especially well into situations where it is important to capture a deep and extensive understanding about the phenomenon under research but, at the same time, interviewees' reactions should be as specific as possible. (Ibid.) This is why theme interviews were selected in this study.

Since both Eisenhardt and Yin underscore the importance of multiple data collection methods validity-wise, the data collected by interviews was deepened by using structured construct connection assignments where the interviewees drew links between different constructs that had been gathered a priori based on previous literature. On the whole, the tactics used in this thesis to ensure research quality are summarized in Table 3. The tactics are based on those presented by Yin (1994) and Eisenhardt (1989). Having these tactics been used in this study, the validity and reliability can justifiably be argued to be good.

Table 3: Case study tactics used in this study to ensure research quality

Test	Definition	Case study tactic	Phase of research in which the tactic occurs
Construct validity	Establishing correct operational measures for the concepts being studied	Use multiple data collection methods Have key informants review draft case study report	Research design Composition
Internal validity	Establishing a causal relationship, whereby certain conditions are shown to lead to other conditions	Use pattern-matching Compare with conflicting literature	Data analysis
External validity	Establishing the domain to which the findings of a study can be generalized	Use replication logic Specified population	Research design
Reliability	Demonstrating that the operations of a study can be repeated, with the same results	Use case study protocol	Data collection

1.5 Structure

The structure of this study is illustrated in Figure 3. The study is composed of five main chapters. First, the scope and boundaries of the study are described in Chapter 1: Introduction. This includes an overview of related background, research motif, and research methods. The research questions and propositions set for this study are also defined in the first chapter.

Next, the theoretical aspects of GSS workshop design are presented and discussed in Chapter 2. This chapter has been divided into four parts explaining 1) the context; 2) the object; 3) the actor; and 4) the structure and dynamics of GSS workshop design. In these parts, theories of GSS and facilitation, collaboration engineering, and systems design are investigated in order to catch a comprehensive view of the related research done to date. The aim of the chapter is to clearly define relevant concepts, and to justify the research propositions set for this study through understanding the structure and dynamics of design and through gathering the key success factors of GSS workshops.

After the goal, scope, and theoretical background of the study have been introduced, the empirical part of this study is presented in Chapter 3: Case study: designers' perspective. In this chapter, the testing and verification of the research propositions are explained. The chapter includes an in-depth description of research methods; the analysis of the results; and the discussion between the empirical results and theoretical propositions derived from previous research.

Finally, the results of the study are concluded in Chapter 4: Implications and conclusions. In that chapter, a model for effective design of GSS supported workshops is presented based on the research findings presented in previous chapters. Then, the presented model is evaluated and some suggestions for further research are discussed. As a final point, the whole study is summarized in Chapter 5.

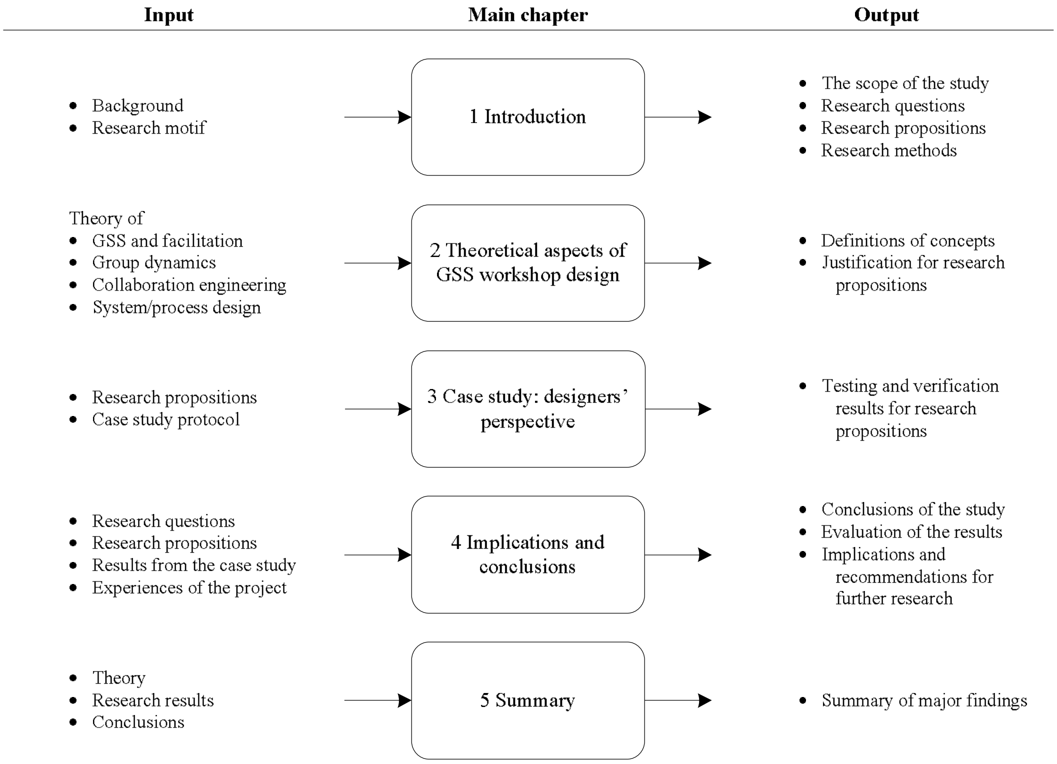

Figure 3: Structure of the study

2 THEORETICAL ASPECTS OF GSS WORKSHOP DESIGN

A designer is an emerging synthesis of artist, inventor, mechanic, objective economist and evolutionary strategist.
—R. Buckminster Fuller

The topic design has been discussed in many disciplines such as general design methodologies (Simon 1996), design theories (Braha & Maimon 1997; Bayazit 2004), engineering design (French 1994; Pahl et al. 1996), and management design (Davenport & Short 1990). This wide spectrum of viewpoints indicates the versatility of such a phenomenon. Webster's Encyclopedic Dictionary (1994) defines design as "to prepare the preliminary sketch or the plans for a work to be executed, esp. to plan the form and structure". Kolfschotten (2007, 16) defines design in the context of Collaboration Engineering as "to create, document and validate a prescription for a collaboration process". In this master's thesis, the design of GSS supported collaborative workshops is studied. This chapter outlines the theoretical background regarding to GSS workshop design. The structure of this chapter follows the framework structure presented by Dorst (2008) according to whom, in order to understand a complex creative endeavor like design, the elements of such a descriptive framework would be

- the context in which the activity takes place
- the object of this activity, i.e. the design problem and the emerging design solution
- the actor, i.e. the designer, and
- the structure and dynamics of the complex of activities that is being studied, i.e. the design process.

2.1 Context: GSS

Group Support Systems (GSS) are a group of collaboration technologies designed to support group work and meetings. As this study examines how facilitators design collaborative workshops supported by GSS, it is worth starting with a closer look at the underlining terms of ‘group’, ‘collaboration’, and ‘GSS technologies’. Therefore, this chapter presents the definitions for those terms and highlights the benefits and pitfalls of using GSS as collaboration support, thus providing with the basic understanding about the contextual background of GSS workshop design.

A group is a band of people that can somehow be connected with a term ‘group’. The connection may be rather weak and accidental such as a band of people standing at the same bus stop or stronger and more conscious such as a band of people setting up the walls to a building. In the context of GSS and this study, a group has that stronger meaning: a group that meets in a GSS supported workshop forms a team with shared goals and predetermined time of collaboration. Therefore, a group is defined with the definition of a team provided by Salas et al. (1992 as quoted in Mathieu 2000):

> *A group is a distinguishable set of two or more people who interact, dynamically, interdependently, and adaptively toward a common and valued goal/objective/mission, who have each been assigned specific roles or functions to perform and who have a limited life-space of members.*

According to this definition, a group is interacting toward a common goal, i.e. they are collaborating. Wood & Gray (1991) emphasize shared rules as the enabler of such an interaction by defining: ”Collaboration occurs when a group of autonomous stakeholders of a problem domain engage in an interactive process, using shared rules, norms, and structures, to act or decide on issues related to that domain.” The definition provided by Elliott (2007) adds to this definition by considering collaboration as a process with some inputs and outcomes which are central to GSS workshops:

> *Collaboration is the process of two or more people collectively creating emergent, shared representations of a process and or outcome that reflects the input of the total body of contributors.*

Turban et al. (2004) define group support systems (GSS) broadly as any combination of hardware and software that improves group work and helps groups in their unstructured or semi-structured problems such as communication or decision making. Huber et al. (1993) describe GSS as “a collective of computer-assisted technologies used to aid group efforts directed at identifying and addressing problems, opportunities and issues”. Also a time/place dimension is closely related to GSS (DeSanctis & Gallupe 1987): GSS can be used in the face-to-face environment where a group gathers together into a single meeting room, or they can be used in the different time and/or different place environment where a group shares the information with the help of the system memory and network connections without the need for everybody gathering together at the same time and/or to the same place. In this study, the examination of GSS usage is limited to the face-to-face environment, and GSS is defined and referred to as

> *a collective of computer-assisted technologies used to support group collaboration in face-to-face meetings.*

The components of GSS are listed in Table 4. In addition to the technologies, understanding the role of the people by whom and the procedures by which the system is utilized are of central importance in GSS usage.

Table 4: The components of a GSS (Turban and Aronson 2001)

The components of a GSS	Includes
Hardware	PCs or keypads Networks Decision room, distributed GSS Additional technology: data projector, videoconferencing cameras
Software	An easy-to-use and flexible interface Modules to support the individual, group, process and specific tasks Numerical or graphical summarization of issues and votes Anonymous data recording Text and data transmission among the group members e.g. GroupSystems.com. Facilitate.com, Meetingworks
People	Group members, chairman, technical facilitator People contribute information to decision making – not the system Selection of right group members
Procedures	Ensuring ease of operation and effective use of the technology A set of rules allowing the definition and control of a group meeting plan The importance of agenda and pre-planning of the meeting: the meeting process forms the foundation for the matter to be dealt with Different procedures for different meeting environments (f-to-f, asynchronous…)

In GSS literature, GSS usage is generally justified by its improving effect on group meetings (Davison 1997). Elfvengren et al. (2003) found that the efficiency and effectiveness of group work examined in their various GSS workshops was enhanced by GSS characteristics that enable different experts to simultaneously collect and structure large amounts of statements; to comment and clarify ideas anonymously; to organize the collected information into illustrative categories; and to prioritize the information and rapidly recognize conflicting and jointly important opinions. These findings are well in line with the general advantages of using GSS listed in Table 5. As a workshop designer introduces his/her customer with the GSS concept, these are the benefits that are, along with real case examples, worth underscoring.

Table 5: Benefits of using GSS, and how the designer is committed to them (Jessup & Valacich 1999; Weatherall & Nunamaker 1995; Turban et al. 2004; Kolfschoten 2007a)

GSS feature	Description and advantages	Outcome	Designer's task
Process structuring	Keeps the group on track and helps them avoid diversions *clear structure of the meeting; improved topic focus; systematical handling of meeting items*	Shorter meetings	Activity decomposition and agenda building *design the process for the meeting*
Goal oriented process	Aids a group to reach its goals effectively *process support facilitates completing the tasks; discussion seen to be concluded; electronic display makes the commitments very public*	Improved quality of results Greater commitment Immediate actions	Task diagnosis and activity decomposition *define the goal and build an effective process to reach the goal*
Parallelism	Enables many people to communicate at the same time *more input in less time; reduces communication dominance by the few; opportunity for broader, equal and more active participation; participation and contribution at one's own level of ability and interest; electronic display distributes data immediately*	Shorter meetings Improved quality of results	Activity decomposition and technique choice *choose appropriate tools to use in each activity*
Group size	Allows larger group sizes *makes it possible to use tools for the effective facilitation of a larger group; enhances the sharing of knowledge*	Greater commitment	Task diagnosis *decide for group size and composition*
Group memory	Automatically records ideas, comments and votes *instantly available meeting records; records of past meetings available; complete and immediate meeting minutes*	Better documentation Immediate actions	Technique choice *take advantage of past process prescriptions; choose appropriate tools (e.g. voting tool) to use*
Anonymity	Members' ideas, comments and votes not identified by others *a more open communication; free anonymous input and votes when appropriate; less individual inhibitions; focus on the content rather than the contributor; enhanced group ownership of ideas*	More/better ideas Greater commitment	Task diagnosis and technique choice *make out whether anonymity is needed or not*
Access to external information	Can easily incorporate external electronic data and files *integration with other data systems; effective sharing of needed information*	Easier to justify the acquisition of the system	
Data analysis	The automated analysis of electronic voting *voting results focus the discussion; software calculates e.g. the average and standard deviation of the voting results*	Shorter meetings Better documentation	Technique choice and agenda building *plan for data analysis*
Different time and place meetings	Enables members to collaborate from different places and at different times *offers means for remote teamwork*	Reduced travel costs Time savings	Task diagnosis and technique choice *choose the best-fit time/place meeting framework*

Interestingly, these benefits, although continuously repeated in GSS literature, are not consistently proved. Since many meeting problems originate from poor planning and facilitation (e.g. Jessup & Valacich 1999; Nunamaker et al. 1997), it is obvious that the benefits have not always been fully exploited during the GSS workshop design. Reported problems in planning and facilitation such as failure to develop a meeting plan; poorly defined goals; failure to organize and analyze ideas and votes efficiently; and non-productive time in meetings, clearly indicate failure in taking advantage of GSS features during the design. Therefore, designer's tasks (from Kolfschoten et al. 2007a) regarding to each GSS feature are also outlined in Table 5.

According to Davison (1997), meeting support should be approached from the perspective of identifying meeting processes critical to its success. Then, the identified processes define the need for more focused support, possibly through a GSS; otherwise a GSS can constrain a group due to its overly restrictive technological protocols (Ellis et al. 1991). Elfvengren et al. (2003) list the GSS features and limitations to be taken into account when planning a face-to-face GSS supported meeting as follows:

- meeting agenda and timetable requires careful planning
- right questions for each phase of the meeting
- verbal (discussion on large amount of ideas) and non-verbal (typing speed) communication can easily take more time than expected
- non-verbal communication reduces the information richness
- facilitation of the information created by a big group
- the important role of a chairman and a facilitator
- roles, expertise, and voting influence of the participants
- dispersion in the level and specificity of ideas
- awareness of the software features, limitations and possibilities.

2.2 Object: the design problem

Effective GSS workshop design aims at preparing a high-quality design for the workshop, thus ensuring workshop success. The objective of the design can be seen twofold: first, the prepared design needs to be of good quality, and second, the results of the workshop that follows the design need to be of good quality (Kolfschoten 2007). These objectives provide a starting point for understanding the actual design problem which is described in this chapter. The chapter proceeds by first presenting some basic definitions regarding to the GSS workshop design problem. Then, the quality of design and workshops are described, after which the design problem is outlined by presenting the causal connection between design and its results. Finally, literature findings about key workshop success factors are listed in order to provide with a basis for the empirical part of this study, where the aforesaid causal connection is tested in practice by determining how practicing designers consider the workshop success factors during their design process.

The design problem presented in this study is to design a GSS supported workshop. The terms ‘workshop’, ‘session’, and ‘meeting’ are regarded as synonyms in this study, and the definition for a session provided by Ellis et al. (1991) is used:

> *A session is a period of synchronous interaction supported by a groupware system. Examples include formal meetings and informal work group discussions.*

The task of a facilitator or collaboration engineer is to prepare and design the session beforehand. The resulting design is documented in an agenda, or a ‘process prescription’ as referred to in collaboration engineering literature, defined by Kolfschoten (2007, 16) as follows:

> *Collaboration process prescription is an artifact that defines the sequence and logic of a set of activities for attaining some set of goals, and the conditions under which these activities will be executed.*

Two major usages of a process prescription, i.e., an agenda, are (1) the ability to bring an issue to the attention of a group or team, and (2) the sequence of activities undertaken by a group toward performing a particular task (Niederman & Volkema 1996). The agenda may be a written out document or simply an intended plan that the facilitator decides to follow during the workshop. As various researchers note (e.g. Niederman & Volkema 1996; Kolfschoten 2007), the actual agenda conducted in a workshop may – and will – vary as a facilitator and group adjusts it during the meeting when new things come up or some activities take different amount of time than planned. The generic structure of the agenda for a GSS supported meeting usually follows a problem solving process as follows (Weatherall & Nunamaker 1995, 85):

1. define the problem
2. list possible solutions
3. list the advantages and disadvantages of each solution
4. agree criteria for evaluating solutions
5. prioritize solutions.

Such an agenda is the result of GSS workshop design. If the design is successful, "the session is likely to reach the goal that is set; the content of the questions per activity is unambiguous and clear; there is balance in the session between typing and talking; the session is adapted to the group's experience, competence, authority, etc.; the session can be executed within the timeframe; the steps in the process have a logic order and contribute to the goal; and there will be some level of consensus at the end of the session" (Kolfschoten & Veen 2005). These outline the factors according to which the quality of design can be assessed. As mentioned before, there are two viewpoints for determining the quality of design. According to Kolfschoten et al. (2007b), the first quality viewpoint, the quality of the prepared design, i.e. the agenda, can be inspected through five quality dimensions:

- efficaciousness (design fit to the goal)
- acceptance (design fit to the stakes)
- transferability (design fit to the ability of the practitioner and offers support for execution)
- reusability (design fit with available resources in each instance of the process)
- predictability (minimal difference between requirements and constraints at design time and during execution).

These dimensions are especially valuable when measuring the quality of a prepared design before the actual workshop. However, this study focuses more on the second quality viewpoint: the quality of results gained from the workshop where the prepared design has been followed. Such quality is the final goal of GSS workshop design. Hengst et al. (2006) identify the quality of workshop results with eight constructs which are listed and shortly explained in Table 6.

Table 6: Quality constructs for collaboration process according to Hengst et al. 2006

Quality construct	Explanation
Process effectiveness	how much useful output is produced with a given resource
Process efficiency	extent to which the actual outcomes of a session coincide with the planned or desired outcomes
Quality of results	amount of quality and creativity of the results measured by expert or participant evaluations
Quantity of results	quantity of results indicating the productivity of the collaboration process
Satisfaction	satisfaction with the meeting outcome and with the meeting process thus indicating the perceived net value of goal attainment
Usability	support system usability for the participants measured by ease of use, system satisfaction, usefulness, and willingness to work again
Individual objective	achievement of individual objectives, such as increased understanding of the task, new insights on the topic, and enjoyment
Social group objective	achievement of social group objectives, such as level of agreement, level of participation, level of interaction, strength of interpersonal relationships, and level of commitment, and level of consensus

The goal of GSS workshop design now determined, proceeding to the actual design problem is natural. A GSS workshop in aggregate is usually described with an input-process-output model in GSS literature (Nunamaker et al. 1991). This model is presented in Figure 4 according to Kolfschoten et al. (2007a) who identify four types of inputs and two types of outputs in a GSS workshop. The inputs are the resources and constraints that form the starting point and possibilities for the workshop. The process includes the issues such as facilitation and workshop process structure that exploit the inputs in order to produce desired outcomes. The outputs describe the task related outcomes such as quality and quantity of results and the social outcomes such as satisfaction and social group objectives.

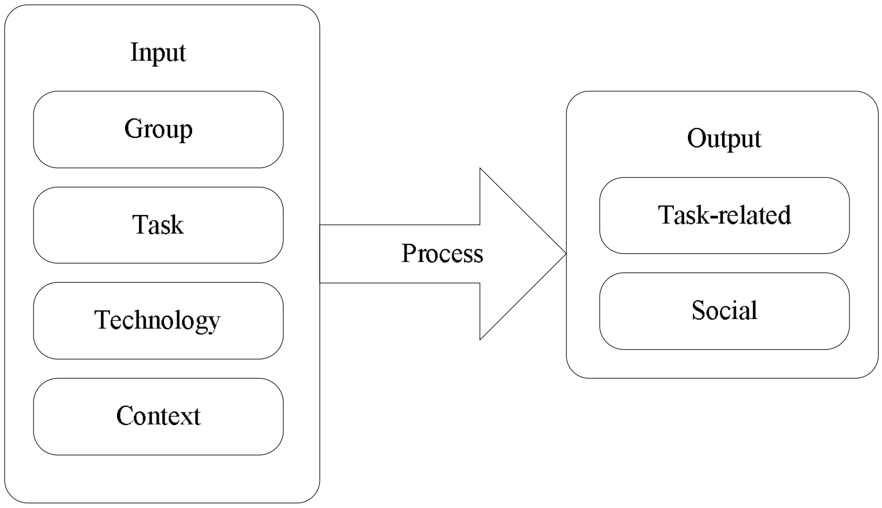

Figure 4: Input-process-output model (Kolfschoten et al. 2007a)

From the design point of view, input-side is the most interesting part of this model. According to Kolfschoten et al. (2007a), the following four characteristics describe the input:

- *Group characteristics* including group size, group proximity, time, composition, and cohesiveness
- *Task characteristics* including the activities to accomplish the task and task complexity
- *Technology characteristics* including anonymity, group memory, speed, media characteristics, and user friendliness
- *Context characteristics* including organizational culture, time pressure, evaluative tone, and reward structure.

To form a comprehensive illustration about the variables influencing GSS meeting success and desired outcomes, a literature research on theory of meeting satisfaction and technology acceptance was conducted for this study. The results are presented in Table 7 where an ‘x’ indicates that the concerned study uses the concerned factor to describe or measure the meeting input or outcome. The measures and variables were roughly organized by the input-process-output model presented above. However, it is worth noting that no single model found from the literature includes all of these factors at a time.

Table 7: Literature findings about the variables and outcomes of meeting success

	Brigss et al. 2003a	Briggs et al. 2006b	Brodbeck & Greitemeyer 2000	Davison 1997	Griffith et al. 1998	Hackman 1987	Limayem et al. 2006	Reinig 2003	Reinig et al. 2007	Shirani et al. 1998	Yuchtman & Seashore 1967
Dependent (meeting outcomes)											
Consensus							x			x	
Meeting productivity, decision time							x				
Organizational efficiency and effectiveness, group performance			x	x	x	x				x	x
Ownership of results				x							
Perceived quality (validity and trustwothiness) of results/outcome				x			x		x		
Satisfaction with meeting outcome	x	x		x			x	x		x	
Satisfaction with meeting process	x	x		x			x	x		x	
Mediating (meeting process attributes)											
Discussion quality/amount				x							
Faithfulness of appropriation							x				
Group synergy						x					
Relative individual goal attainment (RIGA)	x	x		x				x			
Shared/common purpose and team spirit				x							
Independent (meeting inputs)											
Adoption of correct practices (information system included)			x			x					
Cost of participantion	x	x				x		x			
Facilitator expertice, guidance					x		x				
Facilitator influence				x	x						
Group composition and homogeneity				x		x					
Group goals (implicit) (group task included)						x					
Group interaction			x								
Group norms						x					
Group size				x		x					
Habituation to electronic communication											
Habituation to group work				x							
Incentive alignment for participation										x	
Individual ability to communicate				x							
Individual goals	x		x								
Motivation to participate			x			x					
Participants ability to assimilate and process information			x			x					
Participants ability to exloit new information and learn			x								
Perceived value of goal attainment		x						x			
Place/time				x							
Planning and organization of the sessions						x					
Session goals (explicit/out-spoken)						x					
Support system features				x							
Task type				x		x					
Technology				x			x				

According to March & Smith (1995), constructs or concepts outline the vocabulary of a domain. Table 7 forms a relatively comprehensive vocabulary of meeting success but also provides a good starting point for understanding GSS workshop design. As the design problem is to build a successful workshop, the meeting inputs presented on the table should form the factors that are exploited in design: the designer should use these factors as resources, combining them in order to build a process that results in the solution of the workshop problem. For the purpose of structuring the data collection and analysis in the empirical part of this study, the inputs in Table 7 were organized according to Kolfschoten et al. (2007a) into task, group, technology, and context related factors added by the fifth factor group 'facilitation'. The success factors with their definitions are presented in Table 8.

Table 8: Key workshop success factors

	Success factor	Definition
Group	Ability to assimilate and process information	the extent to which participants are able to assimilate and process information
	Ability to communicate	the extent to which individual participants are able to communicate with each other
	Ability to exploit new information and learn	the extent to which participants are able to exploit new information and to learn
	Group composition and homogeneity	the extent to which participants' cultural background, gender, skills etc. resemble or differ from each other
	Group goals	implicit goals for the workshop set by participants
	Group interaction	the amount and quality of group interaction
	Group size	number of participants in the workshop
	Habituation to electronic communication	the extent to which participants are accustomed to using electronic devices for communication
	Habituation to group work	the extent to which participants are accustomed to working in a group
	Individual goals	individual participants' objectives for the workshop, ie. what participants wish to gain from the workshop
Task	Session goals	explicit, out-spoken goals set in coordination with the customer and the designer of the workshop
	Task type	the type of the task or problem to be solved during the workshop, e.g. ideation or selecting between different alternatives
Technol.	Support system features	general and special characteristics of different group support systems
	Technology	software and other technical facilities used during the workshop
Context	Cost of participation	the time and money spent by participants to the workshop
	Incentive alignment for participation	resources used to motivate participants to attend the workshop and to commit to the workshop goals
	Motivation to participate	the extent to which participants are motivated to commit their resources for goal achievement
	Perceived value of goal attainment	the extent to which participants value attaining the goal of the workshop
	Place and time	the place where and the time when the workshop takes place
Facilitation	Adoption of correct practices	the extent to which the good practices gained from past workshops can be applied to the workshop
	Facilitator expertise	the amount of expertise that facilitator has attained during his or her past workshops
	Facilitator influence	the amount of facilitator influence before, during, and after the workshop, ie. the role of facilitator

2.3 Actor: the designer

In order to fully understand GSS workshop design, a closer look at the design actor, facilitator, is needed. A world leading facilitation training organization MG Rush (2009) defines a facilitator simply as “a neutral leader who makes a process easier, e.g., a session leader”. Making a process easier requires the facilitator to be prepared. Preparation and design are some of the key tasks conducted by a facilitator (Nunamaker et al. 1997; Vreede et al. 2002). This chapter presents the roles and characteristics of a designing facilitator, thus providing with the framework for understanding the role of GSS workshop designers, and with the reasoning of how their experiences may add to facilitation-related literature.

The importance of GSS workshop designers is often highlighted in GSS literature (Niederman et al. 1996). Several authors have described the abilities and behaviors required to best facilitate group work. Clawson & Bostrom (1993) presented the tasks of facilitator in sixteen dimensions. Burns (1995) presented the facilitator skills with a matrix of facilitator competencies on one axis and eight facilitation domains on the other axis. Ackermann (1996) distributed the skills and behaviors into three meeting stages: pre-, during, and post-. Niederman et al. (1996) produced a list of key characteristics of the facilitator. In the Collaboration Engineering approach, the facilitator role is split up into the designer and executor. Using this division, Macaulay et al. (2006) present the tasks of the facilitator as summarized in Table 9.

Table 9: Facilitator's tasks split up in design and execution tasks (Macaulay et al. 2006)

Layers model	Collaboration engineer	Practitioner
Environment	Set environmental requirements	Planning, preparing and handling logistics
Technology	Selecting and preparing Appropriate technology	Operating and preparing technology
Activities	Selecting, preparing and scripting appropriate group activities	Executing script
Methods	Select, prepare and transfer appropriate methods	Executing script
Content	Indicate where content information should be inserted	Present, integrate and summarize information
Personal	Train practitioner	Preparing the facilitation role and being self-conscious
Social	Create participant and organization profile and make design fit	Dealing with group dynamics and conflict
Political	Understanding different stakes accommodate where possible	Dealing with politics

Facilitator's role is thus a complex aggregate of tasks and requirements that need to be met. To make MG Rush's short definition of a facilitator more concise, the definition provided by Kolfschoten et al. (2004) is used:

> *A facilitator creates a dynamic process that involves managing relationships between people, tasks, and technology, as well as structuring tasks and contributing to the effective accomplishment of the meeting's outcome.*

The follow-up definitions for a collaboration engineer and practitioner are then (Ibid.):

> *A collaboration engineer designs a collaboration process in a way that it is transferable to a practitioner. This means that the practitioner can execute the process without any further support from the collaboration engineer, not from a professional facilitator.*

A practitioner is a domain expert who can facilitate a single team process as a team leader in this particular domain. A practitioner does not design such a process. Rather (s)he executes a team process designed by a collaboration engineering.

This role separation is presented in Figure 5. The difference between "normal" facilitation and collaboration engineering approaches is in facilitation role specialization and design repeatability. The designer's area of interest is marked out with a dashed line. Designer's task is to prepare and design the process. As can be seen, this task is executed by both a "normal" facilitator and a collaboration engineer, which is why the design best practices gathered from "normal" facilitators in this study can provide support also for collaboration engineers.

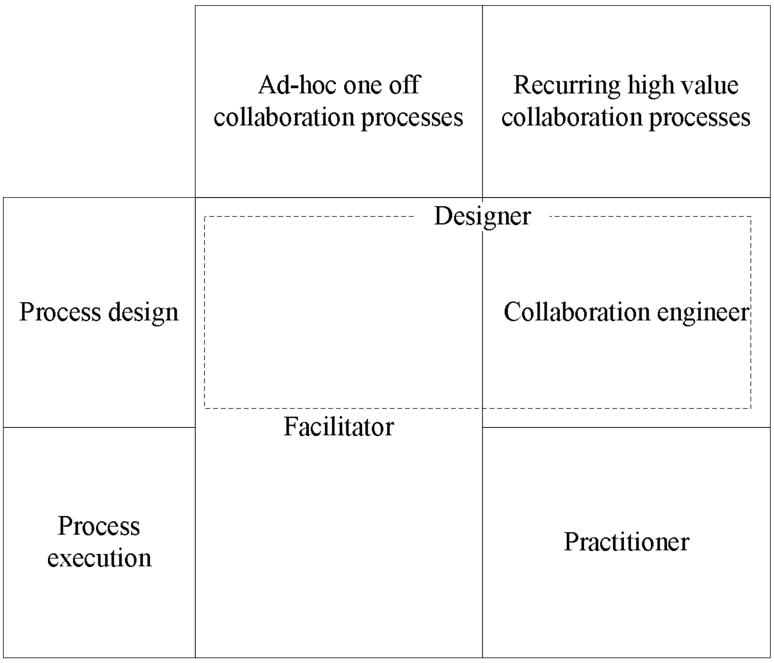

Figure 5: Collaboration support strategies: designer's role (strategies derived from Kolfschoten 2007)

2.4 Structure and dynamics: the design process

Although facilitation effects, including those of design of collaboration processes, have been widely researched, there is a dearth of knowledge about how facilitators conduct design. Traditionally, professional facilitators tend to focus on ad hoc processes that they design by themselves while the experience of designing collaboration processes remains as tacit knowledge and experience of facilitators. (Vreede & Briggs 2005; Kolfschoten et al. 2007a) This study explores collaboration process design as a process of combining a large amount of design related information –inputs – in order to produce a successful meeting – an output. The process inputs and outputs were examined in Chapter 2.2. This chapter reports the design approaches presented in prior literature, thus providing the basic framework on the structure and dynamics of the design process.

Design approaches have been widely studied in several disciplines such as engineering, management, natural sciences, and architecture (Braha & Maimon 1997; Lang 2006; Galle 2008). The general structure of engineering design process models is comprised of the phases of establishing a need; analysis of task; conceptual design; embodiment design; detailed design; and implementation (Howard 2008), and the design process is usually iterative and reflective of its nature (Zimmerman et al. 2007). Some design approaches for GSS include (Antunes et al. 1999; Dennis & Wixom 2002; Goncalves & Antunes 2000; Sheffield 2004; and Wheeler & Valacich 1996). Collaboration engineering approach strives for designing and deploying re-usable collaboration processes for high-value collaborative tasks. Design in the context of collaboration engineering is shown in Figure 6. As can be seen, the field interviews and design phase together form a very similar process structure as the before described general engineering design process.

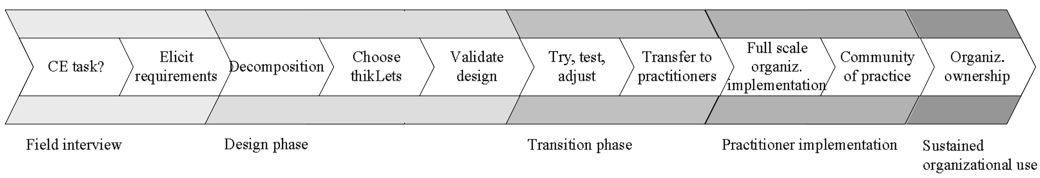

Figure 6: Collaboration engineering approach (Santanen et al. 2006)

In this study, the design process is examined based on the structure model provided by Kolfschoten & Vreede (2007) (Figure 7). This process model describes specifically the design process of a collaboration engineer. However, this model is based on the design practices of "normal" GSS workshop facilitators and can be easily generalized to the design conducted by all kinds of designers (see Figure 5), which is how the model is used in this thesis. In the figure, the blocks in the middle represent the design steps conducted during the design effort. The external inputs are listed on the left. Design documentation that is a continuous activity across the design process is displayed in the background. Black arrows in the figure represent the iterative nature of the design effort. Next, the design steps are described in more detail. The descriptions are based on Kolfschoten & Vreede (2007) and Kolfschoten (2007); some other sources used are identified inside the descriptions.

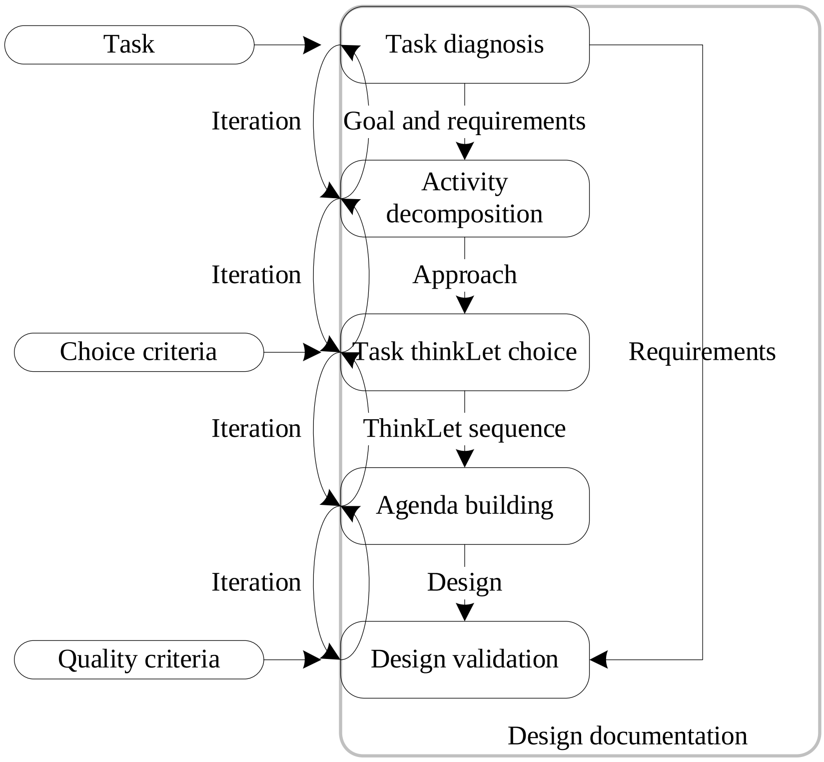

Figure 7: Overview of the Collaboration Engineering design approach (Kolfschoten & Vreede 2007)

2.4.1 Step 1: Task diagnosis

Kolfschoten includes in task diagnosis the following actions:

- task analysis: goal, deliverables, and objectives
- stakeholder analysis: group, stakes, roles, and needs
- resource analysis: time, knowledge, effort, and physical resources
- practitioner analysis: skills, experience, personality, domain expertise.

Task analysis is the cornerstone of the design effort. If it is done incorrectly, the session cannot be successful since the process will create wrong deliverables or meet different objectives than the stakeholders had in mind. In task analysis, the aim is at defining the goal of the session explicitly and as clearly as possible. The goal may be a solution, decision, or analysis.

Stakeholder and resource analysis are done in order to understand the settings of the session. The designer strives for customizing the process description according to the stakeholder characteristics, and thus to increase commitment of resources and acceptance of the process and results. In resource analysis, a time frame, resources, technology, and budget are determined, after which the optimal use of the available resources can be planned.

Practitioner analysis is linked to collaboration engineering where a collaboration engineer designs the process prescription for repeatable use of practitioners. Therefore, the users of the prescription need to be determined in order to build as useful and understandable prescription as possible. As the design process is studied in this thesis more generally, assuming that the user of the design results is usually the designer himself, this part of the analysis is not relevant for this thesis.

2.4.2 Step 2: Activity decomposition

As the task goal and requirements have been defined, the process of executing the task needs to be determined. Therefore, the task needs to be further analyzed and decomposed into activities. First, the designer should check if the organization already has a pre-defined way of performing the task and if that could be used as a basis for building the collaboration process. If no pre-defined process can be found, the standards in the literature may provide a basis for the activity decomposition. If the process is first of its kind, a new process needs to be determined.

As the basic process and deliverables are determined, the process must be further decomposed in smaller steps in order to form a detailed description on the activities needed during the process. On this stage, CE researchers recommend using *patterns of collaboration* (Vreede & Briggs 2005). Patterns of collaboration characterize how people move through the phases of goal attainment. The patterns of collaboration are (Briggs et al. 2005; Briggs et al. 2006a)

- **Generate**: Move from having fewer to having more concepts in the pool of concepts shared by the group
- **Clarify**: Move from having less to having more shared understanding of concepts and of the words and phrases used to express them
- **Organize**: Move from less to more understanding of the relationships among concepts the group is considering
- **Evaluate**: Move from less to more understanding of the relative value of the concepts under consideration
- **Build consensus**: Move from having fewer to having more group members who are willing to commit to a proposal.

These patterns describe the generic activities that can be recognized during the activity decomposition.

2.4.3 Step 3: Task thinkLet choice, i.e. technique choice

The next step in Kolfschoten's design process model is thinkLet choice where the decomposed activities are matched with thinkLets. ThinkLets are "codified facilitation interventions in a group process to create desired patterns of collaboration" (Briggs et al. 2001, Vreede et al. 2006). They are designed to be used as building blocks in the workshop design (Kolfschoten et al. 2004). A thinkLet includes the information about the activity and desired deriverables to which it fits, and defines the rules for facilitation techniques to be used to accomplish the activity. In general, the design step 3 can be interpreted so that the designer needs to match the activities with available facilitation techniques, and we can thus call this step "Technique choice". Choosing right thinkLets or techniques is a complex task since many factors influence their fit to each activity (Kolfschoten & Rouwette 2006). The designer needs to take into account the requirements and limitations set by the task, stakeholder characteristics, and available resources, as well as to understand how different thinkLets or techniques match with each other, i.e. the feasible sequence of activities (Ibid.).

2.4.4 Step 4: Agenda building

A sequence of activities is not yet a complete agenda of the workshop. Additional steps are required to specify all information for each activity and to build the final agenda. The activities, inputs, tasks, and deliverables, as well as required time and other resources of each activity need to be determined. Besides the main activities, the breaks, presentations and other supportive activities need to be decided.

2.4.5 Step 5: Design validation

Kolfschoten presents four ways to validate the design: pilot testing, walk-through, act it out, and expert evaluation:

- **Pilot testing**: The designed workshop is implemented in a small scale allowing the designer and team members to assess the quality of the process.
- **Walk-through**: The process is read and/or discussed through by the designer and the customer or a few of the participants in order to recognize possible pitfalls and difficulties of the process.
- **Act it out**: The design is simulated by the design team, trying to answer the questions posed, and considering if these answers can be used in the next activity. This can be done using role-playing.

- **Expert evaluation**: The designer discusses about his design with other colleagues in order to find better solutions for difficult activities and certain challenges.

3 CASE STUDY: DESIGNERS 'PERSPECTIVE

> *You never know when you read a script how it's going to turn out because so much depends on the collaboration between people. If I'd been in some of the movies I turned down, maybe they wouldn't have been a success.*
> *—Molly Ringwald*

The empirical inquiry of this study includes a multiple-case study conducted among 12 collaboration process designers, through which the design factors and their role in design thinking are assessed. The GSS workshop characteristics as well as the design process presented in previous chapter provide a starting point for the empirical part. This chapter introduces first the four case studies that form the empirical evidence of this study. Then, the methods how the case study data was gathered and analyzed are presented. Finally, the findings are presented regarding to the content, importance, and order of the design factors occurred in the case studies.

3.1 Introduction of the cases

This study was conducted using a descriptive multiple-case study method. The study consists of four separate cases which are introduced in this chapter. The data for the cases was gathered by semi-structured interviews and construct connection assignments which will be described further in more detail.

The interviewees for the cases were selected with the help of GSS researchers at Lappeenranta University of Technology (LUT). The main criterion for selection was that an interviewee had experience in workshop design; the experience in actual facilitation of workshops was not considered vital although most selected interviewees also had a significant facilitation experience. Interviewees represented three different GSS laboratories: laboratories at LUT, Helsinki School of Economics (HSE), and Kouvola Region Expertise Center (KREC). As the practical goal of this study was to collect and document the expertise in workshop design at the GSS laboratory of LUT, all main facilitators of that laboratory were selected. The other two laboratories were chosen as points of comparison. In addition to the most experienced workshop designers, some less experienced designers were selected in order to capture a wider range of different views on the design topic.

A summary of the interviewees – their professions, degrees, and years of experience in GSS workshop design – is shown in Table 10.

Table 10: Interviewees classified

Interviewee ID	Profession and degree	Experience (# of workshops)	Experience (years)
Case 1: Experienced			
C1A	Professor, Ph.D.	20	1994-2008
C1B	Senior Manager, M.Sc.	20-30	2005-2006
C1C	Senior Assistant, Ph.D.	ca. 100	1999-2008
C1D	Professor, Ph.D.	30-40	1997-2001
C1E	Manager, Ph.D.	30-50	1994-1998
C1F	Assistant, M.Sc.	30-50	2004-2008
Case 2: In-experienced			
C2A	Manager, M.Sc.	2	2008
C2B	Development Manager, M.Sc.	10	1998-2008
C2C	Research Assistant, M.Sc.	2	2002
C2D	Director, M.Sc.	10	1995-2008
Case 3: Replicated			
C3	Assistant Professor, Ph.D.	50	2003-2008
Case 4: Consulting			
C4	Trade Manager, M.Sc.	90	2005-2008

As can be seen, the interviewees formulate four separate cases. The first case, Case 1: Experienced, consists of six (6) experienced workshop designers mainly from the GSS laboratory of LUT. The second case, Case 2: In-experienced, consists of four (4) in-experienced workshop designers from the same laboratory.

The distinction between experienced and in-experienced designers was defined so that designers with experience in more than ten workshops were considered as experienced.

The third case, Case 3: Replicated, is a replication of Case 1 in a way that it consists of an experienced workshop designer in the same kind of a research intensive environment as in Case 1, but the GSS laboratory is different (the GSS laboratory at HSE). The last case, Case 4: Consulting, gathers workshop design experience from a laboratory completely focused on consulting in contrast to the first three cases. The differences and similarities of the four cases are summarized in Table 11. More detailed descriptions of each case follow.

Table 11: Summary of the cases

Case	C1	C2	C3	C4
# of interviewees	6	4	1	1
Amount of experience	high	low	high	high
Starting point for workshops	research	research	research	consulting
Main GSS laboratory	LUT	LUT	HSE	KREC

3.1.1 Case 1: Experienced

Case 1 consists of experienced workshop designers from the GSS laboratory of LUT[1]. Two of them have master's degree and four of them doctor's degree in science. All of them have a strong experience in both the design and facilitation of GSS workshops. The workshops at LUT are mainly arranged for teaching and research purposes. The customers of the laboratory come from inside the university as well as different companies. The laboratory has especially close cooperation relationship with companies from forest, metal, and ICT industries.

[1] Interviewee C1B has actually worked at KREC but was selected to Case 1 because his reflections on GSS workshop design were highly emphasized by the experience gained from the workshops conducted during his master's research project done to LUT.

Some of the main topics of the workshops have been customer need assessment and ideation and selection of product/service concepts.

The GSS laboratory at LUT, a single meeting room, has been designed to support up to ten-person electronic workshops but also bigger groups have met there as the workstations have been shared in pairs. A horseshoe-shaped conference table that houses ten PCs for the participants hidden inside the table as well as different kinds of meeting room equipment, such as data projectors and touch-sensitive projection screens called SmartBoards, are specifically designed to support GSS workshops. The GSS laboratory at LUT uses several different GSS software but the main software is GroupSystems that contains all general characteristics of GSS software.

3.1.2 Case 2: In-experienced

Case 2 consists of four workshop designers with relatively little – less than 10 workshops – experience in GSS workshop design. All of them have master's degree in science. This case has been taken into this study in order to understand possible differences in the opinions of experienced and in-experienced designers.

All four designers interviewed for this case have gained their experience from the GSS laboratory at LUT. The workshops have been about ideation, action plans, forecasting, and requirements elicitation etc. with companies from different business sectors such as forest, metal, and telecommunications. Both interviewee C2A and interviewee C2C have worked intensively with only a single project where GSS workshops have been used as support, so their views on GSS design are relatively narrow. The other two interviewees in this case have experience from several different workshops.

3.1.3 Case 3: Replicated

Case 3 presents the experiences gained in the GSS laboratory of HSE. The head facilitator that has been working for the laboratory since its establishment in 2003 was interviewed for this case. The interviewee has doctor's degree in economics and has experience in design and facilitation of about 50 GSS workshops. The customers of the laboratory have mainly been company partners in cooperation from different research projects. General workshop topics have been collaboration development between multiple companies and requirements specification for new technologies.

The GSS facilities at HSE differ slightly from those at LUT. Unlike at LUT, facilities at HSE are portable: the workshops can be arranged outside the laboratory since the laboratory uses laptops that can be carried with, and the used software enables also arranging workshops online through the internet. The main software in use is GroupSystems and Facilitate.Com. The number of laptops is 21 at HSE which is twice the number of PCs at LUT. Therefore, average workshop group sizes have been bigger at HSE.

Regardless of some differences, the starting point of this case is very similar to Case 1, and this case can be considered as a replication of Case 1. The idea is to evaluate if experienced GSS workshop designers in research-intensive environments have similar views on GSS workshop design independent of the GSS laboratory.

3.1.4 Case 4: Consulting

In contrast to the other three cases, Case 4 describes GSS workshop design experience in a pure consulting-intensive environment. The GSS laboratory at KREC has specifically devoted to helping small and medium size enterprises in their different kinds of decision problems, such as planning for company strategies and marketing actions. The head facilitator of the laboratory that has worked there since the laboratory was founded in 2005 was interviewed for this case. He has a strong design and facilitation experience of about 90 workshops.

The facilities and concept of the GSS laboratory at KREC resemble a lot the laboratory at LUT. The laboratory appearance looks a little different since, instead of a single conference table, there is a separate table with PC for each participant so that moving inside the room would be as easy and convenient as possible. The size of the room as well as the software used is still very similar to those at LUT. The possibility of using remote access inside KREC and thus of two groups working simultaneously in separate rooms has also been used a couple of times.

3.2 Data collection process

The data collection process was started with a careful preparation. Semi-structured interviews (Smith 1975), referred as theme interviews by Hirsjärvi & Hurme (1996), were selected as a suitable data collection method. Before conducting the interviews, a case-study protocol was written as recommended by Yin (1989). The protocol contained the data collection instruments – the theme questionnaire (Appendix 1) and the construct connection assignment (Appendix 2) – as well as the procedures and general rules that should be followed in using the questionnaire. All this was done in order to increase the reliability of the case study and to guide the interviewer in carrying out the case study.

The selection criteria for the interviewees are explained in Chapter 3.1. The selected interviewees were first contacted by email where they were asked to participate in the study and the purpose of the study was shortly introduced. All the interviewees asked gave an affirmative answer and the interviews were arranged to be conducted at the interviewees' own workplaces. The interviews containded four parts:

1. **Beginning,** which contained a short introduction into the interview and the explanation of the interviewee's design experience.
2. **Interviewee's own design process,** where the interviewee drew/wrote down his or her own workshop design process.
3. **Absorption in the themes,** where the key themes were talked through by following the design process drawn by the interviewee.
4. **Finishing,** where the interviewee was asked to fill in the construct connection assignment and to give final comments on what, in his or her estimation, are the key issues in design.

The theme questionnaire (Appendix 1) was used by the interviewer as a check-list of the key themes to be discussed during the interviews. Instead of following the order of the themes in the questionnaire, the discussion during the interviews was more directed by the interviewees and their own design processes. The construct connection assignment (Appendix 2) was used at the end of each interview. The interviewees were provided with a question: ”*The most important design tasks as well as different workshop success factors are presented in the figure [on the construct connection assignment]. In which design phase do you think the presented success factors must especially be paid attention to?*” after which the interviewees connected the tasks and success factors in the assignment.

All the interviews were audio recorded. The average duration of the recordings was 44 minutes, the shortest being 29 minutes and the longest 1 hour 6 minutes long. 4 out of 12 interviewees wanted to fill in the construct connection assignment outside the interview in order to be able to conduct the task at their leisure.

3.3 Data analysis

At the beginning of the analysis, all of the recordings of 12 interviews were transcribed. The focus in writing was on the context, not on the wordings of the interviews. Thus, the interviews were not copied absolutely word for word but rather sentence for sentence.

Next, the interviews were read through several times after which each interview was coded using (1) the pre-defined list of success factors gained from the understanding of previous literature (see Table 8 on page 24) and (2) a coding scale of 1 to 4. The scale numbers of coding stood for as follows:

1. Is not important factor and/or not mentioned
2. Is considered but has relatively small impact in design
3. Is important in design
4. Is one of the key factors considered

This scaling method was found to be the most appropriate since (a) this scale would clearly uncover the relevant differences between different interviewees and, at the same time, (b) more detailed scaling would be in danger of being too influenced by the feelings of the analyzer. During the coding of the results, the list of success factors was found to be commendable adequate; all the important factors found from the descriptions of interviewees' design processes could be coded using this list. The idea of coding the interviews was to understand, how each interviewee emphasizes different workshop success factors when describing their own design process. The table where these measures of importance are presented, is referred as "Table of Importance" in this study.

On the other hand, the construct connection assignments of each interviewee were also coded. First, the links from the forms were entered into a database. The final number of separate links was 407. After entering the links, the number of each link in construct connection assignments was presented by pivot tables with success factors in rows and design tasks in columns. This was done (1) for each case group (experienced, in-experienced, replicated, and consulting) separately, and (2) for all interviewees combined. These tables were then presented in percentages as shown in Appendix 3 and Appendix 4, each percentage figure describing how big amount of the interviewees within the case in question had drawn that link. The idea was to present the rate of incidence for each link in construct connection assignment, and thus to understand, in which design task(s) each success factor is especially important to consider according to different case groups. The tables, where these measures of incidence rates are presented, are referred as "Tables of Order" in this study.

Before the actual analysis, the success factors on all tables were organized into five groups using the division of Kolfschoten et al. (Figure 4) added by a separate group of "Facilitation". Thus, the final groups were "Group", "Task", "Technology", "Context", and "Facilitation". During analysis, factors "Group composition" and "Group homogeneity" were combined into a single factor

"Group composition" since the content of those two factors is greatly the same (this view is shared by all the interviewees).

3.4 Results

Next, the results of the case studies are presented regarding to the design steps that the interviewed collaboration process designers follow and the factors that are considered during the design steps.

3.4.1 Design order: assessing design steps

The design activities central to each interviewee's views on GSS workshop design are summarized in Table 12, which has been created according to the understanding gained from the interviews. As can be seen, the interviewees see the design as a problem-solving process where an expert facilitator helps the customer with the problem definition and solution building.

Table 12: How interviewees see GSS workshop design

Interviewee	Emphasized views on workshop design
C1A	Figure out the advantages and disadvantages of GSS, and build customer ownership for the session
C1B	Clarify the goal and steps to it for yourself and the customer
C1C	Help the customer build an agenda for solution
C1D	Tailor a pre-defined GSS process according to customer needs and gather a right mix of people for the workshop
C1E	Define the problem or task, and build an effective process to solve it
C1F	Define the goal clearly and build a successful process for solution
C2A	Choose a good mix of experts and design an efficient process in order to get most out of the experts in a limited time
C2B	Define the problem clearly and understand the limits of a single session, i.e. do not try to solve everything
C2C	Define the task/goal and participants and build a process for solution
C2D	Take advantage of using GSS for problem solving
C3	Present the customer with best practices and give different solution options for the customer to choose
C4	Consult the customer to find out a good agenda/process for the session

At the beginning of the interviews, the interviewees draw and/or wrote down their step-by-step views about the GSS workshop design process. These are presented in Table 13 along with Kolfschoten & Vreede's (2007) (K&V) design steps. The numbering of the steps tells their original order.

Table 13: Interviewees' workshop design processes presented according to Kolfschoten & Vreede's (2007) design steps

Interviewee	Steps of the GSS workshop design process				
	Task diagnosis	**Activity decomposition**	**Technique choice**	**Agenda building**	**Design validation**
C1A	1 Map out the problem 2 Validate GSS: strengths, weaknesses, limitations	3 Go through the experience/process bank 4 Design the GSS process and conduct preliminary testing ………………………………………….		5 Choose the participants and ensure their commitment	
C1B	1 Set-up: define the problem and team structure	2 Analysis: determine the steps	3 Adjustment: adjust the steps to available techniques ………………….		
C1C	1 Initial meeting: customer: the problem/need, designer: past experience and new ideas	2 Planning meeting ……………………………		3 Agenda: schedule and program ………….	
C1D	1 Customer contact 2 Begin the workshop design: definition	3 Build agenda …………………………………………………………………………………….		4 Send the invitations and homework	
C1E	1 Problem/topic 2 Define the starting point and goal, and assess if GSS is a good tool to solve the problem 3 Choose participants	4 Process: background information, preparations, homework ……………………………………			5 Follow-up after the workshop: evaluate benefits and feedback
C1F	1 Getting to know the customer 2 Short problem description 3 Understanding the resources: participants	4 Detailed problem analysis: clarify the goal 5 Process design ………………………………………………………………			6 Does it work?: go back to step 4 until the answer is yes 7 Code the design into the system
C2A	1 Set up the goals	2 Combine the process of solusion and GSS		3 Plan the schedule 4 Plan the votings etc. and test them	
C2B	1 Customer need definition: the goal 2 Participant definition 4 Division of the roles and work	3 Decomposing the workshop into steps: process and GSS tools		5 Practical arrangements	
C2C	1 Goal definition 2 Participant selection	3 Planning the process and stakeholder roles		4 Informing the participants about the agenda	
C2D	1 Problem description 2 Approach definition	3 Activity decomposition	4 Plan for using GSS tools	5 Specific plan for agenda	6 Iteration 7 Confirmation of the agenda and schedule 8 Sending the agenda and invitations to the participants
C3	1 Interview the customer	2 Examining possible agendas from literature and past workshops	3 Plan a draft agenda ………………………….		4 Introduce the draft to the customer 5 Introduce the new/final agenda to the customer and gain approval
C4	1 Initial meeting: define of goals and make the first proposal for the workshop process 5 The customer selects the participants and invites them to the workshop …………………………………………………………	2 Plan a draft agenda and ask the customer for comments …………….		3 Finalize the agenda	4 Going through the agenda with the customer

Table 13 reveals that the interviewees' design steps cover relatively well the design steps presented by K&V. Taking into consideration the iterative nature of design that appears in both interviewees' and K&V 's design descriptions, also the order of the steps can justifiably be argued to be similar. Thus, it can be concluded that the results of this study support the design model presented by K&V, and the model can be used to represent the design steps and their order in this study. The interviewees' activities in the five design steps are shortly described below.

Task diagnosis. All the interviewees recognized task diagnosis as one of the first and most important steps in their design process. The main activity was to define the goal, deliverables, and objectives, but also conducting the stakeholder analysis was mentioned by most of the interviewees.

The next three steps, activity decomposition, technique choice, and agenda building, were not always separated from each other in the interviewees' design process descriptions, the reason of which probably is the very iterative nature of the steps. However, the activities inside the steps can be found from the interviewees' descriptions.

Activity decomposition. During activity decomposition, the interviewees tried to fully understand the task and to find out a good solving model for it from the library of their past GSS workshop agendas or from the processes presented in the literature. **Technique choice.** Choosing appropriate GSS tools and techniques was done according to the task and customer needs using mostly the techniques tested and approved in their previous workshops. **Agenda building.** The whole plan for the workshop was finally summarized in an agenda which included the information about the step-by-step workshop process; used techniques; time usage; breaks; voting scales etc..

Design validation. The most popular technique to conduct design validation by the interviewees was walk-through. The agenda was finalized by asking the customer for comments and by reading and discussing through the agenda in order to find out its possible problems and weaknesses.

3.4.2 Design content: success factors and their importance

Interviewees' views on the role of different success factors during their design processes are summarized in Table 14. As mentioned before, these measures result from the interviews where each interviewee described their own workshop design process. The table shows which success factors each interviewee takes into account during their workshop design process, and how these factors are emphasized.

The table reveals clearly that similar patterns between different interviewees' opinions exist. These patterns and exceptions within the patterns will be examined next. In order to understand which success factors are truly significant in design according to this study, the average importance measures of all success factors are first examined, after which each success factor group is inspected in more detail.

Table 14: Interviewees' views on the role of different success factors during their design process

Success factor	C1A	C1B	C1C	C1D	C1E	C1F	C2A	C2B	C2C	C2D	C3	C4
Group												
Group goals	|	´	½	½	´	½	´	½	´	½	|	´
Group composition	½	|	½	|	|	|	|	|	|	|	€	€
Group size	´	½	´	€	½	½	½	€	´	´	½	´
Individual goals	´	´	´	´	´	´	´	´	´	´	´	´
Ability to exploit new information and learn	€	€	€	´	´	´	´	´	´	´	´	´
Group interaction	½	½	½	½	|	½	½	½	´	|	½	´
Ability to assimilate and process information	½	½	€	€	´	½	½	€	€	€	´	½
Ability to communicate	½	€	€	´	´	´	´	´	´	€	´	´
Habituation to electronic communication	´	€	´	´	´	´	´	´	´	´	´	´
Habituation to group work	€	´	´	´	´	´	´	´	´	€	´	´
Task												
Session goals	|	|	|	|	|	|	|	|	|	|	|	|
Task type	½	½	|	½	|	|	|	½	|	½	½	|
Technology												
Technology	´	½	½	½	½	€	½	½	½	½	|	½
Support system features	½	|	½	½	½	½	½	½	½	½	€	|
Context												
Perceived value of goal attainment	|	|	|	½	½	½	|	½	€	½	´	½
Cost of participation	´	´	½	€	´	´	|	½	€	´	´	€
Motivation to participate	|	|	´	½	´	|	|	´	´	½	´	½
Incentive alignment for participation	|	|	½	|	´	½	|	½	´	½	´	½
Place and time	€	€	½	½	€	½	½	½	€	½	½	€
Facilitation												
Facilitator expertise	½	|	|	½	½	½	½	€	½	½	½	|
Adoption of correct practices	½	½	½	|	½	|	½	½	|	|	|	½
Facilitator influence	€	€	€	€	€	€	€	½	€	½	½	½

| = is one of the key factors considered in design
½ = is important in design
€ = is considered but has relatively small impact in design
´ = has no effect in design / is not mentioned
C1A = case 1, interviewee A
Case 1 = experienced designers
Case 2 = inexperienced designers
Case 3 = experienced designers, replicated
Case 4 = consulting

First look at the importance measures

To identify unimportant success factors as well as the success factors over which the interviewees have highly divided opinions, the averages and standard deviations for the importance measures of different success factors were calculated. The results are shown in Table 15. When using 1,5 as the dividing line of unimportance, five unimportant success factors can be recognized: individual goals; ability to exploit new information and learn; ability to communicate; habituation to electronic communication; and habituation to group work (italicized in grey in Table 15). Standard deviations being relatively low for each of these success factors, it can be concluded that this view is shared by all the interviewees – and cases.

Table 15: Averages and standard deviations for the importance figures for different success factors in workshop design[2]

Success factors	Averages					Stdev
	Exper.	In-exper.	Repl.	Consult.	All	All
Group						
Group goals	2,5	2,0	4,0	1,0	2,3	1,2
Group composition	3,7	4,0	2,0	2,0	3,5	0,8
Group size	2,2	1,8	3,0	1,0	2,0	1,0
Individual goals	*1,0*	*1,0*	*1,0*	*1,0*	*1,0*	*0,0*
Ability to exploit new information and learn	*1,5*	*1,0*	*1,0*	*1,0*	*1,3*	*0,5*
Group interaction	3,2	2,8	3,0	1,0	2,8	0,9
Ability to assimilate and process information	2,3	2,3	1,0	3,0	2,3	0,8
Ability to communicate	*1,7*	*1,3*	*1,0*	*1,0*	*1,4*	*0,7*
Habituation to electronic communication	*1,2*	*1,0*	*1,0*	*1,0*	*1,1*	*0,3*
Habituation to group work	*1,2*	*1,3*	*1,0*	*1,0*	*1,2*	*0,4*
Task						
Session goals	4,0	4,0	4,0	4,0	4,0	0,0
Task type	3,5	3,5	3,0	4,0	3,5	0,5
Technology						
Technology	2,5	3,0	4,0	3,0	2,8	0,7
Support system features	3,2	3,0	2,0	4,0	3,1	0,5
Context						
Perceived value of goal attainment	3,5	3,0	1,0	3,0	3,1	0,9
Cost of participation	1,5	2,5	1,0	2,0	1,8	1,0
Motivation to participate	2,8	2,3	1,0	3,0	2,5	1,4
Incentive alignment for participation	3,2	2,8	1,0	3,0	2,8	1,2
Place and time	2,5	2,8	3,0	2,0	2,6	0,5
Facilitation						
Facilitator expertise	3,3	2,8	3,0	4,0	3,2	0,6
Adoption of correct practices	3,3	3,5	4,0	3,0	3,4	0,5
Facilitator influence	2,0	2,5	3,0	3,0	2,3	0,5

Interestingly, all these unimportant success factors belong to group-related factors. A reason for this may be the selected list of success factors; group-related success factors form the biggest group of success factors in the success factor list,

[2] 1 = is not important factor and/or not mentioned; 2 = is considered but has relatively small impact in design; 3 = is important in design; 4 = is one of the key factors considered in design

and has therefore more aspects detailed than in other groups. Looking back to the Proposition 1 (Content) of this study (Table 1 on page 6), it can be concluded that the main factors considered during GSS workshop design are the proposed factors excluding the five unimportant group-related factors.

However, a more noteworthy implication of the resulting list of the five unimportant success factors arises from their contents. When comparing them with the remaining five group-related factors, the reason for the difference in importance figures gets an explanation. Each unimportant success factor handles an aspect from the *individual point of view*: an individual participant's goals, abilities, and habituations. Instead, the other group-related factors focus on *group as a whole*: group's goals, composition, and interaction. Only a single significant group-related factor "Ability to assimilate and process information" considers a characteristic more related to individual participants, but even that factor has an average weight of 2,3 which means that, according to the interviewees on average, this factor has relatively small impact in design. Thus, it can be concluded, that GSS workshop designers focus on group as a whole and the goals, abilities, and ambitions of individual participants are ignored during the design.

A closer look at the interviews provides with some explanations for individual participants' goals and characteristics being ignored in workshop design. Participants' individual goals, i.e. what individual participants wish to gain from the workshop, are not paid any closer attention to because "it usually goes so rudely that those that participate [the workshop] are used as tools" (interviewee C2B). The individuals are seen as an orchestra or a group of tools that are orchestrated as a whole and not individually. It seems that GSS are assumed to automatically handle group work and communication problems, and need therefore not to be paid closer attention to. Moreover, the interviewees found participants mostly to be familiar with group work and electronic communication nowadays.

Group-related success factors

After eliminating the success factors under the analysis which are insignificant in design, there are five group-related factors left: group goals; group composition; group size; group interaction; and ability to assimilate and process information. Among these factors, group composition and interaction are emphasized by the interviewees although the views are some divided between different Cases.

According to the interviews, the decision of group composition deals with the backgrounds of workshop participants, i.e. getting together the right quality and amount of relevant views, but also with group communication. The focus is not on the abilities of individual people as mentioned above but on their backgrounds: for instance, what functions and companies should be represented. The following list of criteria for the right set of people can be derived from the interviews:

- people with expertise
- people with right backgrounds
- people that have contribution
- people that are influenced by the results
- all people that benefit or suffer from the implications
- different kinds of people, heterogeneous group
- opinion leaders
- difficult people
- management level people with decision-making power
- people from different functions and departments
- people from so many different levels as needed
- people that are interested in using/testing GSS.

Group composition means that ”one understands what the resources [i.e. the group] are that can be played with; what one can set them to work with; how fiercely they can be employed; how much they know etc.” (interviewee C1F). People’s backgrounds guide what the group can be asked about and, on the other hand, how the group react to what they are asked about. Several interviewees talked about forming as heterogeneous group as possible since such a group specifically exploits the strengths of GSS.

In Case 1, the designers think that advising the customer in selecting the right mix of people is important since the customer may not understand what are the right people to solve the problem in question and what is the strength of a heterogeneous group. As the interviewee C1D stated, "the customer may not understand that if you take eight or ten engineers into the lab, the results are engineer-like". In Cases 3 and 4 instead, where group composition was significantly less emphasized (see Table 15), consulting customer about group selection was not considered as a designer's task; the interviewed designers had group composition as pre-defined limitation. Moreover, in Case 4, the participant selection was actually fixed after the workshop agenda was prepared.

Group interaction is tightly connected with group composition according to the interviews. The right mix of people along with GSS is assumed to handle communication issues, which is probably the reason that some interviewees did not even mention group interaction separately. The importance of reserving time for discussions during the workshop was often highlighted. Group goals and size are usually considered as limitations, not as factors to be manipulated during the design. The role of group size is predominantly to set the frames for people selection – and it also has some effect in designing the workshop agenda.

Group goals are often not explicitly separated from session goals among the interviewees. This is probably a partial reason for the high standard deviation (1,2) of the factor "Group goals". Several interviewed designers talked about striving for understanding what a customer really wants. While group goals were defined as "implicit goals for the workshop set by participants" in contrast with session goals being "explicit, out-spoken goals set in coordination with the customer and designer of the workshop", the designers' seem to try to understand implicit group goals in order to make them explicit. This way they assume group and session goals to be the same. The designer's task is, according to the interviewees, to untangle the group's expectations about the workshop. As experienced interviewees C1F and C3 phrased it, customers do not always even know what they want. This is a challenge for the designer.

Task-related success factors

Task-related factors are highly emphasized by all the interviewees. The interviewees are united on the key importance of session goals, and also the other task-related success factor "task type" is valued very important. According to the interviewees, the designer's key task is to understand the problem in question, and to clarify the goals of the workshop. In that case only, the designer is able to understand how GSS fits with the problem, and to build a right group process to solve the problem.

As the interviewee C1B stated, "the most important matter is that the session goal is clearly defined". This view is shared by all the interviewees, and the word "clearly" is underscored in several instances. The reasons for this view offered by the interviewees are listed below.

- The starting and target points need to be understood.
- The customer may not even know what they are looking for as the workshop design begins.
- The customer may have a wrong idea how to get to the solution.
- The designer and customer need to gain a shared understanding about the problem and the session goals.
- The better the problem and goals are specified, the better the session usually goes.
- If the problem specification is done incorrectly, the whole day [session] is wasted because totally wrong things are done.

All the interviewees claim for setting as realistic and concrete goals as possible. The interviewee C3 opens up this issue saying that "it would be worthwhile to ask the customer that if we have here an envelope containing the results after the session, what they want the envelope would contain.” The rationale for realistic and concrete goals seems to be two-fold according to the interviewees: (1) the workshop must be kept focused or the task blows up, and (2) without concrete and realistic goals the customer may assume magic results and only get disappointed as they are not achieved.

Technology-related success factors

The importance of technology-related success factors was evaluated in this study by two factors named “technology” and “support system features”. Interestingly, although supportive GSS technologies are central to the idea of GSS workshops, most interviewees valued these factors important instead of them being of the key importance in their design. The interviewee C1F even played down the significance of technology and techniques and claimed for designing the right process instead: according to him, the role of technology is only to support the process. Several interviewees endorsed the idea stated by the interviewee C1F that the GSS laboratory and technologies used there “are comparable to pen and paper, only an alternative way of performing tasks”.

However, technology-related factors are important in design, a view shared by all the Cases. According to the interviewees, the task of the designer is to understand the advantages and limitations of different techniques, to familiarize the customer with them, and to build the process that makes the best use of them. The interviewees, especially the interviewee C4, emphasized the need of choosing as simple tools and methods as possible since workshop participants usually have no or little experience in GSS techniques beforehand. Learning new and complicated techniques may take too much of the attention and time of the workshop, and simple and familiar techniques are easier to “sell” to the participants. Facilitator expertise was regarded very useful in evaluating and selecting right tools and techniques during the design. Because the process was seen more important than the technology, all interviewees, except naturally the inexperienced designers, seemed to rely on a relatively small library of familiar tools and techniques that they considered during their GSS workshop design; the need to always search for new and better techniques was not seen useful as viable basic tools and techniques were known.

Context-related success factors

According to Kolfschoten et. al (2007a), context characteristics include organizational culture, time pressure, evaluative tone, and reward structure. In this study, the context characteristics have been taken into account with five factors: place and time; cost of participation; perceived value of goal attainment; motivation to participate; and incentive alignment for participation. Among these success factors, motivational aspects are distinctively emphasized by the interviewed designers.

Interviewees’ views on the role of context-related motivational aspects during their design process are summarized in Table 16. As can be seen, all three factors are regarded as important factors on average but the factors have relatively high standard deviations. In order to catch a more comprehensive view about the three closely related factors, the factors were summarized into a single factor “Motivational aspects” by taking the maximum importance weight of the three factors for each interviewee. The summarized factor reveals that the designers in Cases 1, 2, and 4 are relatively unanimous about the high importance of motivational aspects during the GSS workshop design. Only the designer in Case 3 and a single designer in Case 2 seem to ignore motivational aspects during their design.

Table 16: Interviewees' views on the role of motivational aspects during their design process

Success factor	C1A	C1B	C1C	C1D	C1E	C1F	C2A	C2B	C2C	C2D	C3	C4
Perceived value of goal attainment	l	l	l	½	½	½	l	½	€	½	´	½
Motivation to participate	l	l	´	½	´	l	l	´	´	½	´	½
Incentive alignment for participation	l	l	½	l	´	½	l	½	´	½	´	½
Motivational aspects (total)	l	l	l	l	½	l	l	½	€	½	´	½

The design tasks that were connected to motivating the customer by the interviewees include the following:

- ensuring commitment
- asking the customer for comments on the process prescription draft
- giving the customer different options to choose
- setting realistic goals and expectations
- introducing the advantage that the GSS laboratory has over a traditional meeting room
- familiarizing the customer with the system features
- explaining how the workshop can help – advantages and disadvantages
- making customer understand before the workshop what is the plan and why
- scheduling the workshop.

The motivational aspects seem to focus on customer commitment which is regarded as a vital pre-requisite of workshop success by the interviewees and thus as an important factor to be taken into account during the workshop design. As stated by the interviewee C1A, "ensuring commitment is, to the minimum, making customer understand what can be achieved with this kind of a system and where it [GSS] is really advantageous". When examining the design process description of the interviewee C3, many of the listed motivation-related design tasks can also be found from her design process although they have not explicitly been defined as tasks of increasing customer motivation. Moreover, these tasks, such as asking the customer for comments and setting realistic goals and expectations, have an important weight in C3's design process. Hence, it can be concluded that all interviewed designers accomplish motivation-related tasks during their GSS workshop design process and those tasks are considered as important.

Although motivational aspects are the most important context-related factors according to the interviewees, also the place and time of the workshop are considered during the design by all interviewees. Nonetheless, those factors have no significant role in their design. Several designers regarded understanding the customer's schedule and its limitations as an important frame of design though. As it comes to the last context-related success factor, cost of participation, all cases point to the conclusion that the factor is not of central importance in GSS workshop design. Only the inexperienced designer C2A really highlights the factor; for him, cost of participation means above all a way of motivating busy people to participate by promising productive working-time and short enough workshops. Therefore, this factor could actually be included in the factor "Motivational aspects".

Facilitation-related success factors

Among facilitation-related success factors, facilitator expertise and adoption of correct practices are valued as critical success factors in design. Depending on the case, their importance is measured between 3 (important) and 4 (one of the key factors) (Table 15). The averages of all interviewees are 3,2 and 3,4 accordingly. However, the third factor "facilitator influence", i.e. the role of facilitator, gets only an average figure of 2,3 among the interviewees which means that, although considered during the design, its impact is smaller. Since the standard deviations are relatively low for all facilitation-related success factors (around 0,5), it can be concluded that these results are shared by all interviewees and cases.

Similar figures of different cases reveal that GSS workshop designers with different types and rates of experience seem to be quite unanimous in their opinions about the role of facilitation expertise and correct practices. Experienced designer C1B recalls the time he was a novice facilitator that "it was quite painful at the beginning as I did not even know the system", and continues that the facilitator experience is critical. The role of experience and good practices emerges also in several other comments of different interviewees. Old agendas are re-used as design templates, and "all proposed agendas are more or less based on past experience" (interviewee C1F). According to the interviewees, past experience is especially needed in judging which methods work well and in building realistic schedules for workshops.

However, the interviewees' opinions in different cases seem to be divided when the importance of considering facilitator influence is examined. Facilitator influence was defined in this study as "the amount of facilitator influence before, during, and after the workshop, ie. the role of facilitator". All interviewees mention this factor when describing their design process but their opinions on its importance differ. The designer in consulting case (Case 4) points out that the role of facilitator has been one of the most problematic issues in their workshops according to customer feedback and thus regards considering the factor as important. He thinks the designer should strive for defining the roles of different parties in the workshop as early as possible. The importance of role distinction during workshop design also arises from Case 3: Replicated but in Cases 1 and 2 the factor has relatively small impact in design.

3.4.3 Design structure: meeting success factors in order

At this point, the results presented outline

- the interviewees' design processes, i.e. the design steps and their order,
- the design content, i.e. the factors considered during the design, and
- the importance of those factors during the design.

The final step of the analysis is to combine these pieces of information and thus to understand the role of different meeting success factors across the whole design process. This is done with the help of the construct connection assignments where the interviewees connected the design steps and meeting success factors. As a result, the a priori propositions of this study (see Table 1 on page 6) are assessed. The case-by-case incidence rates of the links in the construct connection assignments can be found in Appendix 3 and Appendix 4. In the analysis, these results are used by weighting the incidence rates with average success factor importance figures in order to model the significance of the factors across the design process. The weighted case-by-case incidence rates of the links in the construct connection assignments can be found in Appendix 6 and Appendix 7, and the weighted incidence rates presented by five success factor groups are shown in Appendix 8. The manner of representing the results and its links to the research propositions are shown in Figure 8. As can be seen, each proposition is presented in their own axes:

- Proposition 1 about the design content is presented by the five success factor groups used in this study
- Proposition 2 about the importance of different success factors is presented by the significance rates, i.e. the weighted incidence rates
- Proposition 3 about the order in which the factors are considered during the design process, is presented by the five design steps defined earlier in this study.

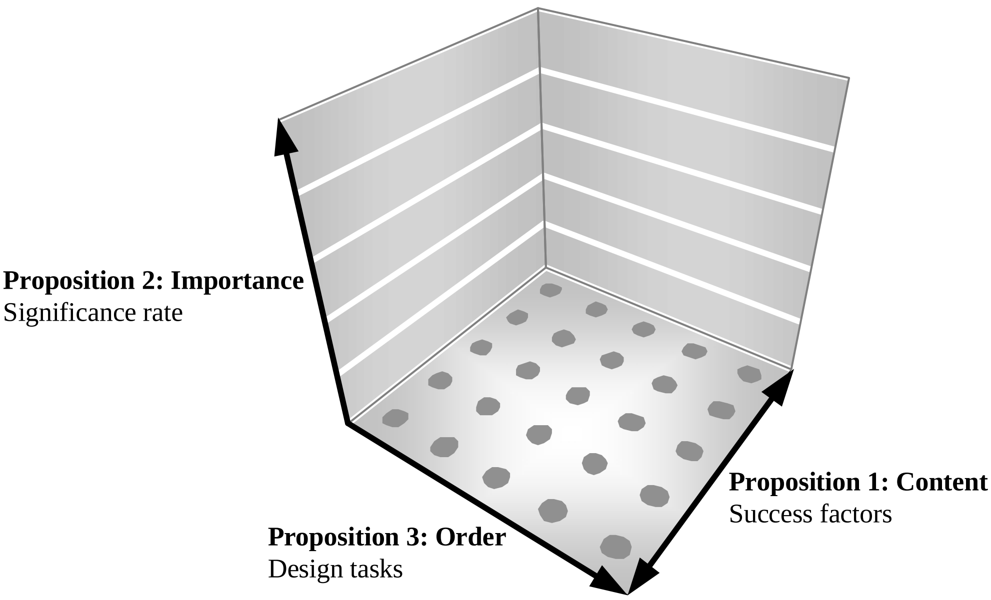

Figure 8: The manner of representing the results and how the research propositions are connected to it

March & Smith (1995) state that "a model is a set of propositions or statements expressing relationships among constructs". Figure 8 provides a model of representing facilitators' design by expressing relationships among design constructs. The model with the Case Study data is presented in the figures in Appendix 9. Those figures outline the interviewees' way of designing GSS workshops by presenting how the factors are organized "inside the interviewees' heads" during their design process. The figures are described next in more detail by first explaining the data embodied in them, after which the figures are described and compared with each other by each design step individually.

The bar heights in the figures of different cases are not directly comparable since the smoothness of importance values in different cases differs significantly due to the varying number of case study interviewees (e.g. Case 1 consists of six interviewees in comparison to Case 3 and 4 with only a single interviewee). Instead, the bar heights inside an individual case can be compared, according to which the relations of different factors and thus the trends of design thinking inside individual cases can be determined. Then, the trends of different cases can be compared to each other.

In comparison purposes, the results of each case study are shown in two figures:

- First, in a figure where only two most important success factors from each success factor group (i.e. Group, Task, Technology, Context, and Facilitation) are included when determining the significance rates, and
- Second, in a figure where all significant success factors from each group are included.

The strength of the first figure is that all success factor groups are equal in a way that the significant rates are calculated from the same amount (i.e. two) of factors. Hence, the less important factors in success factor groups with more than two factors cannot make a smoothing effect on the group results and thus decrease the relative importance of that group. The most important factors that were used from each success factor group are shown in Table 17.

Table 17: Two most important factors from each success factor group used in significant rate calculations

Success factor group	Most important factors
Group	Group composition and Group interaction
Task	Session goals and Task type
Technology	Technology and Support system features
Context	Perceived value of goal attainment and Incentive alignment for participation
Facilitation	Facilitator expertise and Adoption of correct practices

However, considering also the less important but still significant success factors is vital in order to understand the whole. Therefore, the second figure shows the results where all significant success factors are included in significance rate calculations. Furthermore, a proposition was made that the interviewees who consider a success factor know more about its importance than the interviewees who ignore the factor. To test this, the significance rates were determined excluding the empty cells (see Table 14) in the Cases with more than one interviewee. That way, it was possible to assess if the interviewees that consider success factors that others do not would make a difference to the results. However, the results (see Appendix 8) were not found to be considerably different and it was concluded that the interviewees are relatively unanimous about the factors that need to be taken into account during the design.

The figures in Appendix 9 reveal similar patterns in facilitators' design across all the cases, but some differences also exist. A design step by design step description of the figures is presented below.

Step 1: Task diagnosis. In task diagnosis, the designers in all cases map out the situation: the most important success factors considered are related to the task, group, and context. Task-related factors have the overwhelmingly most important role during this design step. The designers in different cases seem also to have technology-related factors in mind, but those factors have a considerable role only in Case Consulting. Facilitation-related factors, i.e. previous facilitation expertise, have a substantial effect in design-thinking in this step as well as in all the following steps.

Step 2: Activity decomposition. In activity decomposition, the role of facilitation-related factors gets even stronger. The designers use their expertise in order to decompose the task into subtasks and to build the solution process. Here, task- and group-related factors seem to have a substantial role in most cases. In-experienced designers rely less on facilitator expertise which is quite obvious due to their lower level of experience.

Step 3: Technique choice. In technique choice, facilitator expertise is also emphasized. Keeping the task- and group-related factors still in mind, the designers in all cases focus on technology-related factors. It is worth noticing, that in Case Consulting the steps activity decomposition and technique choice are not separated and can therefore be interpreted together.

Step 4: Agenda building. In agenda building, the context-related factors with respect to motivational aspects seem to gain a considerable amount of designers' attention. Also the other success factors are considered in order to build a good agenda. In Case Replicated, the agenda creation is specifically influenced by technology-related success factors.

Step 5: Design validation. In design validation, the designers use their expertise to evaluate the quality of the design. Experienced designers, in particular, seem to think about the motivational aspects during design validation. In Case Consulting, the group, participants, are defined on this step. In that case, the design is adjusted and validated according to the group needs.

A summary (approximation) of these results is shown in Figure 9. As can be seen, the emphasis of considering the success factors is on the first three steps. During agenda building and design validation the motivational aspects are important to keep in mind. Facilitation related factors have a significant role during the whole design process.

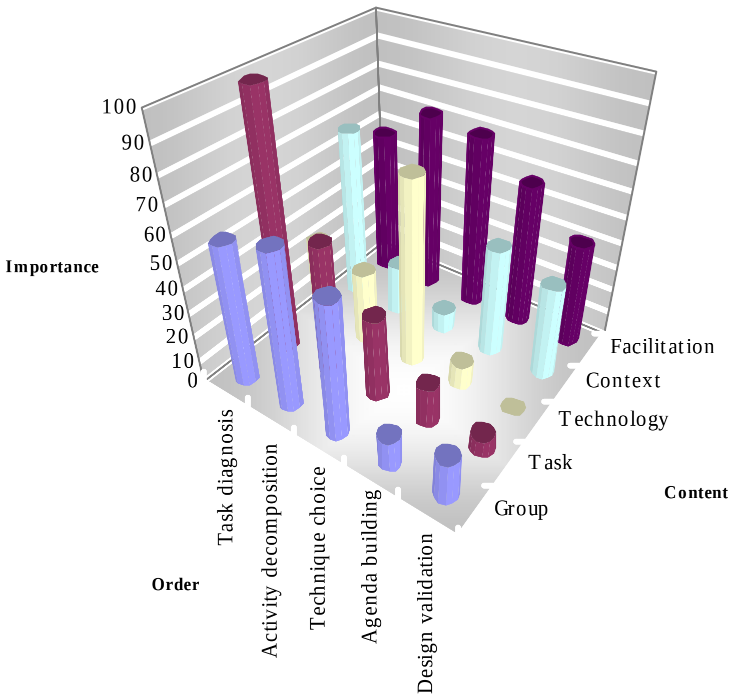

Figure 9: Summary of the cases

3.5 Discussion: comparison between the empirical results and theory

A notable observation made during this study was that the literature around GSS and CE research is especially specialized in different technology-related issues but, as the designers design workshops in practice, technology is in a much smaller role. The focus seems to be in task definition and group instead – technology provides only some supporting tools. This contradiction between theory and practice is partially natural and even desirable since technology is not meant to provide intrinsic value but to support collaboration. However, designers' desire to gain more understanding and support in dealing with "softer" issues such as group dynamics implies that understanding collaboration process design in its full – not only technological – context is important. The model of design thinking presented in this study contributes to such an approach.

Various authors such as Clawson & Bostrom (1996), Dickson et al. (1996), and Niederman et al. (1996) have studied effective facilitation and distinguished aspects and activities that are considered to be important. Also effective preparation and design, which are some of the key tasks of effective facilitation, have been studied with respect to their main inputs and activities. This study focuses on the content of the design of GSS supported workshops, thus adding to the research on effective design. In this chapter, the findings of this study are compared and contrasted with Niederman and Volkema (1996), and Kolfschoten et al. (2007a) list, as these studies provide a longitudinal view on the factors influencing the design task of facilitator[3]. Furthermore, the differences and commonalities between this study results and theory are discussed regarding to the context, object, actor, and structure and dynamics of the design, as they were presented in theoretical background Chapter 2.

[3] These studies were actually the only relevant studies found that listed and examined the importance of the factors influencing specifically the design – not the whole phenomenon of facilitation – of collaborative workshops.

Table 18 shows how the results of Niederman and Volkema, and Kolfschoten et al. (Ibid.) (NVK) and this study are related. A black spot signifies a strong and an 'x' a partial overlap. When comparing the two lists, it is worth noting that their sources are different: NVK's factors are based on general considerations by experienced facilitation researchers and practitioners, while the list of this study was derived from a literature research on critical meeting success factors. However, the evaluation of these list factors has been done by practitioner facilitators in each three studies. With these in mind, it is interesting to see how the list of this study thoroughly encompasses NVK's list (except the factor 'group norms'), but also includes several aspects such as individual goals and context- and facilitation related factors that cannot be found from NVK's list. This is especially interesting because this study found context-related motivational aspects and facilitation-related expertise and correct practices to have a significant influence in facilitators' design thinking. This may imply that NVK's listing did not consider all relevant factors in design content analysis; the success factor list of this study reveals that there are more than just "concrete" group- and task-related factors that have an impact in design.

Another interesting implication – or question – that arises from the differences in the importance evaluations of some design factors is what effect constraining factors have in design. For instance, group size is rated relatively high in NVK, but in this study, where the group size was usually predetermined, group size has a smaller impact. The same pattern can be found inside the results of this study when comparing different types of facilitators' views on the importance of group composition. Through deep semi-structured interviews conducted for this study, the researcher found that the design is always a resource-constrained assignment, and, if a design factor is predetermined, i.e. constraining, a facilitator rates it less important than when the factor is manipulatable. Some differences in importance evaluations may therefore result from the differences in what factors are constraining among different facilitators. These findings may imply that more understanding about the influence of constraints is needed in order to wholly understand facilitators’ design thinking.

Table 18: Overlap between Niederman, Volkema, Kolfschoten etl al. and this study results

	Niederman & Volkema (1996); Kolfschoten et al. (2007)													
This study	Task goal	Task complexity/difficulty	Task deliverables	Task size	Task time frame	Group size	Group # stakeholders	Group education level	Group organization culture	Group institutionalized methods	Amount of group conflict	Group norms	Expected tech. Use	Top manager presence
Group goals	x		x											
Group composition							●	●			x			x
Group size						●								
Individual goals														
Ability to exploit new information and learn								x						
Group interaction														
Ability to assimilate and process information								x						
Ability to communicate														
Habituation to electronic communication								x	x	x			x	
Habituation to group work									x	x				
Session goals	●		●											
Task type		●		●										
Technology													●	
Support system features													x	
Perceived value of goal attainment														
Cost of participation														
Motivation to participate														
Incentive alignment for participation														
Place and time					●									
Facilitator expertise														
Adoption of correct practices														
Facilitator influence														●

Despite some differences, NVK and this study share some central results. The same task- and group-related factors arise from the listings. Session (or task) goals and deliverables were found to be the most critical design factors. As group related factors were found to have a smaller emphasis, Kolfschoten et al. (2007a) suggested that “it may be possible to design collaboration processes and facilitation techniques that can be used for different types of groups”. According to the findings of this study, facilitators really use general workshop processes as design templates since the workshops are seen to share several basic principles. The importance of the factors 'facilitator expertise' and 'adoption of correct practices' also highlight this view.

To place the findings of this study in a wider design perspective, this chapter is concluded by shortly reflecting the findings with the theory of context, object, actor, and structure and dynamics of design presented in Chapter 2. First, when considering the context of design, this study gives some more insight in the benefits of using GSS presented in literature (see Table 5 on page 16). The study found designers to emphasize task-related process structuring and goal orientedness which were considered mostly during task diagnosis, activity decomposition, and agenda building. The other benefits were exploited if relevant to the task and group at hand. Especially more experienced facilitators applied a couple of tried and tested ways of using GSS from design to design, and the custom was not to look for new ways of exploiting GSS benefits.

When looking at the object of design, the designers were found to consider most of the group, task, context, technology, and facilitation related workshop success factors gathered from literature (see Table 8 on page 24) as already discussed earlier in this chapter. Furthermore, the findings from the design content analysis raise some interesting topics to discuss with prior research. Briggs & Kolfschoten (2009) argue that understanding personal goals is important since individual goals motivate effort toward group goals. In contrast, according to the findings of this study, workshop designers pay little or no attention to personal goals, but the focus in design is on session goals (and group goals). This conflict would be interesting to study further. On the other hand, the results of this study propose that selecting people that have the right expertise and stake is considered important in participant selection. This may imply that personal goals are actually taken into account but only in a more general manner. Motivation in its wider perspective was also highlighted in this study. To name some motivational aspects, previous studies refer to clear role distinctions (Clawson & Bostrom

1993), letting participants decide the agenda (Niederman et al. 1996), and considering individual goals (Briggs & Kolfschoten 2009). Several of these factors were also mentioned by the interviewees in this study, and building motivation and commitment was found to be an important design factor. However, as stated by an interviewee, “it would be great always to know which strings to pull” but the practice is usually much harder. These imply that better design support in building motivation would be valuable.

When looking at the actor of design, this study did not reveal any significant differences between facilitators with different amount of experience, as in (Kolfschoten & Vreede 2007). However, the role of correct practices and facilitator experience were found to be critical as in several previous studies (e.g. Antunes et al. 1999; Clawson and Bostrom 1995; Hayne 1999; Nunamaker et al. 1997; Vreede et al. 2002). When considering the facilitator role separation of collaboration engineer and practitioner, also the “normal” facilitators interviewed in this study were found to be using process designs repeatedly, which claims for better design documentation and supports the usefulness of collaboration engineering approach.

When assessing the structure and dynamics of design, the generic design process presented by Kolfschoten & Vreede (2007) was found to model relatively well also the generic design process of the workshop designers interviewed in this study. The literature definitions of design presented in Chapter 2 were fully reflected in the interviewees’ design processes: design was seen as planning and forming the structure, as creating, documenting, and validating a prescription for a collaboration process. While Kolfschoten & Vreede (Ibid.) focused more on the activities that model the steps of the design process, this study focused on the factors that need to be taken into account in each design step, thus deepening the understanding of Kolfschoten & Vreede’s process. The results of this study show that design factors really have a certain order which they follow along with the design process, although the small case group allowed the researcher to build only a preliminary presentation of that order. The existence of the order of design factors implies that a more accurate design model would be possible to build to provide facilitators for a checklist for evaluating their design process efficiency.

4 IMPLICATIONS AND CONCLUSIONS

> *Solving a problem simply means representing it so as to make the solution transparent.*
> *—Simon 1996*

The main research objective of this thesis was to provide a holistic view on workshop success factors affecting the design of collaboration processes, assess their role across the design process, and thus to describe the effective design of GSS supported workshops. This section contains conclusions of the study and evaluation of the results. The focus in conclusions is on the implications of this study; a more detailed comparison between the results and prior research can be found from Chapter 3.5.

4.1 Implications for research

This study extends prior literature by highlighting the key success factors of meetings (the group, task, technology, context, and facilitation -related success factors) considered during collaboration process design. It also links these success factors with the design activities conducted by facilitators. The study can form a basis for developing the theory of design thinking in collaboration engineering, for developing further support and training for collaboration engineers, and for studying the connection between the design and success of meetings.

When looking at the content of workshop design (see Proposition 1), it can be concluded that the success factors discussed in prior literature are the same factors that facilitators take into account during the meeting design. The key workshop success factors were listed on the basis of literature research in five success factor groups of task, group, technology, context, and facilitation (see Table 8 on Page 25). The key design factors that arouse from the content analysis of design thinking can be summarized with five factors as follows:

- *Session goals* give the start and provide the backbone for the whole design process. (Task)
- *Group composition* is considered to ensure correct information available in the meeting and to understand the demands of the group. (Group)
- *Supporting technology* is selected according to the demands of the task and group. (Technology)
- *Motivation* of the group is ensured in order to build commitment. (Context)
- *Correct practices* guide the designer in building a workable meeting agenda with right timeframes and content. (Facilitation)

When examining the importance of different design factors (see Proposition 2), the designers emphasize some factors above others. Session goals are the number one design factor. However, when considering different success factor groups, no group cannot be elevated to be significantly more important compared to the others. Physical constraints, such as time or group size were usually considered at least somewhat important, but their role in design thinking was smaller than that of more controllable factors. This study also includes an interesting finding about the factors that are not important in design: according to the case study results, the goals and desires of individual participants are ignored by the designers, as the participants are regarded collectively as a group. This may imply that considering individual participant needs is too hard, although it would be beneficial in building individual participants' commitment toward the group goal.

When looking at the order of considering design factors during workshop design (see Proposition 3), some tentative conclusions can be drawn. The design process which facilitators follow is similar, comprising the steps of task diagnosis, activity decomposition, technique choice, agenda building, and design validation. Some factors, such as session goals or technology can rather easily be linked to a certain design step but, due to the iterative nature of design, the factors tend to have some impact on several design steps. A preliminary conclusion of the order of different design factors is presented in the model of design thinking introduced below.

When comparing different types of facilitators, their views on workshop design are generally consistent. This may imply that some universal design best practices exist. In fact, the most obvious differences in the design views were not found between experienced and in-experienced facilitators but between facilitators from different laboratories. As the laboratories have slightly differing starting points for the workshops, the found differences may actually implicate differences in which design factors are controllable and which are predefined. For instance, group composition was ranked high among the facilitators at LUT, but low among the facilitators of other laboratories. Meanwhile, the facilitators at LUT usually had an opportunity to control who were invited to the workshop, while the participant group was usually predetermined in other laboratories.

The resulting model of design thinking is shown in Table 19. Through listing the key design factors and their role in design, the model outlines how to design GSS supported workshops effectively which is the main research question of this study. According to the understanding gained in this study, three types of design factors can be recognized in workshop design thinking: (1) controllable factors that the designer needs to define and modify; (2) constraining factors that set the boundaries of the design; and (3) guiding factors that the designer exploits across the whole design process in understanding, defining, and utilizing the other key design factors.

Table 19: The model of workshop design thinking

Key design factors	Design tasks					Factor type
	Task diagnosis	Activity decomposition	Technique choice	Agenda building	Design validation	
Session goals	x	x			x	Controllable: define and control
Goals, objectives, task type						
Group composition	x	x	x			
Group composition, interaction, goals, abilities						
Supporting technology		x	x			
Tools, techniques, methods, technology features						
Motivation	x			x	x	
Motivation to participate, commitment						
Physical constraints	x	x	x	x		Constraining: understand and adapt
Place, time, other constraining factors						
Correct practices	x	x	x	x	x	Guiding: exploit
Best practices, facilitator expertise						

The controllable factors are in the center of design thinking, encompassing session goals, group composition, supporting technology, and motivational factors. As the ‘x’:s show in Table 19, each of these factors is emphasized in certain design tasks. For instance session goals, group composition, and motivation of participants are paid special attention to during task diagnosis. The constraining factors influence the designer’s decisions in the background. The case study results imply that every workshop has some preordained factors, such as workshop time-frame, which the designer just needs to adapt to. The constraining factors can be any factors that set limits to the design; some of the factors included in controllable factors in the model can actually be constraining if they have been predetermined before the design begins. Group composition, for instance, was regarded as a constraining factor by some of the designers interviewed in this study.

The controllable and constraining factors together formulate the contents of design thinking. The third type of design factors, guiding factors, provide the designer with guidance in design decisions in the form of tacit knowledge and expertise or of explicit best practise guides and design support tools. The role of guiding factors was ranked high across the whole design process, which implies that there is a real need for design support. Furthermore, the interviewed designers were found to use trusted design practices repeatedly, which implies that they are accustomed to the collaboration engineering type of design approach where design patterns are used repeatedly as building blocks of collaboration processes. The model of design thinking presented in this study can provide valuable information for the development of further design support.

4.2 Implications for practice

From a practitioner perspective, this study highlights both the variances and commonalities among facilitators in how they design collaboration processes. Since the group of facilitators interviewed in this study is robust and they reflect best practices of GSS workshop design, current facilitators in GSS laboratories – both “normal” facilitators and collaboration engineers – can use these as a benchmark for assessing their own design practices. Novice facilitators can learn from the experiences of more experienced facilitators presented in this study. Among designers and implementers of collaboration engineering, deeper understanding of the role of meeting success factors in different collaboration process design steps may help to better guide the design of CE tools, approaches and techniques to support collaboration engineers in developing appropriate meeting agendas. The study may also provide support for the training of collaboration engineers.

4.3 Limitations and future research

General weaknesses of case studies were avoided with a thoughtful research design but, due to the small and differing amount of interviewees in the case studies, one has to be cautious in making any generalizations from the results. However, the findings reflect the results in prior literature which may imply a better generalizability.

The limitations of this study suggest interesting directions for future research. First, the preliminary model of the importance and order of design factors across the workshop design process could be validated. Second, this model could be used in developing supportive approaches and tools for workshop design. Third, the connection between effective design practices and workshop success could be studied. Fourth, as this study formulated only a generic view on workshop design, the possible differences in the design of different types of workshops could be researched further. Fifth, an interesting topic for future research could also be to examine workshop design as resource-limited action with some resources, such as time and group size, pre-defined. As the results of this study propose, factor type, i.e. whether the factor is controllable or constraining, may have a significant impact in design thinking. Therefore, the resource-limited approach would be of high interest.

Validating the results of this study could be done by conducting the same study for a bigger group of facilitators in order to make statistical analysis on the designers' views. The further research questions that arise from this study could be studied through a combination of focused questionnaires, semi-structured interviews, and small case studies.

5 SUMMARY

This study examined the design of GSS supported workshops. The starting point for this study was the need for documenting the workshop design experience gained in the GSS laboratory at Lappeenranta University of Technology (LUT) where hundreds of GSS supported workshops had been conducted since the laboratory's foundation in 1997, but the design expertise of the laboratory's facilitators had never been explicitly documented. Also a review on GSS related literature revealed GSS research community to have a dearth of knowledge about how workshop designers, i.e. facilitators and collaboration engineers, effectively accomplish the design effort. These problems were brought out in this study by the main research question of "How to effectively design GSS supported workshops?".

The research strategy of this study followed descriptive case study strategy. The empirical inquiry included a multiple-case study conducted among 12 GSS workshop designers, ten of which came from the GSS laboratory of LUT and two of which formed 'control' cases from other GSS laboratories. The study was carried out by first conducting literature research on the key factors contributing to the success of GSS supported workshops, according to which three research propositions about the design factors were formulated. Second, the case study protocol was prepared to guide data collection and analysis. Third, the data was collected from selected GSS workshop designers by semi-structured interviews and construct connection assignments, after which the data was coded and analyzed along with the research propositions. Finally, the model of workshop design thinking was presented by outlining the key design factors and effective design practices.

The study found GSS workshop designers to consider almost all of the task, group, technology, context, and facilitation related workshop success factors listed based on the literature research. Only the factors related to individual goals and abilities were found not to be considered during the design effort. This finding about the individual participant characteristics of being ignored was found to be interesting since some prior literature claimed for the importance of considering individual goals due to their motivating effect on workshop participation. Therefore, future research was recommended around this topic.

The most interesting findings were however the factors that designers really consider during workshop design. When the importance of different workshop success factors during the design effort was studied, workshop designers were found to emphasize some factors above the others. Session goals, group composition, supporting technology, motivational aspects, physical constraints, and correct design practices were found to outline the key factors in design thinking. These factors were further categorized into three factor types of controllable, constraining, and guiding design factors, because the case study findings indicated the factor type to have an effect on the factor's importance in design. Furthermore, the design factors' role across the design process was assessed regarding to their order of consideration. Designers were found to follow the design process of task diagnosis, activity decomposition, technique choice, agenda building, and design validation accordingly, and a preliminary presentation about what design factors to emphasize in each design step was illustrated in the model of workshop design thinking.

The study extends prior literature by providing deeper insight in GSS workshop designers' design thinking, especially the content of design. The presented model of design thinking may provide design support for (novice) workshop designers. It also increases the understanding about the critical factors to be taken into account in the design of collaboration processes as well as the understanding about how to emphasize the critical factors during different design steps. Furthermore, the model may provide support for the creation of design support tools and for the training of GSS workshop designers.

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APPENDICES

Appendix 1: Theme questionnaire

Tämän teemahaastattelun tavoitteena on kerätä GDSS-istuntojen suunnittelussa ja vetämisessä mukana olleiden henkilöiden istuntosuunnittelun "best practice"-käytäntöjä.

Aloitus

1. Haastatteluintro: lyhyt johdatus haastattelun tavoitteisiin ja teemoihin
2. Selvitys haastateltavan kokemuksesta: Suunnittelija/fasilitaattori, istuntojen lukumäärä ja ajankohdat
3. Pari kysymystä mallinnettavista caseistunnoista: tarkennuksia

Haastateltavan oma suunnitteluprosessi

4. Piirustus: Haastateltavan oma näkemys istuntosuunnitteluprosessista

- prosessin vaiheet ja järjestys
- tärkeimmät huomioon otettavat asiat – suunnittelun muuttujat

Syventyminen teemoihin

Jos mahdollista, syventyminen teemoihin suoritetaan haastateltavan piirtämän istuntosuunnitteluprosessin pohjalta eli alla esitettyä käsittelyjärjestystä muutetaan tarpeen tullen.

5. Miten istunnon tavoite määritellään? Mitä istunnon ongelmanmäärittelyssä tulee ottaa huomioon? Mitä ongelmanmäärittelyvaiheessa tehdään? Miksi?

- tavoite (eksplisiittinen ja implisiittinen)
- tehtävän tyyppi
- tehtävän kompleksisuus
- istunnon osanottajat: ketä ja miksi, lkm, tyyppi…

6. Miten istunnon eteneminen suunnitellaan? Miksi? Miten istunto jaetaan vaiheisiin?

- vaiheistus
- tehtävien määrittely
- prosessin mallintaminen
- kokemus edellisistä istunnoista

7. Miten käytettävät GSS-tekniikat ja –työkalut valitaan? Miksi? Vertaillaanko tekniikoita toisiinsa?

- tekniikoiden arviointi- ja valintakriteerit
- tekniikoiden yhdistely ja järjestys
- kokemus edellisistä istunnoista
- fasilitaattorin roolin määrittely

8. Miten istunnon lopullinen aikataulu ja ohjelma suunnitellaan? Miksi?

- painotukset
- mallintaminen
- kokemus edellisistä istunnoista
- aika ja paikka

9. Ketkä osallistuvat suunnitteluprosessiin? Millä tavalla eri osapuolet vaikuttavat suunnitteluprosessissa? Miten eri osapuolet kommunikoivat keskenään

- suunnitteluprosessin osapuolet
- suunnittelun vuorovaikutusprosessi

10. Miten suunnitelma validoidaan? Miten varmistetaan, että suunnitelma toimii?

- testaus
- hyväksyttäminen ja osapuolet

11. Miten suunnitelmat ovat toimineet käytännössä? Toteutuiko kaikki niin kuin oli suunniteltu?

- joustavuus

- vaihtoehtoissuunnitelmat

Lopetus

12. Konstuktioiden yhdistelytehtävä

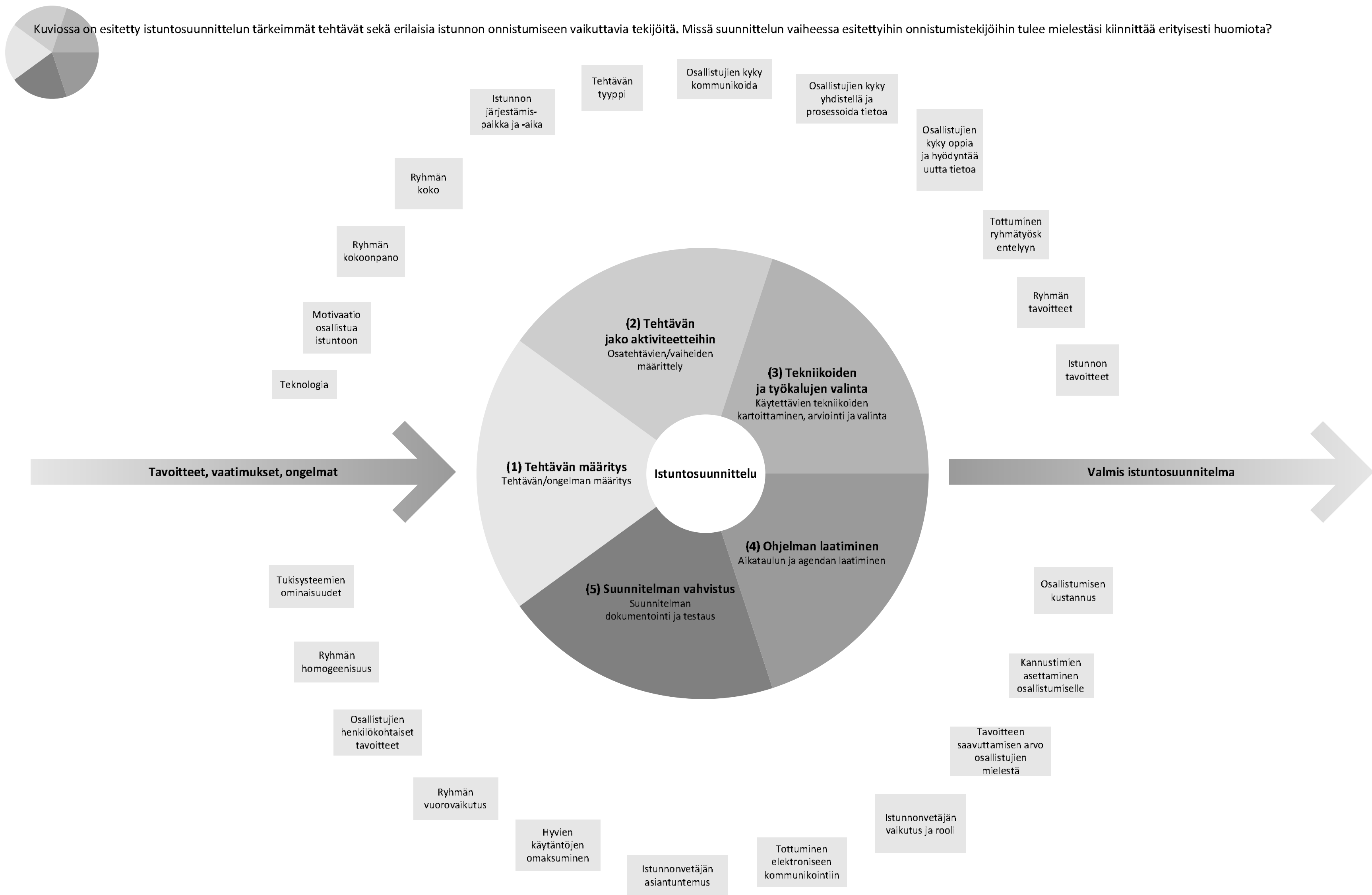
- perustelut
- kommentointi

Kuviossa on esitetty istuntosuunnittelun tärkeimmät tehtävät sekä erilaisia istunnon onnistumiseen vaikuttavia tekijöitä. Missä suunnittelun vaiheessa esitettyihin onnistumistekijöihin tulee mielestäsi kiinnittää erityisesti huomiota? Yhdistele tai vedä yli.

- miten ja kuinka paljon tekijöihin pyritään vaikuttamaan?
- mikä on todellisuus?

13. Olemme nyt keskustelleet melko syvällisesti GSS-istuntojen suunnitteluun liittyvistä asioista. Onko teillä vielä mielessä jotain, mitä haluaisitte tuoda esille?
14. Kiitos!

Appendix 2: Structured construct connection assignment



Appendix 3: Case-by-case incidence rates for the links in the construct connection assignments

Success factors ▼ / Design tasks ▶	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation
	Case Experienced (n = 6)					**Case Replicated (n = 1)**				
Group										
Group goals	**83 %**	33 %	17 %	0 %	0 %	**100 %**				
Group composition	**83 %**	**50 %**	33 %	17 %	17 %	**100 %**		**100 %**		
Group size	**83 %**	**50 %**	33 %	33 %	0 %	**100 %**				
Individual goals	**67 %**	33 %	0 %	17 %	17 %	**100 %**	**100 %**	**100 %**		
Ability to exploit new information and learn	17 %	33 %	**67 %**	**50 %**	0 %			**100 %**		
Group interaction	17 %	**67 %**	**67 %**	17 %	0 %		**100 %**	**100 %**		
Ability to assimilate and process information	17 %	**50 %**	**67 %**	17 %	0 %			**100 %**		
Ability to communicate	17 %	33 %	**83 %**	17 %	0 %			**100 %**		
Habituation to electronic communication	17 %	0 %	**67 %**	33 %	0 %			**100 %**		
Habituation to group work	17 %	33 %	**50 %**	**50 %**	0 %			**100 %**		
Task										
Session goals	**83 %**	**50 %**	**50 %**	17 %	17 %	**100 %**				
Task type	**100 %**	33 %	17 %	17 %	0 %	**100 %**	**100 %**			
Technology										
Technology	17 %	17 %	**83 %**	0 %	0 %					
Support system features	33 %	17 %	**83 %**	0 %	0 %		**100 %**	**100 %**	**100 %**	
Context										
Perceived value of goal attainment	33 %	17 %	0 %	17 %	**67 %**		**100 %**	**100 %**	**100 %**	
Cost of participation	17 %	0 %	17 %	**50 %**	17 %			**100 %**		
Motivation to participate	**67 %**	17 %	0 %	33 %	17 %	**100 %**				
Incentive alignment for participation	**67 %**	17 %	0 %	**67 %**	33 %	**100 %**				
Place and time	**50 %**	0 %	33 %	**50 %**	0 %	**100 %**				
Facilitation										
Facilitator expertise	**50 %**	**50 %**	**50 %**	33 %	33 %	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**
Adoption of correct practices	33 %	**50 %**	**50 %**	**50 %**	33 %		**100 %**	**100 %**	**100 %**	
Facilitator influence	**67 %**	33 %	**50 %**	17 %	0 %	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**

Success factors ▼ / Design tasks ▶	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation
	Case In-experienced (n = 4)					**Case Consulting (n = 1)**				
Group										
Group goals	**100 %**	25 %	0 %	0 %	0 %	**100 %**				
Group composition	**75 %**	**50 %**	0 %	0 %	0 %					**100 %**
Group size	**75 %**	**50 %**	**50 %**	0 %	0 %	**100 %**				
Individual goals	25 %	**50 %**	25 %	0 %	0 %					**100 %**
Ability to exploit new information and learn	**50 %**	25 %	**50 %**	25 %	0 %					
Group interaction	25 %	**50 %**	25 %	0 %	0 %					**100 %**
Ability to assimilate and process information	25 %	25 %	**50 %**	25 %	25 %			**100 %**		
Ability to communicate	25 %	25 %	**50 %**	**50 %**	25 %			**100 %**		**100 %**
Habituation to electronic communication	0 %	25 %	**75 %**	25 %	25 %					**100 %**
Habituation to group work	25 %	25 %	**75 %**	25 %	0 %		**100 %**			
Task										
Session goals	**100 %**	25 %	25 %	0 %	0 %	**100 %**				
Task type	**100 %**	**50 %**	25 %	25 %	0 %	**100 %**				
Technology										
Technology	25 %	0 %	**100 %**	0 %	0 %		**100 %**			
Support system features	25 %	25 %	**75 %**	25 %	0 %	**100 %**				
Context										
Perceived value of goal attainment	**50 %**	25 %	25 %	0 %	0 %	**100 %**				
Cost of participation	**50 %**	0 %	25 %	**50 %**	0 %	**100 %**				
Motivation to participate	**100 %**	0 %	0 %	25 %	0 %				**100 %**	
Incentive alignment for participation	**50 %**	25 %	25 %	25 %	25 %	**100 %**			**100 %**	
Place and time	**50 %**	0 %	0 %	**75 %**	0 %				**100 %**	
Facilitation										
Facilitator expertise	25 %	25 %	**50 %**	**50 %**	25 %	**100 %**				
Adoption of correct practices	25 %	0 %	**50 %**	0 %	**50 %**		**100 %**			
Facilitator influence	0 %	25 %	0 %	**50 %**	25 %		**100 %**			

Appendix 4: Incidence rates for the links in the construct connection assignments, all interviewees together

All interviewees (n = 12)

Success factors ▼ / Design tasks ▶	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation
Group					
Group goals	**92 %**	25 %	8 %	0 %	0 %
Group composition	**75 %**	42 %	25 %	8 %	17 %
Group size	**83 %**	42 %	33 %	17 %	0 %
Individual goals	**50 %**	42 %	17 %	8 %	17 %
Ability to exploit new information and learn	25 %	25 %	**58 %**	33 %	0 %
Group interaction	17 %	**58 %**	**50 %**	8 %	8 %
Ability to assimilate and process information	17 %	33 %	**67 %**	17 %	8 %
Ability to communicate	17 %	25 %	**75 %**	25 %	17 %
Habituation to electronic communication	8 %	8 %	**67 %**	25 %	17 %
Habituation to group work	17 %	33 %	**58 %**	33 %	0 %
Task					
Session goals	**92 %**	33 %	33 %	8 %	8 %
Task type	**100 %**	42 %	17 %	17 %	0 %
Technology					
Technology	17 %	17 %	**75 %**	0 %	0 %
Support system features	33 %	25 %	**75 %**	17 %	0 %
Context					
Perceived value of goal attainment	42 %	25 %	17 %	17 %	33 %
Cost of participation	33 %	0 %	25 %	42 %	8 %
Motivation to participate	**75 %**	8 %	0 %	33 %	8 %
Incentive alignment for participation	**67 %**	17 %	8 %	**50 %**	25 %
Place and time	**50 %**	0 %	17 %	**58 %**	0 %
Facilitation					
Facilitator expertise	**50 %**	42 %	**50 %**	42 %	33 %
Adoption of correct practices	25 %	42 %	**50 %**	33 %	33 %
Facilitator influence	42 %	42 %	33 %	33 %	17 %

Appendix 5: Average case-by-case importance figures of each success factor

Success factor	Average importance					Averages without 1s		
Group	**Exper.**	**In-exper.**	**Repl.**	**Consult.**	**All**	**Exper.**	**In-exper.**	**All**
Group goals	2,5	2,0	4,0	1,0	2,3	3,3	3,0	3,3
Group composition	3,7	4,0	2,0	2,0	3,5	3,7	4,0	3,5
Group size	2,2	1,8	3,0	1,0	2,0	2,8	2,5	2,7
Individual goals	1,0	1,0	1,0	1,0	1,0			
Ability to exploit new information and learn	1,5	1,0	1,0	1,0	1,3	2,0		2,0
Group interaction	3,2	2,8	3,0	1,0	2,8	3,2	3,3	3,2
Ability to assimilate and process information	2,3	2,3	1,0	3,0	2,3	2,6	2,3	2,5
Ability to communicate	1,7	1,3	1,0	1,0	1,4	2,3	2,0	2,3
Habituation to electronic communication	1,2	1,0	1,0	1,0	1,1	2,0		2,0
Habituation to group work	1,2	1,3	1,0	1,0	1,2	2,0	2,0	2,0
Task								
Session goals	4,0	4,0	4,0	4,0	4,0	4,0	4,0	4,0
Task type	3,5	3,5	3,0	4,0	3,5	3,5	3,5	3,5
Technology								
Technology	2,5	3,0	4,0	3,0	2,8	2,8	3,0	3,0
Support system features	3,2	3,0	2,0	4,0	3,1	3,2	3,0	3,1
Context								
Perceived value of goal attainment	3,5	3,0	1,0	3,0	3,1	3,5	3,0	3,3
Cost of participation	1,5	2,5	1,0	2,0	1,8	2,5	3,0	2,7
Motivation to participate	2,8	2,3	1,0	3,0	2,5	3,8	3,5	3,6
Incentive alignment for participation	3,2	2,8	1,0	3,0	2,8	3,6	3,3	3,4
Place and time	2,5	2,8	3,0	2,0	2,6	2,5	2,8	2,6
Facilitation								
Facilitator expertise	3,3	2,8	3,0	4,0	3,2	3,3	2,8	3,2
Adoption of correct practices	3,3	3,5	4,0	3,0	3,4	3,3	3,5	3,4
Facilitator influence	2,0	2,5	3,0	3,0	2,3	2,0	2,5	2,3

Definition of the figures:
1 = is not important factor and/or not mentioned
2 = is considered but has relatively small impact in design
3 = is important in design
4 = is one of the key factors considered

Appendix 6: Weighted case-by-case incidence rates for the links in the construct connection assignments[4]

Success factors ▼ / Design tasks ▶	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation
Group	**Case Experienced (n = 6)**					**Case Replicated (n = 1)**				
Group goals	**52 %**	21 %	10 %	0 %	0 %	**100 %**	0 %	0 %	0 %	0 %
Group composition	**76 %**	46 %	31 %	15 %	15 %	**50 %**	0 %	**50 %**	0 %	0 %
Group size	45 %	27 %	18 %	18 %	0 %	**75 %**	0 %	0 %	0 %	0 %
Individual goals	17 %	8 %	0 %	4 %	4 %	25 %	25 %	25 %	0 %	0 %
Ability to exploit new information and learn	6 %	13 %	25 %	19 %	0 %	0 %	0 %	25 %	0 %	0 %
Group interaction	13 %	**53 %**	**53 %**	13 %	0 %	0 %	**75 %**	**75 %**	0 %	0 %
Ability to assimilate and process information	10 %	29 %	39 %	10 %	0 %	0 %	0 %	25 %	0 %	0 %
Ability to communicate	7 %	14 %	35 %	7 %	0 %	0 %	0 %	25 %	0 %	0 %
Habituation to electronic communication	5 %	0 %	19 %	10 %	0 %	0 %	0 %	25 %	0 %	0 %
Habituation to group work	5 %	10 %	15 %	15 %	0 %	0 %	0 %	25 %	0 %	0 %
Task										
Session goals	**83 %**	**50 %**	**50 %**	17 %	17 %	**100 %**	0 %	0 %	0 %	0 %
Task type	**88 %**	29 %	15 %	15 %	0 %	**75 %**	**75 %**	0 %	0 %	0 %
Technology										
Technology	10 %	10 %	**52 %**	0 %	0 %	0 %	0 %	0 %	0 %	0 %
Support system features	26 %	13 %	**66 %**	0 %	0 %	0 %	**50 %**	**50 %**	**50 %**	0 %
Context										
Perceived value of goal attainment	29 %	15 %	0 %	15 %	**58 %**	0 %	25 %	25 %	25 %	0 %
Cost of participation	6 %	0 %	6 %	19 %	6 %	0 %	0 %	25 %	0 %	0 %
Motivation to participate	47 %	12 %	0 %	24 %	12 %	25 %	0 %	0 %	0 %	0 %
Incentive alignment for participation	**53 %**	13 %	0 %	**53 %**	26 %	25 %	0 %	0 %	0 %	0 %
Place and time	31 %	0 %	21 %	31 %	0 %	**75 %**	0 %	0 %	0 %	0 %
Facilitation										
Facilitator expertise	42 %	42 %	42 %	28 %	28 %	**75 %**	**75 %**	**75 %**	**75 %**	**75 %**
Adoption of correct practices	28 %	42 %	42 %	42 %	28 %	0 %	**100 %**	**100 %**	**100 %**	0 %
Facilitator influence	33 %	17 %	25 %	8 %	0 %	**75 %**	**75 %**	**75 %**	**75 %**	**75 %**

Success factors ▼ / Design tasks ▶	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation
Group	**Case In-experienced (n = 4)**					**Case Consulting (n = 1)**				
Group goals	**50 %**	13 %	0 %	0 %	0 %	25 %	0 %	0 %	0 %	0 %
Group composition	**75 %**	**50 %**	0 %	0 %	0 %	0 %	0 %	0 %	0 %	**50 %**
Group size	33 %	22 %	22 %	0 %	0 %	25 %	0 %	0 %	0 %	0 %
Individual goals	6 %	13 %	6 %	0 %	0 %	0 %	0 %	0 %	0 %	25 %
Ability to exploit new information and learn	13 %	6 %	13 %	6 %	0 %	0 %	0 %	0 %	0 %	0 %
Group interaction	17 %	34 %	17 %	0 %	0 %	0 %	0 %	0 %	0 %	25 %
Ability to assimilate and process information	14 %	14 %	28 %	14 %	14 %	0 %	0 %	**75 %**	0 %	0 %
Ability to communicate	8 %	8 %	16 %	16 %	8 %	0 %	0 %	25 %	0 %	25 %
Habituation to electronic communication	0 %	6 %	19 %	6 %	6 %	0 %	0 %	0 %	0 %	25 %
Habituation to group work	8 %	8 %	23 %	8 %	0 %	0 %	25 %	0 %	0 %	0 %
Task										
Session goals	**100 %**	25 %	25 %	0 %	0 %	**100 %**	0 %	0 %	0 %	0 %
Task type	**88 %**	44 %	22 %	22 %	0 %	**100 %**	0 %	0 %	0 %	0 %
Technology										
Technology	19 %	0 %	**75 %**	0 %	0 %	0 %	**75 %**	0 %	0 %	0 %
Support system features	19 %	19 %	**56 %**	19 %	0 %	**100 %**	0 %	0 %	0 %	0 %
Context										
Perceived value of goal attainment	38 %	19 %	19 %	0 %	0 %	**75 %**	0 %	0 %	0 %	0 %
Cost of participation	31 %	0 %	16 %	31 %	0 %	**50 %**	0 %	0 %	0 %	0 %
Motivation to participate	**56 %**	0 %	0 %	14 %	0 %	0 %	0 %	0 %	**75 %**	0 %
Incentive alignment for participation	34 %	17 %	17 %	17 %	17 %	**75 %**	0 %	0 %	**75 %**	0 %
Place and time	34 %	0 %	0 %	**52 %**	0 %	0 %	0 %	0 %	**50 %**	0 %
Facilitation										
Facilitator expertise	17 %	17 %	34 %	34 %	17 %	**100 %**	0 %	0 %	0 %	0 %
Adoption of correct practices	22 %	0 %	44 %	0 %	44 %	0 %	**75 %**	0 %	0 %	0 %
Facilitator influence	0 %	16 %	0 %	31 %	16 %	0 %	**75 %**	0 %	0 %	0 %

[4] The used weights are the average measures of importance shown on Appendix 5. The table above has been calculated by multiplying the rates of incidence from Appendix 4 by the case-specific measures of importance.

Appendix 7: Weighted incidence rates for the links in the construct connection assignments, all interviewees together[5]

Success factors ▼ / Design tasks ▶	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation
	All interviewees (n = 12)				
Group					
Group goals	**53 %**	15 %	5 %	0 %	0 %
Group composition	**66 %**	36 %	22 %	7 %	15 %
Group size	**42 %**	21 %	17 %	8 %	0 %
Individual goals	13 %	10 %	4 %	2 %	4 %
Ability to exploit new information and learn	8 %	8 %	18 %	10 %	0 %
Group interaction	12 %	**41 %**	35 %	6 %	6 %
Ability to assimilate and process information	9 %	19 %	38 %	9 %	5 %
Ability to communicate	6 %	9 %	27 %	9 %	6 %
Habituation to electronic communication	2 %	2 %	18 %	7 %	5 %
Habituation to group work	5 %	10 %	17 %	10 %	0 %
Task					
Session goals	**92 %**	33 %	33 %	8 %	8 %
Task type	**88 %**	36 %	15 %	15 %	0 %
Technology					
Technology	12 %	12 %	**53 %**	0 %	0 %
Support system features	26 %	19 %	**58 %**	13 %	0 %
Context					
Perceived value of goal attainment	32 %	19 %	13 %	13 %	26 %
Cost of participation	15 %	0 %	11 %	19 %	4 %
Motivation to participate	**47 %**	5 %	0 %	21 %	5 %
Incentive alignment for participation	**47 %**	12 %	6 %	35 %	18 %
Place and time	32 %	0 %	11 %	38 %	0 %
Facilitation					
Facilitator expertise	40 %	33 %	40 %	33 %	26 %
Adoption of correct practices	21 %	36 %	**43 %**	28 %	28 %
Facilitator influence	24 %	24 %	19 %	19 %	10 %

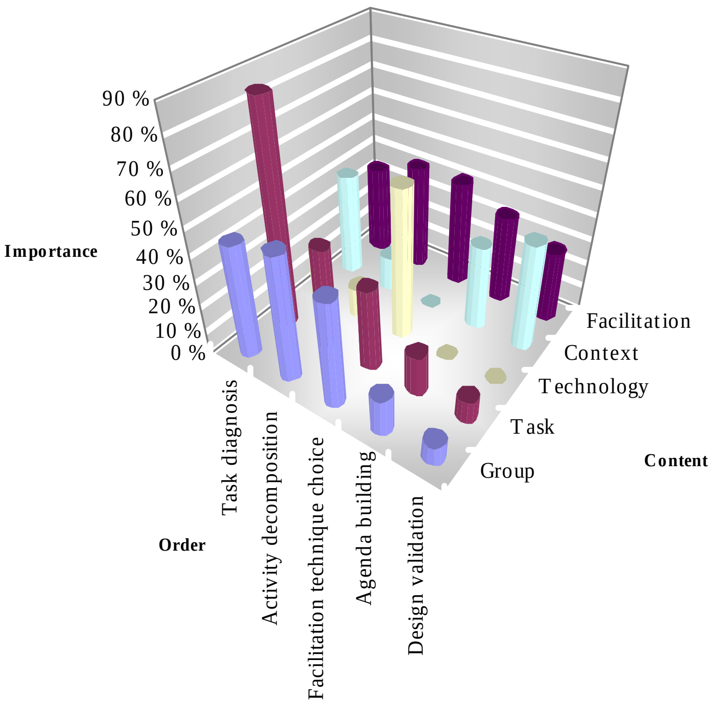
[5] The used weights are the average measures of importance shown on Appendix 5 that have been converted to percentages dividing each number by 4. The table above has been calculated by multiplying the rates of incidence (Appendix 4) by the weights.

Appendix 8: Weighted incidence rates for the links in the construct connection assignments as success factors are divided into five groups[6]

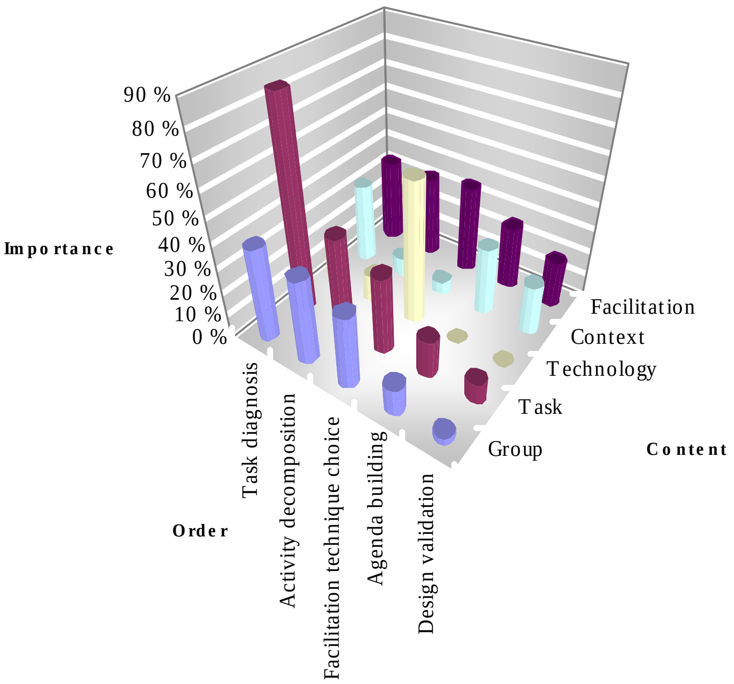
Criteria for including individual success factors ▶	A) All significant success factors included					B) Two most important success factors from each group included					C) All significant success factors included but individual importance figures of 1 excluded				
Design tasks ▶ / Success factors case by case ▼	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation	Task diagnosis	Activity decomposition	Facilitation technique choice	Agenda building	Design validation
Case Experienced (n = 6)															
Group	39 %	35 %	30 %	11 %	3 %	45 %	49 %	42 %	14 %	8 %	45 %	39 %	33 %	12 %	3 %
Task	85 %	40 %	32 %	16 %	8 %	85 %	40 %	32 %	16 %	8 %	85 %	40 %	32 %	16 %	8 %
Technology	18 %	12 %	59 %	0 %	0 %	18 %	12 %	59 %	0 %	0 %	19 %	12 %	62 %	0 %	0 %
Context	33 %	8 %	5 %	28 %	21 %	41 %	14 %	0 %	34 %	42 %	39 %	9 %	6 %	34 %	23 %
Facilitation	34 %	33 %	36 %	26 %	19 %	35 %	42 %	42 %	35 %	28 %	34 %	33 %	36 %	26 %	19 %
Case Inexperienced (n = 4)															
Group	38 %	27 %	13 %	3 %	3 %	46 %	42 %	9 %	0 %	0 %	46 %	31 %	16 %	3 %	3 %
Task	94 %	34 %	23 %	11 %	0 %	94 %	34 %	23 %	11 %	0 %	94 %	34 %	23 %	11 %	0 %
Technology	19 %	9 %	66 %	9 %	0 %	19 %	9 %	66 %	9 %	0 %	19 %	9 %	66 %	9 %	0 %
Context	39 %	7 %	10 %	23 %	3 %	36 %	18 %	18 %	9 %	9 %	48 %	8 %	12 %	26 %	4 %
Facilitation	13 %	11 %	26 %	22 %	26 %	20 %	9 %	39 %	17 %	30 %	13 %	11 %	26 %	22 %	26 %
Case Replicated (n = 1)															
Group	45 %	15 %	30 %	0 %	0 %	25 %	38 %	63 %	0 %	0 %					
Task	88 %	38 %	0 %	0 %	0 %	88 %	38 %	0 %	0 %	0 %					
Technology	0 %	25 %	25 %	25 %	0 %	0 %	25 %	25 %	25 %	0 %					
Context	25 %	5 %	10 %	5 %	0 %	13 %	13 %	13 %	13 %	0 %					
Facilitation	50 %	83 %	83 %	83 %	50 %	38 %	88 %	88 %	88 %	38 %					
Case Consulting (n = 1)															
Group	10 %	0 %	15 %	0 %	15 %	0 %	0 %	0 %	0 %	38 %					
Task	100 %	0 %	0 %	0 %	0 %	100 %	0 %	0 %	0 %	0 %					
Technology	50 %	38 %	0 %	0 %	0 %	50 %	38 %	0 %	0 %	0 %					
Context	40 %	0 %	0 %	40 %	0 %	75 %	0 %	0 %	38 %	0 %					
Facilitation	33 %	50 %	0 %	0 %	0 %	50 %	38 %	0 %	0 %	0 %					
All interviewees together (n = 12)															
Group	36 %	26 %	23 %	6 %	5 %	39 %	39 %	29 %	7 %	10 %	44 %	31 %	27 %	7 %	5 %
Task	90 %	35 %	24 %	11 %	4 %	90 %	35 %	24 %	11 %	4 %	90 %	35 %	24 %	11 %	4 %
Technology	19 %	16 %	55 %	6 %	0 %	19 %	16 %	55 %	6 %	0 %	19 %	16 %	57 %	6 %	0 %
Context	35 %	7 %	8 %	25 %	10 %	40 %	16 %	9 %	24 %	22 %	43 %	8 %	10 %	30 %	12 %
Facilitation	28 %	31 %	34 %	27 %	22 %	30 %	34 %	41 %	31 %	27 %	28 %	31 %	34 %	27 %	22 %

[6] In cases (A) and (B), the weights used are the average measures of importance shown on Appendix 5. In case (C), the weights used are the averages without 1's shown on Appendix 5.

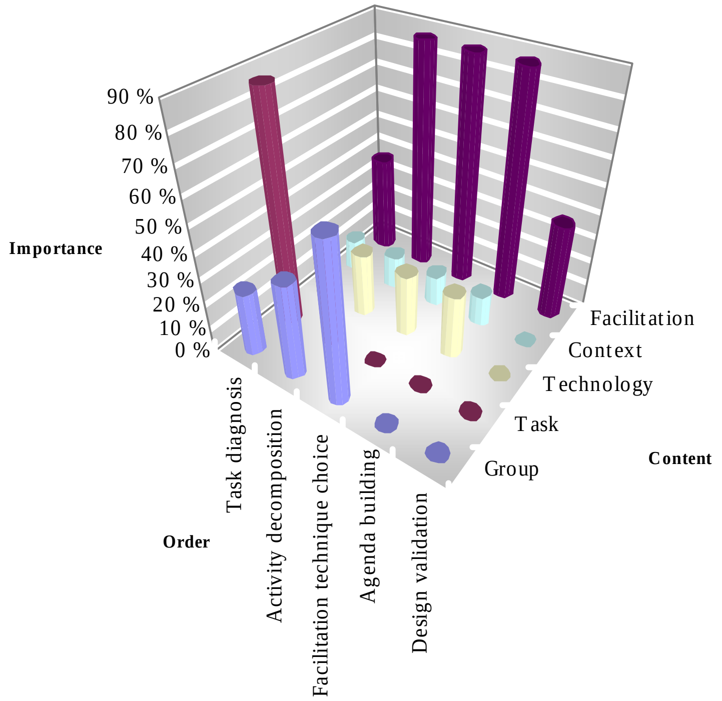
Appendix 9: Case-by-case design models



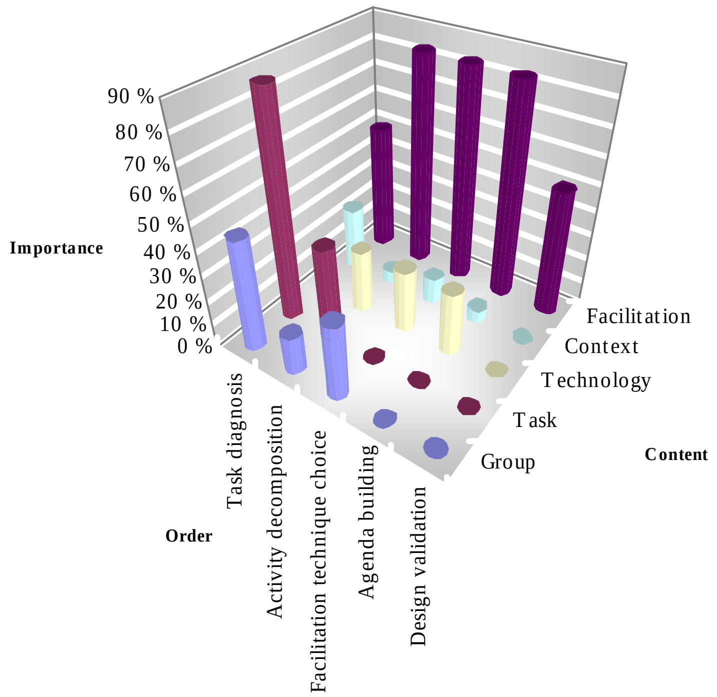
Case Experienced, two most important success factors from each group included



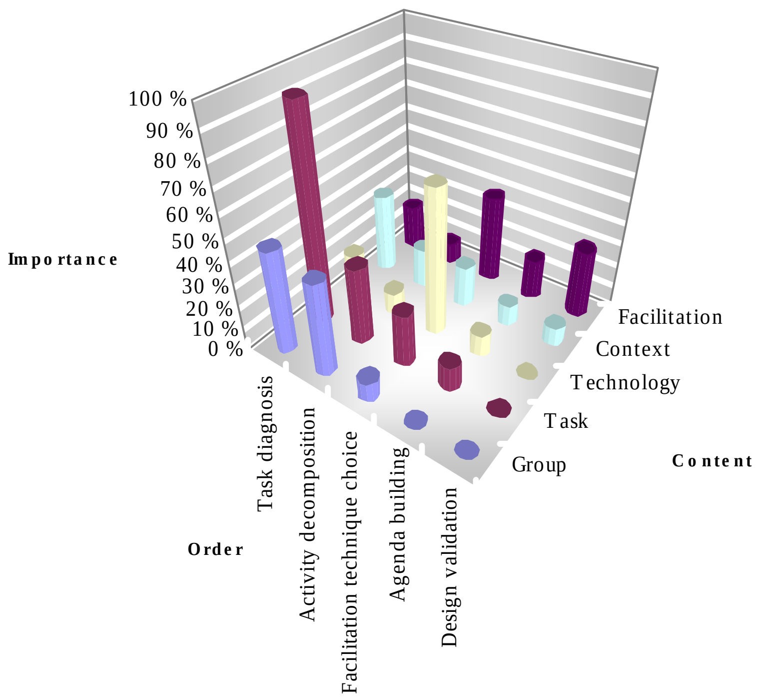
Case Experienced, all significant success factors included



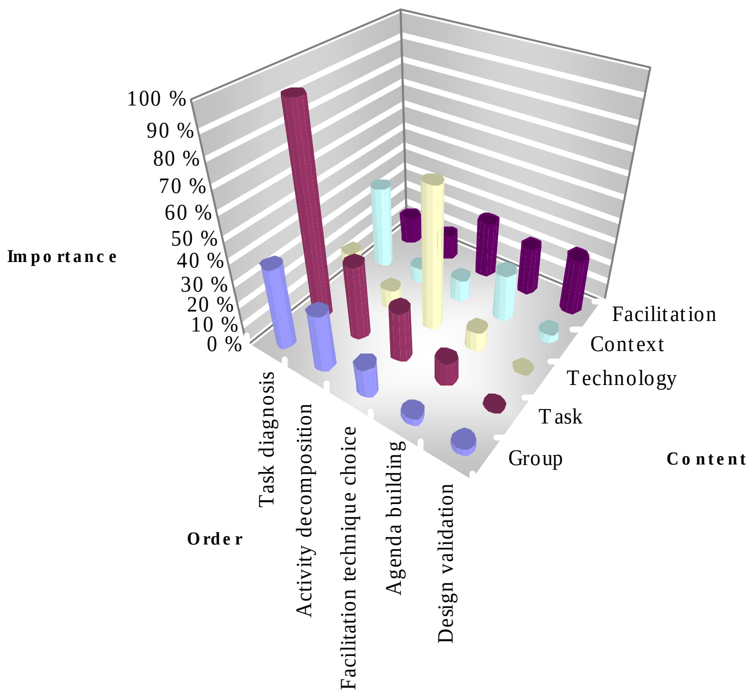
Case Replicated, two most important success factors from each group included



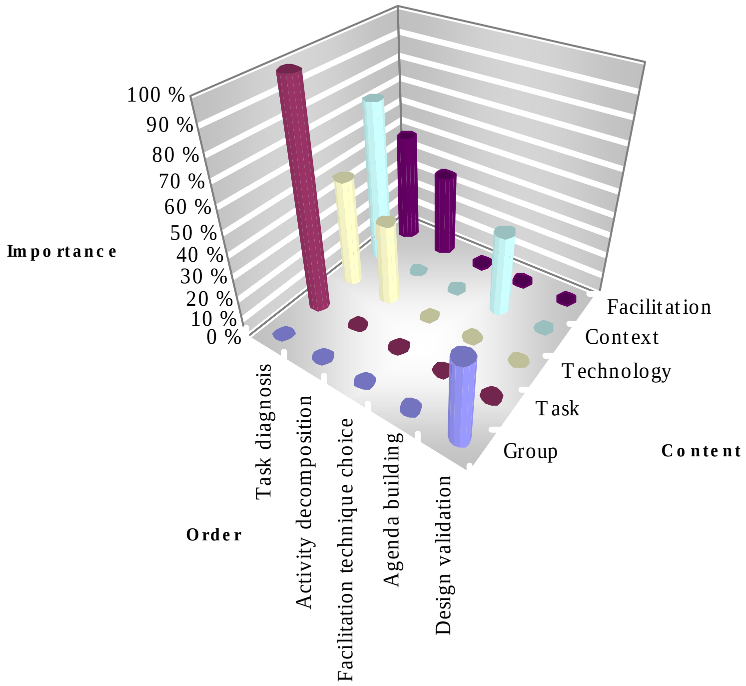
Case Replicated, all significant success factors included



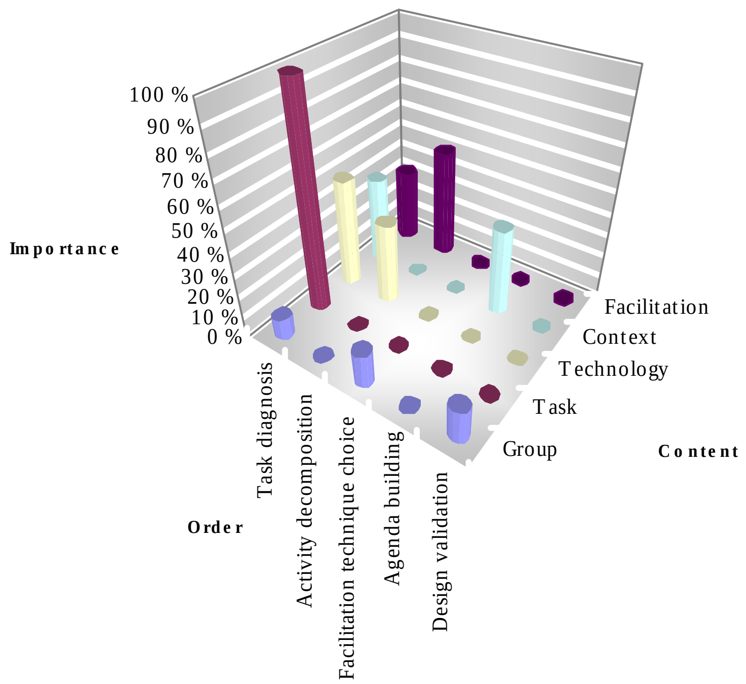
Case In-experienced, two most important success factors from each group included



Case In-experienced, all significant success factors included



Case Consulting, two most important success factors from each group included



Case Consulting, all significant success factors included