Projects as a reflection of the core group

- the case of construction projects

by

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ABSTRACT

Is project performance the result of the effort made by a central group of managers and professionals or the result of the right use of project management methods and techniques? This is a question many project people ask themselves when planning and executing a project. This study seeks to answer part of this question by focusing on the role of a central group in projects; here named the core group.

This study highlights the role of the people embodying the core competence of projects, here seen to be the central managers, the client and main professionals. A main argument guiding this research is that the way this core group is composed, and the way the process develops within the group, are important factors for project development and performance. Studying 55 large construction projects for office and educational purposes in Norway and Sweden, project performance is here understood as being equal to the productivity of the process, here expressed as costs per m2 building constructed, and the quality of the building, as defined by core group members' evaluations on several dimensions

The composition of groups is generally seen as very important, for both how groups cooperate and how they perform. Within the study of top management teams it has been argued that diversity is particularly beneficial as it prevents groupthink and improves decision making. *Homogeneity of values, a high level of work involvement and previous joint work experience* are also factors that are highlighted as positive for a good performance as they facilitate group cooperation. Nevertheless, *none of these factors appeared to be of importance for the effective functioning of core groups* as they had no impact on the process of the core group and the productivity and quality of construction projects. The productivity analyses were conducted on a representative sample of 37 projects.

However, these findings alone are not sufficient for discarding the role of the core group, as *the group process was revealed to be very important for the performance of these projects*. Conflict is generally seen to be functional up to a certain level as it opens up for different viewpoints, gets all facts and opinions on the table and prevents groupthink. Groupthink is a phenomenon typical of cohesive groups or groups with

strong leaders that exert pressures to conform and think unidimensionally and it is generally considered negative for the quality of decisions and performance.

Unexpectedly and contrary to small-group theories, conflict or level of disagreement has here been found to have a strong negative impact on performance. Even a low level of conflict was detrimental to productivity and quality. Supportive to this finding and contradictive to general theories, *groupthink was found to have a positive impact on productivity.* This means that the best way to achieve an efficient project process should be to avoid or suppress unnecessary conflicts and learn to handle the important ones constructively. As groupthink is favorable, this means that there should be a certain pressure to agree with the other members in the group. Other findings disconfirming general group theories were that *cohesion or a good cooperative environment and a common project identity had no effect on productivity.* Additionally, neither the size of the core group nor the duration of the construction projects showed any effect on performance. Although not a focused issue of the study, it is worth mentioning that factors generally put forward as main predictors of project effectiveness did not show to have any impact. Neither the contractor system, the number of contracts, the contracting system, the use of project methods, the time spent on the design stage and on formal meetings, degree of overlap between design and construction nor external unforeseen events had any effect on the productivity of the studied projects.

These results reveal that project processes are unlike organizational processes within stable organizations. The time perspective, whether short-term or long-term, obviously has an important role for people's behavior. One should therefore be careful with using general organizational theory on projects.

Finally, it is important to note that the results acquired hold for productivity (the internal effectiveness of projects), and not necessarily for the external, qualitative effectiveness as the measurement of quality suffers from several shortcomings. It may well be that conflict, cohesion and a common project identity in the core group can be functional for more qualitative, long-term aspects such as the design, user- and environmental friendliness and maintenance of buildings. Distinguishing between the internal and external effectiveness makes a claim for a contingency approach to group and project studies.

Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1. INTRODUCTION

Project performance is generally seen as a result of the rational project methods and techniques which have been used or the specifically designed contracts and structures. Projects are rarely seen for what they really are; a collection of professionals working intensively together for a limited period of time. Even though the world of practice sees the critical role individuals play for how the project performs, theories and studies about projects still neglect such aspects. There have been studies examining the human perspective of projects (Cleland, 1968; Katz and Allen, 1985; Thamhain, 1990), but these are few and mostly concerned with the project manager or general organizational processes. Inspired by a research field gaining increasing interest, namely the studies on top management groups (Bourgeois, 1980; Hambrick and Mason, 1984; Bantel and Jackson, 1989; Eisenhardt and Schoonhoven, 1990; Hambrick, 1994), this study launches a 'core group' perspective on projects. Since the most important resource of projects has been overlooked for so long, it is time to redirect the current focus of project management towards those embodying the core competence of projects and being central in value creation.

A 'core group' perspective directs attention to the key managers, professionals and clients of projects, generally a group of 10 people. These professionals are central in both the planning and implementation stages of the project, and particularly critical in the early stages of the project. While the activities in the planning stage constitute 10 to 20 per cent of the total project costs, their impact on overall performance is assumed to be substantial. Adopting such a 'core group' perspective on projects means to analyze project performance in relation to how well the core group functions as an entity. The composition of top management groups is in fact shown to have an impact on the performance of large corporations (Bantel and Jackson, 1989; Murray, 1989; Eisenhardt and Schonhooven, 1990; Finkelstein and Hambrick, 1990). Diversity of composition is here seen to be particularly favorable as it prevents groupthink (Janis, 1972) and stimulates creativity. As projects are short-lived, focused and not very vulnerable to external events, a basic argument guiding this study is that core

groups should be even more influential for projects than top management groups are for large corporations.

Some would argue that one can not study groups without analyzing their processes. However, few efforts have been made to investigate the more fundamental intervening processes of group composition and performance (Smith et. al, 1994; Pelled, 1995; Jehn, 1995). A project generally involves a complex process, where specialists from different professions and organizational units must work together temporarily on multidisciplinary tasks. Whether core groups are subdued to conflict and open disagreements or develop a common identity and cohesive bonds, should therefore be of major importance for their performance. Drawing upon the social-psychologically inspired group research field (e.g. Steiner, 1972, Shaw, 1981; Goodman and ass., 1986; Hackman, 1983) and social identity theory (Tajfel, 1981,1982; Turner, 1982,1987), several aspects of group processes have been highlighted.

The project mode of organizing has become increasingly popular across a wide array of industries and settings, but its first application was mainly within construction. As construction is an industry with long traditions of applying the temporary and focused mode of project management, this industry constituted the research setting in this study. On this basis, the three main research questions to be answered here are;

How does the composition of the core group affect the performance of construction projects?

How does the process of the core group directly affect the performance of construction projects?

How does the composition of the core group indirectly affect the performance of construction projects through group processes?

See the figure below for an overview of main variables and relations.

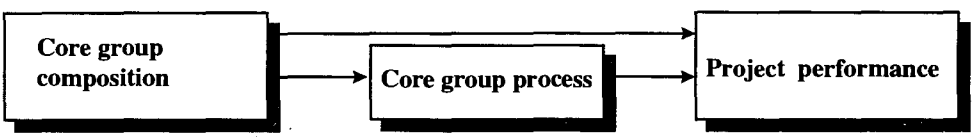

Fig.1, Overall model

The main argument put forward here is that the composition of core groups has a considerable effect, both on group process, as measured by conflict, groupthink, cohesiveness and common project identity, and on project performance, as measured by productivity and quality of end results. The process is also seen to have a direct effect on project performance. Composition is indicated by the degree of diversity (age, educational level, positional and industry tenure), the degree of homogeneity of project values and stable professional group identity and, finally, by the degree of work involvement and previous joint work experience.

The units to be studied have been construction projects for office and educational purposes of more than 5,000m2, residing in Norway and Sweden. Restricting the study to one industry and type of projects allows controlling for the task, technology and industry. Research has shown that factors specific to the industry influence the role of the top management group (Murray, 1989) and that task and technology impact group behavior substantially (Hackman, 1990; McGrath, 1986). Limiting the study to one industry allows for the control of industry and task spuriousity, but lowers the generalizability of the results.

1.1 Purpose

The aim of the present study is twofold. Since the field of project management lacks a solid theoretical foundation regarding human aspects and since the concept of core groups is new, a thorough theoretical review of the presented issues has been given. By drawing upon different, but complementing theoretical perspectives, a multidisciplinary approach has been adopted. The main perspectives derive mainly from the fields of project management, construction management, organizational behavior, small groups and top management groups. Whole sections of the review are, in the above line of order, devoted to the issues of project performance, group composition and group process.

The second aim is to empirically explore the multilevel research model in order to establish whether the core group has any impact at all on productivity and the quality of end results. Since there has been an extensive theory development and testing on how top management groups impact the performance of large organizations, hypotheses will be developed. The aim of this study is therefore primarily to test whether theories developed for stable, private firms hold for temporary, both private and public construction projects.

1.2 Practical contribution

This report will hopefully direct attention to new aspects of project management. By focusing on the core group, its composition and process, the role of key managers and professionals is highlighted. Analyzing the way these factors influence project performance will hopefully give project people a better insight into these matters.

The focus on members´ characteristics and their composition points to the importance of the recruitment and management of professionals in projects. People in the ´project world´ generally pay attention to and have a high competence level in technical and structural issues. The procurement of physical assets and materials is usually taken well care of. On the other hand, the hiring and managing of people happen accidentally and are generally not given much attention. Developing knowledge about the composition of project professionals and putting the 'management of group processes' on the daily agenda of project managers may therefore be seen as important contributions of this study. But the proof of having convinced the project world will first be seen when these issues are found on the future Gantt diagrams.

1.3 Report outline

The report consists of seven main chapters, organized as follows: Chapter two contains the review and discussion of relevant theories with an initial description of

the units of analysis. As the main theoretical perspectives are presented, at the same time, the review gives insight into different ways of perceiving projects. In the third chapter, the research model and hypotheses are presented. The method chosen and the description of data collection is presented in chapter four. Chapter five reports the measurement of variables while chapter six presents the results of the analysis. Finally, the findings and the following theoretical and practical implications are discussed in chapter seven.

2. THEORETICAL PERSPECTIVES

This chapter introduces the levels of analysis; i.e. groups and projects, and gives a description of the relevant theoretical contributions of this study. It will seek to give theoretical answers to the defined problem. At the same time, it gives a presentation of different dimensions of project work. Adopting project analogies in the headings does not only reveal different theoretical perspectives, but also different ways of seeing projects. The following review can therefore be seen as a presentation of different cognitive maps of project organizations, existing in the minds of people working with and in projects.

Projects may also be seen as mental creations, as they often have unclear boundaries and no distinct physical location. Members of projects are not necessarily bound together by physical and structural forms, being often dispersed in different businesses and geographical sites. Many projects challenge the traditional idea of what an organization is; normally residing in a specific building and having its distinct history and traditions.

The following chapters will guide you as a reader through the theoretical foundation of the research model, which at the same time reflects some common mental pictures of projects. Theories reveal different pictures of the world, but also different mental cognitive structures. Projects may be interpreted as groups or teams or even more common, as a collection of interrelated groups (chapter 2.1). They can be interchanged with the final result or product (chapter 2.2) or even more often seen as a reflection of the people in the projects (chapter 2.3). Finally; projects are sometimes paralleled to their internal group-processes (chapter 2.4).

2.1 Projects versus groups and teams

There is disagreement both among practitioners and theoreticians with regard to what projects, groups and teams are. The definitions vary and these organizational unit labels are often interchanged. In order to clarify the position taken and define the units of analysis, a closer look at the characteristics of projects, groups and teams will be given.

2.1.1 Toward a project definition

The project mode of organizing is a characteristic phenomenon of our time. The project approach has found general application within many kinds of activities and industries. While projects previously were only found within the building industry, the army and engineering-based industries, you now find projects within all kinds of industries. Examples of industries where the project mode has gained wide popularity are the health services, arts and media, research-based businesses and the public sector. There can be several possible reasons for this development, the most apparent reason being the need for flexible, innovative and efficient problem and task solving. Previously big, stable and divisionalized organizations get leaner and smaller as they outsource support functions. The speeding up of product development and production, together with the increasing use of temporarily hired employees have paved the way for greater use of the project mode.

But increasing use of the project mode has blurred the concept. Everyone talks about projects, but one may ask whether all are 'real' projects? I will look deeper into the most common project definitions to give a clear picture of what projects are. It appears that most project definitions (see appendix 1 for an overview), are conceptualized around some common features.

Most descriptions of projects are mainly focused on the character of the task often including its uniqueness, goal-directness and temporary character. Projects are by

some conceptualized as 'temporary systems' (e.g. Goodman and Goodman, 1972). Some also point to the given resource constraints, which are not only a typical characteristic of project work, but also of organizational activity in general. Among the prevailing definitions, some describe the involved participants pointing to the fact that projects are cross-functional as they cut across traditional, organizational, departmental and professional boundaries. Although not mentioned in the referred project definitions, a typical project feature and source for many problems is the dual orientation, towards the line or functional division and the task-oriented project. This dual structure is generally called the matrix organization, which is a complex organizational device that pose specific organizational challenges.

It appears that the temporary, ad-hoc nature, the flexible, unique character and the aforementioned need for some stated, recognizable aim are projects' most distinguishing features (e.g. Gray, 1981; Stephanou and Obradowich, 1985; Lock, 1987; Kolltveit, 1988). Five central dimensions characterizing projects are here included in the definition;

Projects are

- *temporary efforts*
- *predefined, purposeful task-performance systems*
- *unique, often complex endeavors*
- *constrained by time and budget*
- *cross-functional entities*

2.1.2 Categorizing projects

This chapter serves as a frame to position the chosen empirical units of analysis in relation to projects in general. The chosen units of analysis are projects set up for the planning and construction of large buildings for office and educational purposes.

Having laid out the characteristics of ideal-type projects, however, practice shows us that projects differ considerably. Most projects have some uniqueness to them, but they differ regarding the degree of uniqueness. There are three main dimensions that may differentiate projects in uniqueness; task, technology and people. While some projects are unique on all three dimensions, others are unique on one or two. Research projects often have a completely new problem or task to solve, but may involve known technology and familiar people. The degree of uniqueness is important because it influences the complexity and interrelatedness of the task directly, which again affects the way the project is organized.

Projects do not live in a vacuum. They are heavily influenced by their environment or uncontrollable events, a fact that both theoreticians and practitioners tend to overlook. Like stable organizations, projects relate to both the technical and the institutional environment (Scott, 1987). The technical environment includes the client organization, other competitors and market-related factors. The institutional environment is often defined as a set of culturally produced elements and norms. The actors may be the Government, professional groups or the public opinion, installing a set of both visible and invisible requirements and expectations on the project organization. The degree of dependence on the environments differ from project to project. Looking upon the external environment as an important source of uncertainty and risk, the degree of dependence on the environment may be an important predictor of how projects develop.

The following figure is an attempt to capture these two dimensions. It includes examples of projects that fit the different categories.

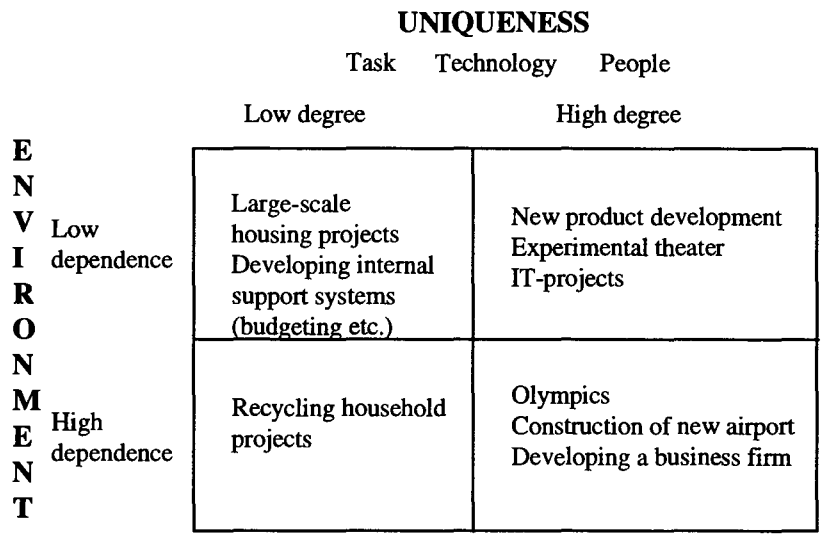

Fig.2, A categorizing system for projects

2.1.3 Toward a core-group definition

Teams and groups are often confused, although current definitions (see appendix 2 presenting group definitions and appendix 3 presenting team definitions) reveal that teams and groups are conceptualized differently. In an article on top management groups, Hambrick (1994) reconsiders the 'team' label and argues that many top management teams have little 'teamness' to them. His main argument is that groups need to be integrated in order to be called 'teams'.

The team definitions are more normative than the definitions of projects and groups, as a ´team´ usually is defined by the desired qualities of a well-functioning and cohesive group. Teamwork involves multidisciplinary participation, collaboration and coordination in accomplishing a goal or a result according to the mentioned definitions. Teams are described as united and collaborative and can therefore be seen as an example of ´ideal´ work groups.

Groups have many similarities with teams, except that they are not necessarily related to a common goal or task. Some of the earlier theorists view the experience of common fate as a critical factor (e.g. Lewin, 1948). For other theorists, the fact that groups consist of people in face-to-face interaction with one another is central (e.g. Bales, 1950; Mitchell and Larson, 1987). The third type of definitions center around some formal or implicit social structure, usually in the form of status and role relationships (e.g. Sherif and Sherif, 1969). Most definitions are applicable to small groups (of twenty members or less), but seem to exclude large-scale social categories such as ethnic groups, social class or nationality. Category membership can influence people´s behavior just as much as membership in the most cohesive face-to-face groups (Brown, 1988). This problem has led some researchers to propose a much more subjective definition of groups in terms of people´s self-categorizations (Tajfel, 1981; Turner, 1982; Turner et al. 1987). According to this view, groups exist when two or more individuals perceive themselves to be members of the same social category (Turner, 1982, p.15). Brown claims this definition to be too subjective. He proposes to extend Turner´s (1982) definition by including others' recognition of the group.

Recent conceptualizations of groups refer to the mutual interdependence between members (e.g. Alderfer, 1977; Shaw, 1981; Mitchell and Larson, 1987; Hackman, 1990). Contrary to earlier theorists only referring to the interpersonal or social categorical dimensions of groups, there are theoreticians focusing at work or task-related aspects when defining groups (e.g. Steiner, 1972; McGrath, 1984; Goodman and ass., 1986; Gist, Locke and Taylor, 1987; Hackman,1983, 1990; Worchel, Wood and Simpson, 1992). Groups in this literature are mainly named work groups (Alderfer, 1977; Hackman, 1990), performance groups (Goodman and ass, 1986), task performance systems (Gist, Locke and Taylor, 1987) or task forces.

There is a growing stream of research looking at a particular group in organizations, namely the 'top management group or team' (Bourgeois, 1980; Bantel and Jackson, 1989; Eisenhardt and Schonhoven, 1990; Fredrickson and Iaquinto, 1989 among

others). Others have labeled it the 'upper-echelon group' or 'top level group' (Hambrick, 1981; 1994). When choosing the top level group in projects, it made sense to include the most influential or 'strategic' people, that during the project process had regular meetings and were considered a group. The groups to be studied resulted from a selection of top managers and main consultants of the projects. Such groups have some similarities with the denoted top management groups, but their task, their interaction as well as roles differ. When presenting the present research topics for a group of selected managers and professionals in the Norwegian construction industry in Norway, the term 'top level group' was found inappropriate to describe the central people in construction projects. The main reason was that projects are not as hierarchical as stable organizations. Referring to the central managers and professionals as 'top' gives the wrong connotations. Due to the temporary and task-oriented nature of projects', these people are heavily involved in actual task-solving and do not delegate tasks to the same degree as top managers in stable organizations. However, having major responsibility in making decisions and developing technical or design solutions, they are more central and influential than other project-members. A suggested way of defining the managers and main professionals in construction projects is therefore to describe them as the 'core group'. For the purpose of this study, the 'core group' consists of the following persons in building projects;

Managers	:	*project manager*
		design group manager
		site manager
Client and consultants	:	*client*
		user-representative
		architect
		structural consulting engineer
		heating-and-ventilation consulting engineer
		electrical consulting engineer
		main contractor

What make core groups of projects different from top management groups of large corporations is among others, that the selected members in core groups have very different ambitions, goals and interests with their participation in projects and are not united by a common goal or corporate culture. As the members represent different firms and professions, the group is fragmented and differentiated, something that is also reflected by the many conflicts appearing. However, given the specialization and experience of professionals in handling the project process, their roles and expectations are quite clear. Experienced professionalized people know what to do when handling a new project because they have encountered similar challenges earlier. This renders the tasks of core groups much more predefined, concrete and controllable than the ill-defined decision and negotiating tasks of top management teams. Although the time pressure is high in project, members of core groups are faced with less unpredictable challenges than top group members are. So when making the comparison of core groups with top management teams, it is important to keep in mind that there are differences.

Before continuing, I will give a short explanation of the actual tasks of construction projects. First, planning and constructing a building is a complex affair as tasks are interrelated and change throughout the project stages. Given the tight time schedule and diverse life-cycle stages, project work also involves intense pressure, work overload and stress at times. The members of core groups are responsible for presenting concrete solutions to the client's needs and demands, develop plans and procedures, as well as executing these plans and designs. Due to the specialization of tasks, tight contact and coordination is needed which among others leads to hourlong meetings throughout the whole process. In order to get an idea of what the tasks are and how they shift through the different stages, an overview of McGrath's Task Circumplex (McGrath and Kravitz, 1982) is presented.

PROJECT STAGES	TASK TYPES
1. Conceptual planning	I.To generate plans and creative ideas
2. Design	II. To choose and develop drawings
3. Procurement	III. To negotiate, bargain and allocate tasks
4. Construction	IV. To execute the plans -constructing the building

Looking at the categorization of tasks occurring in a construction project, it appears that nearly all the tasks in McGrath's typology are present. As for the involved members, their role differs depending on the project stage. In the beginning, the architect, client and user-representatives are the key persons in defining the needs and possible solutions. When a solution is selected, the design and technical estimations are developed. During this stage, the design group manager has an important role and the consulting engineers become critical in developing technical solutions to the architects' drawings. Finally, when the main drawings and specifications are ready, the bidding process starts. Here the challenge lies in the hand of the project manager, in selecting good contractors. It may also happen that the contractor is appointed from the very beginning, depending of which contractor system that is used. Finally, the actual construction work starts which involves tight supervision and coordination between all members of the core groups. Unexpected events and changes may also occur. This is a critical stage where the project manager has to keep tight control of time and money.

At the same time, many of these professionals are responsible for different operative units which they have to manage and delegate work to. This dual orientation creates a tension, both with regard to interests and group identities. As such, the group is involved in both planning, administration, professional task solving and management of fellow professionals. These factors raise severe challenges both for each individual and for the group cooperation as a whole.

Another way core groups can be distinguished from many other types of groups is according to the types of individuals who comprise them. The members of core groups tend to consist of people who are educated (from 2 to 6 years) in a specialized field. They are more or less professionalized, which i.e. means that they have an exclusive competence or task, are committed and identify with their work and profession, have a need for autonomy and a felt obligation to render service without concern for self-interest. Professional workers are significantly different from organizational workers according to the theory of profession. The main professions or specialized occupations to be represented within the present field of study are; architecture, engineering, project management and the clients' fields which can be anything from medicine or business administration to law.

Hambrick makes a big point out of the fact that most top management units function as groups, but that they should ideally strive towards becoming teams (1994). He defines teams as being behaviorally integrated, a group that engages in mutual and collective interaction. Most core groups in projects function like 'groups', which means that they are more a constellation of professionals who operate somewhat distinctly from each other rather than a united, coherent and collaborative task solving unit. The actual work is performed separately which makes the group multidisciplinary, not interdisciplinary. Another factor that makes the group rather disintegrated is that all members are located apart, in their separate firms and offices. Even though some argue for a physical unification of project members, the main tendency is to be spread geographically. It appears that most professionals prefer to share offices with fellow professionals, rather than with the client and the project administration.

On the basis of the mentioned definitions of groups and teams and general practice, the description of core groups in projects can be summarized as follows:

A core group in a project is;

- *an influential set of around 10 people making the major decisions*

and executing important tasks in the project

- heavily involved throughout the whole project process

- a temporary unit with regular face-to-face meetings and interaction

- a cross-functional or multidisciplinary collection of professionals

- a mutually interdependent and collaborative entity

2.1.4 Summary

In this section the most common project, group and team definitions have been presented. Since the team definitions center on the task (cross-functional, goal-directed, cooperation etc.) they have similarities with project definitions. The project, being the level of analysis, is usually conceptualized as a unique, temporary effort, and a purposeful and cross-functional task performance system constrained by time and budget. The conceptualizations of groups, on the other hand, describe more the interpersonal and psychological dimensions. Projects may be seen as collections of interrelated groups. One of the groups found in projects is the core group, which in this study is assumed to share many of the general characteristics of a group. This group is defined to involve cross-functional cooperation directed towards the attainment of a goal, interdependence among members, face-to-face meetings and regular interaction.

The figure below summarizes the chapter by presenting the kind of characteristics most frequently used to describe projects, groups and teams.

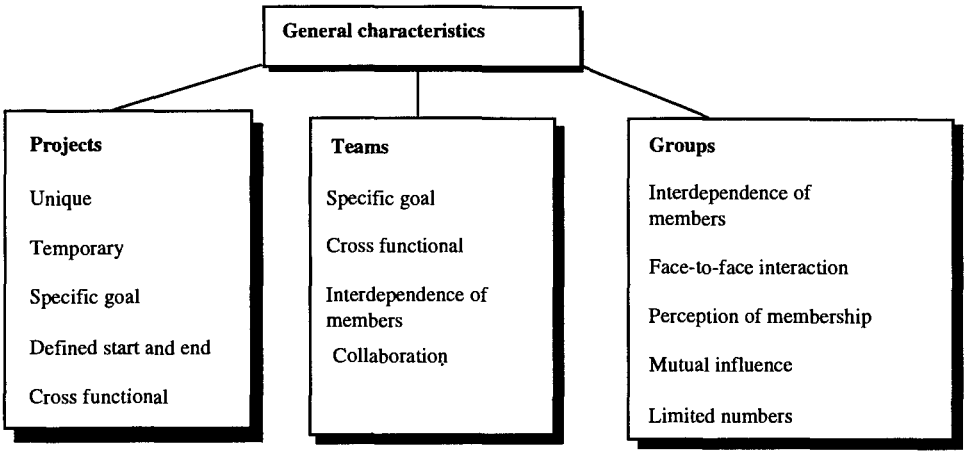

Fig.3, Characteristics used to describe projects, groups and teams.

2.2 Projects as end-results

The final end-result often symbolizes the project. Because of the goal-directed and product-centered mentality in projects, people tend to focus on the results of the project, more than the process. The performance of the project is the center of attention. But project performance or project success can be conceptualized in many different ways. There are few topics in the field of project management that are so frequently discussed and yet so rarely agreed upon. As performance is the dependent variable here, a thorough discussion of different conceptualizations of project performance will be given along with a presentation of what is generally proposed to affect project performance. The review will largely be based on normative theories and studies, since they are predominant within the project management field.

2.2.1 On the nature of project performance - current definitions of project success

According to Goodman and Pennings (1977) there is no agreement as to what organizational effectiveness really is. The number of definitions vary with the number

of authors who have been preoccupied with the concept. However, most organizational researchers have defined effectiveness in terms of predetermined goal attainment.

Compared to other organizational domains, the ´project management field´ is probably the major advocate of ´internal´ efficiency measures. Common definitions of project success reveal that measures and indicators tend to be narrow and limited.

> *Criteria for project groups´ performance are technical quality, budget and cost performance, meeting an assigned schedule, value to the company, and overall group performance.* (Keller, 1986)

> *The objectives of project management can be condensed under three headings. A successful project is one which has been finished on time, within its cost budgets and to a technical or performance standard which satisfies the end user.* (Lock, 1987)

> *The variability of the various input and output measures and the fact that different measures may be more appropriate at one stage of the life cycle than at another suggest that project management must focus on certain critical generic project dimensions. These dimensions are cost, time and performance.*
> (King and Cleland, 1988)

It appears that project success for the past 20 years or so has been defined as the completion of an activity within the constraints of time, cost and performance. According to Morris (1988), most project management theories are concerned with the interests of the technical and middle management and neglect the interests of the members of the outside world such as the owner, regulatory agencies, government, media, community groups, competitors, suppliers etc. This neglect of the wider environment of the project, reveals a short-term perspective in the presented performance indicators.

Pinto and Slevin (1988) point to the fact that there are several examples of projects that were completed on time and under budget, but considered as failures. On the other hand, they also refer to projects that were finished late and far over budget, but hailed as successes. A good example in this matter is the opera house in Sydney,

Australia, which was a failure in project management terms, but has become one of the best known symbols of Sydney and Australia.

This debate within the project management field reflects the distinction between internal and external effectiveness noted by Pfeffer and Salancik (1978). The internal effectiveness directs attention to the internal functioning of the project and is often conceptualized by efficiency, most often measured in time and money. The external effectiveness, on the other hand, is about the fulfillment of the demands of the environment, represented by the client within project work. Although there is a trend towards including the more qualitative or external effectiveness criteria for project success, its ambiguous and vague character leads people to stick to the simple and quantitative measures. The recent increasing concern for the client (Pinto and Slevin, 1988) indicates an evolution towards an open system model of project success. This means that the environment is taken into consideration and that the 'black box' is opened. A study by Baker, Fisher and Murphy (1983) which investigated how project managers perceive project success, confirmed that client satisfaction was of great importance. *'In the long run, what really matters is whether the parties associated with, and affected by, a project are satisfied. Good schedule and cost performance means very little in the face of a poor performing end product'* (Baker, Fisher and Murphy 1983, p. 685).

2.2.2 Defining project performance

The concept of success or performance has proved to be complex and nebulous. The lack of coherence and agreement in defining performance within the organizational field, leaves the individual researcher with a dilemma. What should be most important when evaluating the results of the collective human effort and activity in organizations? An exhaustive answer will not be given here because it requires a fundamental discussion and because there is no correct answer. The considerations that have influenced the selection of effectiveness indicators will be explained.

Theoretically, it has been argued that more than one indicator should be used to measure performance. There are practical considerations influencing the choice of indicators as well. On one hand, the performance measures should be relevant and legitimate within the practical world. They need to be useful. But on the other hand, they need to be empirically measurable within acceptable time and resource limits. Although the chosen performance indicators do not take the institutional environment into consideration, the interests of the client and the users have been incorporated in the performance definition.

Choosing only one 'ultimate criterion' of performance effectiveness is according to Steers (1975) most common among organizational researchers, but can be questioned on several grounds. First, it is difficult to defend the use of some variables as comprehensive or even adequate measures of organizational effectiveness. Second, several of the criteria that have been used satisfy the interests of only certain organizational constituencies. They are by no means objective, even though they often pretend to be. Finally, there is a problem of integration; how do these isolated criteria contribute meaningfully to an understanding of the effectiveness construct? Most often they reveal only one dimension of the performance of the organization. Therefore, performance or success will here be understood in terms of variables reflecting both internal, quantitative and external, qualitative performance. In addition to the quantitative efficiency measures of productivity, the concept of 'quality' will be introduced. Combining internal and external indicators of performance, this study conceptualizes performance as follows;

Project performance is defined as a multi-attribute dimension accounting both for productivity and quality of end-results.

2.2.3 Defining productivity

The introduced performance indicators will now be explained and defined. In accordance with the prevailing perspective in project management, the goal approach will be used. The goal approach views effectiveness as the degree to which the organization attains ideal end-states. Since the most common goals within practical project work are internal and efficiency-oriented and since this says something about how well resources are exploited, a quantitative performance measure will be chosen. The most common efficiency variables in theory and studies are productivity and profitability or rate of return (Campbell, 1977; Steers, 1975). In Steers' review of 17 multivariate models of organizational effectiveness, these evaluation criteria are among the four most frequently occurring of a total of fifteen mentioned criteria.

In this study, productivity will be chosen as the quantitative performance indicator. Productivity is an economic measure and to economists productivity is a measure of how much is produced of a given amount of input. If we have a product, Y, and an input factor, X, we could express the relation as Y/X. To exemplify this relation I will use construction projects, where the actual relation can be expressed as m2 produced per amount of money spent, for instance 10,000 kr./m2. A productivity measure can be calculated for each firm or project. Each score is then marked in a diagram where the input factor is measured on the X-axis and the amount of units produced on the Y-axis. The average productivity may be seen as a measure of the industry's potential production pr. unit input factor. But, the productivity measure for the best unit is even more interesting.

See also the figure on the next page that exemplifies the best unit.

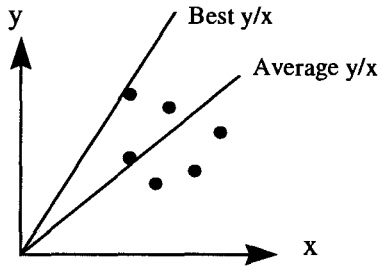

Fig.4, Best and average productivity measure

The best unit expresses the largest production per unit input factor observed. The productivity measures of the remaining organizational units may be expressed in relation to this best performing unit with the formula

(Kittelsen, 1990); $E_i = \frac{Y_i/X_i}{Y_{best} / X_{best}}$

The important thing to note is that the efficiency norm (E_i) does not indicate the technologically possible production per unit input factor. Such a measure would easily be criticized for not considering organizational factors or external contingencies. The last productivity formula presented is a 'best practice' measure and is based upon the achievable productivity because it is actually measured. The productivity measure for the best performing unit can be used as point of reference for calculating productivity for other units. Such an efficiency measure produces a scale that expresses a measure of how efficient each unit is and the potential for improvement. Fully efficient units obtain an efficiency of 1, the others less than 1 (see Myrtveit) for further description of the approach, 1995). This form of productivity is measured by the 'DEA (Data Envelopment Analysis)- method'. The term points to the use of a front function that entails all the observations and data. The actual method will be explained further in chapter 5. Since the 'best practice' approach and DEA-method is seen to be especially relevant for non-commercial organizations with many input factors and products, and frequently used to denote productivity (Kittelsen, 1990), it will also be used here. But

the present study will draw most heavily uupon Albriktsen and Førsunds' (1990) adaptation of the DEA-method for the construction industry.

Productivity will be expressed as a function of the best performing unit, the so-called 'best practice' measure.

2.2.4 Defining quality of end-results

Inspired by Deming (1986) and Japanese practices, quality has gained high popularity as a performance measure and generated a 'movement' within different theoretical and practical fields. The strive for quality across fields such as manufacturing, construction, services, medical care, research etc. has lead to the appearance of quality circles, quality systems, total quality management and more. The 90's can be called the 'era of quality'. The 'movement' has also reached the construction industry, but up till now it has not been possible to reach an agreement of a single, general definition on the quality of buildings (see Fergusson, 1993). Troye and Henjesands' citation fits also perfectly to the construction industry (1991); *Thinking about quality sometimes leaves one with a feeling of 'emptiness of mind'.* A general agreement in the marketing literature is that the concept of quality somehow should be tied to clients' or users'[1] evaluations of, or attitudes to, the product. Fergusson (1993) arrived at the same conclusions when examining 17 industrial facilities in the US.

According to Fergusson (1993), the construction industry has untill now operated to 'meet requirement' and according to 'manufacturing-based' principles of quality. The current technical and cost-oriented quality focus and following lack of client or user orientation has created much dissatisfaction among clients of engineering and

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[1] In the construction industry, these are not necessarily the same individual(s). Although the client usually is the final user of the building, one has recently seen investment firms or estate agents investing in buildings for hire. Because of the financial motives, these clients focus on the cost-directed and short-sighted considerations, often at the expense of the needs of the user.

construction services, both in the US and Norway. In response to this development, studies have been conducted to measure quality from a user or client perspective both on industrial facilities (Fergusson, 1993) and office and housing facilities (Preiser, Rabinowitz and White, 1988). In her study, Fergusson found that integration between industry functions, between disciplines and trades and through time explained 82% of the variance in plant quality. Both Fergusson and Preiser et.al. address the quality of housing and office facilities in terms of customer satisfaction with the product. On the basis of the work of Preiser et.al., the quality of the end result will be captured; namely the building, according to several dimensions that are relevant for most clients and users when evaluating buildings for office or educational purposes .

The quality of the end result; the actual building, is defined according to clients' evaluations on several dimensions such as fulfillment of needs and product characteristics; design, functionality and technical abilities.

2.2.5 Factors influencing project performance

Generally, factors that affect the performance of projects can be classified in two groups; internal and external. Internal determinants are the factors in the project itself that enhance or inhibit effectiveness. They can be anything from coordinative or structural arrangements to motivational issues. The second group of effectiveness determinants are rooted in the environment; whether it is technical or institutional. See figure below for a presentation of the most commonly proposed determinants of project performance within project management literature.

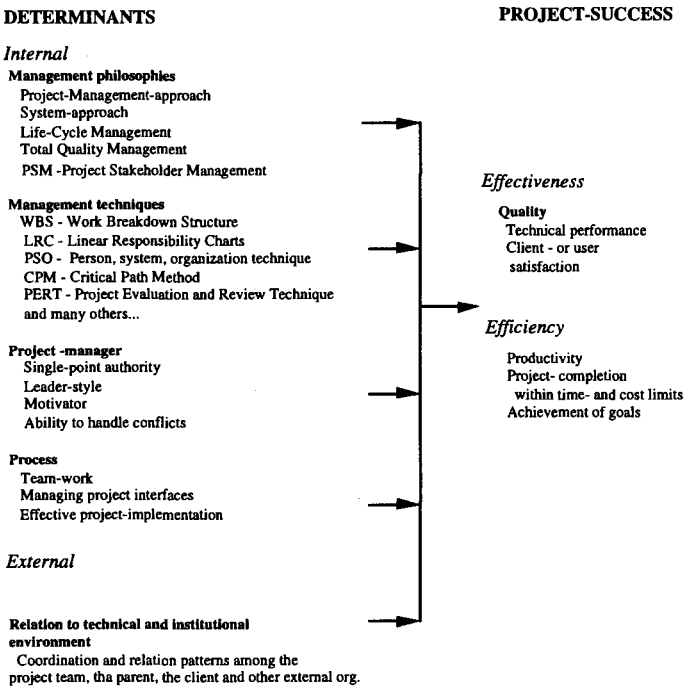

Fig.5, Overview of proposed determinants of success within project management literature.

Adopting a normative approach, most literature on project management presents´ the best way´ to organize project work, believing that difficult obstacles can be overcome by the best principles and techniques (Andersen, Grude and Haug, 1987; Cleland and King, 1988; Gray 1981; Kerzner, 1989; Lock, 1987; Westhagen, 1991 among others.). Most books and studies on project management build on the idea that a project is able to fulfill predetermined goals (e.g. Meredith and Mantel, 1989; Cleland and King, 1988; Kerzner, 1989) and function like a planned and controlled activity. A strong belief that actions and decisions follow the actual goals of the project still prevails. In a similar way, it is assumed that projects follow a sequential pattern and that plans and formal arrangements direct the behavior of the people involved. Therefore, the notion of rationality is strong within most project management theory. Looking back at the origin of project management, there is a strong imprint and manifestation of the rational spirit. Due to its technical origin, the project management field started with the elaboration of methodologies and techniques to

plan and control the project. Special planning and monitoring techniques such as PERT and CPM were developed in the USA in the middle of the 1950s and became almost synonymous with 'project management' (Jessen, 1992). The selection and use of the best suited methods and techniques have been regarded as one of the most important issues to secure good project performance. Some refer to the structured and autocratic 'project management approach' as an important determinant of success; *Project management has achieved universal recognition as the most effective way to ensure the success of large, complex, multidisciplinary tasks* (Stuckenbruck, 1988,p. 56). In order to give an idea of what project management is, a general description is given below:

> *Project management involves project planning and project monitoring and includes such items as;*
>
> **** Project planning***
>
> *- Definition of work requirements*
>
> *- Definition of quantity of work*
>
> *- Definition of resources needed*
>
> **** Project monitoring***
>
> *- Tracking progress*
>
> *- Comparing actual to predicted*
>
> *- Analyzing impact*
>
> *- Making adjustments*
>
> (Kerzner, 1989, p. 2)

Along with this perspective follows a view on the project manager, having single point authority and responsibility of the project, and having great influence on project performance.

However, the most pervasive theoretical tradition within project management is, without a doubt, the systems approach (Morris, 1988). A system may be broken down into a number of subsystems. Properly organized and managed, the overall system acts in a way that is greater than the sum of its parts. The systems approach emphasizes treating the system as a whole. During the 1950s, work in economics,

psychology, sociology, anthropology, and other disciplines developed these open-system ideas by elaborating such concepts as self-organization, purposive systems, the importance of goals and objectives, the hierarchical classification of systems and subsystems, and the importance of systems´ boundaries and interfaces (Morris,. 1988, p. 17). The systems perspective focusing especially on the internal subsystems and their functioning, has contributed substantially to the development of project management. Kerzner (1989) even states that project management is an outgrowth of systems management. Systems thinking has generated a whole range of techniques such as systems analysis, systems engineering, work breakdown structures and simulation models. In accordance with the assumptions of this paradigm, the integration and management of the system may be seen as main predictors of project-effectiveness.

Another perspective worth mentioning, because of its influence in the last 10-15 years, is the transaction cost approach which views projects as an inter-organizational arrangement made up of multiple organizations connected together by contracts, a quasi-firm (Eccles, 1981), or a hybrid form between market and hierarchy (Williamson, 1975). Dealing mostly with the structural and contractual features of projects, this line of research is preoccupied with how to cope with formal relations, uncertainty, insurance, information and the handling of contracts (Stinchcombe and Heimer, 1985).

Influenced by recent trends within organizational behavior, the team dimension has appeared within project management. Good teamwork is by some seen as a prerequisite for innovation and project effectiveness (Thamhain,1988,1990). Another behavioral dimension of project work frequently mentioned is conflict. By some, conflict is seen as the single most important and inevitable characteristic of project processes (Kerzner, 1989), due to the heterogeneous nature of projects leading to conflicting objectives and interests. There are several studies that have dealt with the conflict issue over the years (Barker, Tjosvold and Andrews, 1988; Butler, 1973; Cleland, 1968; Evan, 1965; Kezsboum, 1992, Thamhain and Wilemon, 1975). The

project manager has often been described as a conflict manager (Kerzner, 1989). The ability of project managers to handle conflict is therefore by many seen as a critical determinant of successful project performance.

2.2.6 Towards a 'core group model' of project performance

Due to the traditionally heavy emphasis on technical issues and projects methods, there is a growing interest and need for competence about the human dimensions of project management. The project management field reflects in this matter the general tendency within organizational analysis to neglect individuals or the psychological dimension. Seashore (1977), Pennings and Goodman (1977), in their proposed effectiveness model, returned people on the scene. They claim that a large part of the researchers concerned with organizational effectiveness, have followed the strategy of removing people and individuality;

> *With the role of the dominant coalition given such a prominent and controlling place in the framework of Pennings and Goodman, it becomes necessary to resume a line of research that lately has been largely neglected. Namely, the inquiry into how the attributes of specific key individuals impact upon the behavior of the organizational system. Attention is reinvented to the perceptions, cognitions, and affective patterns of those individuals who comprise the dominant coalition.*
>
> (Seashore, 1977, p.192)

Following up the recent interest and attention paid to the 'dominant coalition' or top management group within general organizational analysis, I will draw attention to the role of the core people for project performance. Although not emphasized earlier within the project management literature, experienced project people claim that the destiny and performance of a project lie in the hands of a few people (drawn from interviews with professionals during fall 1994). Due to the focused and professional character of construction projects, there is reason to believe that the main managers and professionals have the influence and competence to shape the way the project is developing. Opposed to big, formal organizations that have major cultural and structural barriers to change, projects are more free to set a new course. The

temporariness of project organizations leaves people with an option to set new agendas. There is no burdensome past or lifetime stability. Projects do more than other organizational forms contain the spirit and freshness of the present. Therefore, one may assume that managers and core professionals, together with the client, can make an impact on construction projects. Given the mentioned characteristics, one should believe that the core group is more influential than the top management group in shaping the direction and performance of projects. The next chapter will therefore argue for the development of a research model based on the assumption that the core group is central for both project productivity and quality of end-result.

2.2.7 Summary

A theoretical map has been given in this review, through description of the dominating and general thoughts within the project management field. In accordance with Goodman and Pennings (1977), central challenges in conceptualizing performance have been dealt with by defining the nature of the organization (see previous chapter), by including a precise set of dimensions, by discussing the domain of effectiveness (which indicators or criteria to adopt), and by defining the perspective that should dominate in the use of these criteria. The fifth challenge has been that of determinants. Determinants explaining project performance are found at individual, role, group, organizational and environmental levels.

It has been argued that although there is no general overall conceptualization of project success, projects are generally viewed as successful if they have been finished on time, within cost budgets and to a technical or performance standard that satisfies the end user. Project performance is here defined by two indicators; productivity of the project and quality of end-results.

Acknowledging that there are both internal and external determinants of project performance, the final part has dealt with the introduction of an internal and group centered explanation of project performance. Assuming that the core group has major

decision power and responsibilities, a group level model of performance has been suggested.

2.3 Projects as a collection of core managers and professionals

This chapter takes a social and psychological perspective by examining how the characteristics of core groups may affect the performance of the whole project. Assuming that core groups share many of the same characteristics as those of general performing groups, I will give an overview of the relevant theories and studies within this field. In order to see current research in perspective, I will start with a basic thought behind the social psychology of groups;

> *Man is a social animal, whether as a result of instinct, conditioning or rational decision. Psychology, with its emphasis on examining the causes of individual behavior, has dealt with significant others as stimuli, as sources of need satisfaction and as environmental manipulanda.*
>
> *The supposition is that the particular combination of individuals will be significant in determining the nature of the interaction among them. The behavior, compatibility and effectiveness of a group is dependent on the particular combination of individuals with their unique configurations of personality, demographic, and skill characteristics.*
>
> (Haythorn, 1968, p1 and 2)

The social psychological group research field is characterized by four relatively separate bodies of work. The first concentrates on the consequences of group activity for the group´s members and for the group itself. This work is associated with social psychologists such as Allport, Asch, Lewin, Festinger, Thibaut, Kelley, Schachter, Back, French, Zander, Cartwright and many others. A second body of group research has emphasized the group interaction process itself and is distinctly associated with the work of Bales and many of his colleagues. Conceptually, this part of group research deals with groups as structures for patterning social interaction. The third and newer group research field has emphasized group productivity and other aspects

of group task performance (e.g. Steiner, 1972; McGrath, 1984; Goodman and ass., 1986; Gist, Locke and Taylor, 1987; Hackman,1983, 1990; Worchel, Wood and Simpson, 1992). An outgrowth of this field of research is the study of 'top management teams or groups', the so called 'upper-echelon' perspective (Hambrick and Mason, 1984).

Breaking the great influence of American researchers, a group of British social psychologists developed a fourth body of research. Based on social constructivist ideas, they developed the social identity or social categorizing perspective. With emphasis on the role of social identification processes, this perspective has traditionally been concerned with the implications of identity processes for intergroup behavior in analyses of social conflict and prejudice (Brown, 1988). This perspective has lately attracted much interest and is now used to analyze many different kinds of organizational phenomena, from conflict, negotiation and group performance to strategy, change and institutionalization processes.

Dealing with task performing groups in projects, I will primarily draw on the third and fourth bodies of research with a particular reference to the 'top management group' field.

2.3.1 A basic group performance model

One of the first to pay attention to work groups from an efficiency perspective was Steiner (1972). His work constitutes a cornerstone for much of the subsequent research and theorizing on work groups. He assumed that whenever a group or several interrelated groups of people want to perform a task, the performance or productivity depends on three classes of variables; the task demands, resources and process. Task resources include both human and physical components. The human resources, that Steiner pays considerable attention to, include all the relevant knowledge, abilities, skills or tools possessed by the individuals who attempt to

perform the task. Given that the best composition is found, Steiner claims that actual productivity often fails to equal potential productivity. This is because process interferes. The task process consists of the actual steps taken by an individual or group when confronted a task. It includes all those intrapersonal and interpersonal actions by which people transform their resources into a product, and all those nonproductive actions that are prompted by frustration, competing motivations or inadequate understanding (Steiner, 1972). Building upon Steiner's work, Gladstein (1984) introduced a group performance model that synthesizes the most commonly studied variables and relations within the group research field.

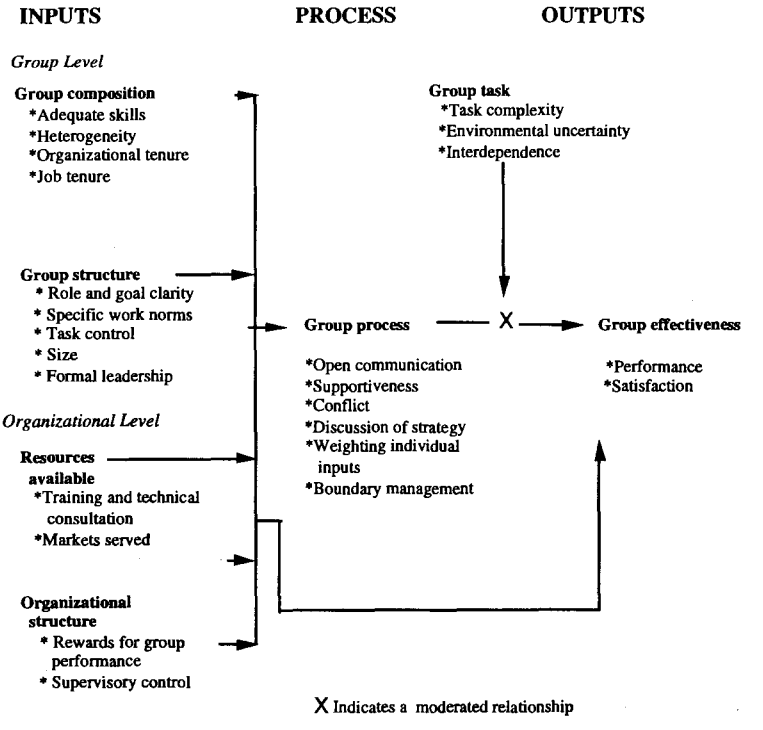

Fig.6, Gladstein model of group behavior: Constructs and measured variables.

The model is very broad, but it is representative of most current models within the group performance field. One can criticize the group model on both methodological,

conceptual and substantive grounds. For instance, Goodman, Ravlin and Argote (1986) claim that such models are too broad and general, too static, that they oversee the role of the task and environment and finally, lack conceptual clarity. A large part of group research has been conducted in the laboratory which also has led to the neglection of groups' environment; both the organizational, institutional or technical dimensions. However, there are few good alternative models taking the presented criticism into account. The presented group model will therefore serve as a backbone to the proposed research model here, although some of the mentioned criticism will be accounted for when suggesting an approach to study core groups.

First of all, the central premise of group performance; that both inputs and process have an impact, will constitute the skeleton of the research model. Secondly, relating to inputs, the model's emphasis on human resources will be pursued here. Relating again to the presented group-models, the third element that needs to be examined is the process. The 'fit' or dynamics between the members of the core group may be critical.

Both the composition and process of groups is generally seen to affect the group performance. Lately, one has seen several studies investigating micro-mediating processes in relation to organizational output, for instance the work on top management groups (Hackman, 1994), by this intending studies of how a set of people can impact the behavior of the whole organization. It will here be suggested that the core group is particularly critical for the performance of the whole project as its members are central in the planning stage and control both resources and people throughout the whole project process. Like top managers' background and interaction is shown to have an impact on the behavior of large corporations due to their strategic power and influence, one can also assume that some core individuals can have a considerable impact on projects. The members of core groups in construction projects have the expertise and roles that make them take the lead from the very beginning of the project and throughout the whole process. These people have a close and tight control of both the planning and executing of the different functional tasks. The project and site manager is of course especially critical for keeping within time and budget limits. While the architect designs the frame and overall design of the building, the consulting engineers set the major premises for the technical and functional solutions regarding building materials, heat-and ventilation systems,

plumbing and electricity. As the selection of design and technical solutions constitute the basis for further work in the project, the background and coordination of these professionals can influence the solutions chosen. Something which again may influence how the project develops and finally; how the productivity of the project turns out. How well these professionals cooperate with the managers and client is of course also of vital importance for the development of the project.

2.3.2 The role of group composition for process and performance

According to the presented group models and the general research on groups (e.g. Shaw, 1981), there is ample evidence that the kinds of individuals who make up a group constitute a set of powerful determinants of group behavior. According to Steiner (1972) one also has to consider the distribution of relevant resources among the members. It does make a difference how the groups are formed. Like the mixing of different fluids create distinct chemical reactions, the meeting or meshing of individuals in a group create distinctive social and behavioral processes.

When studying the role of the human resources in core groups, several questions arise. What are the needed resources and dispositional qualities of members in the core groups? And following; what kind of group composition is needed, homogenous or heterogeneous, in order to secure the right kind of processes and project performance? The importance of an average competence level in the group has been widely recognized according to Steiner (1972), but when it comes to the desired degree of heterogeneity, there is no single, all-purpose answer. There has been considerable research looking at how group composition affects both group performance and organizational performance, but results about the relationships are still mixed.

The inquiry into differentiating features of people is fundamental in understanding the nature of behavior, either at an individual, group, institutional or societal level. It has led to the creation of different categories or attributes to characterize the basis for

behavior. Social categories can be seen as theoretical abstractions drawn from empirical phenomena (Blau, 1977). These social categories or positions constitute the social structure which is seen as an important determinant of behavioral patterns. A social structure is delineated by its parameters. Structural parameters are the criteria implicit in the social distinctions people make in their associations with one another (Blau, 1977, p.6). What distinguishes people from each other is entirely in the eye of the beholder. The evaluation of people´s resources can therefore be made according to many dimensions or categories.

Psychologists have mostly been preoccupied with what distinguishes people from each other in terms of personality, skills, abilities, cognitive schemes etc. Sociologists have created ´labels´ and behavioral analyses based upon social and demographic categories such as class, profession, religion, age, sex, etc. The most distinctive task of sociology is by Blau (1977) seen as the structural analysis of various forms of differentiation, their interrelations, the conditions producing them and changes in them, and their implications for social relations. Based on sociology, organizational demography has analyzed how different cohort groups in organizations affect both organizational and group behavior (Pfeffer, 1983). Within this perspective both age, sex, race or ethnic origin, educational background, organizational tenure and functional experience have been used to define heterogeneity.

In accordance with the majority of group researchers, group composition will here be seen as a causal factor that can affect different aspects of group life, although it can be viewed as a contextual factor or as a consequence as well.

Drawing upon several reviews on group composition, (Haythorn, 1968[2]; Shaw, 1981; McGrath,1984; and Driskell, Hogan and Salas, 1987; Jackson,1992), I will present the major findings within this field. Previous studies have either focused on the group

[2] Haythorn covers the period between 1940 and 1968.

being homogenous or heterogeneous or the group being dominated by people with certain characteristics opposed to others.

Researchers studying the effects of composition on **group process**, have mostly been concerned with interpersonal attraction (cohesiveness) and similarity versus complementarily of personal characteristics; compatibility of needs and still others with the heterogeneity-homogeneity dimension of group composition (Shaw, 1981).

It is widely accepted that heterogeneity creates barriers to social intercourse on the assumption that common group membership and proximate status promote social associations (Blau, 1977). This assumption implies that the greater the differentiation of either kind, the more extensive are the barriers to sociable intercourse. Differentiation and integration are according to Blau (1977) complementary opposites.

Following the logic that Jackson (1992) describes as one of the most robust in psychology, people are attracted to others with similar characteristics, the general hypothesis being that demographic homogeneity will be positively associated with social integration or cohesiveness and that demographic heterogeneity will be positively associated with conflict. Empirical analysis has yielded some support for these ideas as O'Reilly, Caldwell and Barnett (1989), investigating 20 work units, found that tenure similarity had a significant impact on group integration (coefficient of variation of .29). Zenger and Lawrence's (1989) analysis of members of technical project groups yielded a coefficient of determination between age similarity and communication with other project members of .18.

With the increasing interest in groups as task-performing systems, the study of group composition with regard to **group performance**, has attracted more attention. The results are also here somewhat mixed, depending on the compositional trait studied and the task solved. A report of studies on personality (Driskell, Hogan and Salas,1987), examining how the distribution of different levels of personality attributes like adjustment, ambition, sociability etc. affected performance, revealed

that the dominance of some core personality dimensions were relevant. Jackson (1992) reports that members who are similar with respect to personal attributes are likely to do somewhat better, in comparison to groups composed of members who are dissimilar. Using sociometric techniques, tests of the effects of assembling groups on the basis of personal preference have been conducted. Rearrangements of work partners in construction groups (carpenters and bricklayers) on the basis of personal preference resulted in definite reduction of material and labor cost indexes and in labor turnover (Van Zelzt, 1952).

Looking at ability as a compositional trait, Mc Grath and Altman (1966) concluded that while individual ability appears to predict individual performance, there is little evidence that group performance can be reliably predicted from knowledge of member ability. However, Kabanoff and O'Brien (1979) found that high-ability groups were more productive than low-ability groups on creative tasks. Terborg, Castore and DeNinno (1976) found that groups composed on the basis of high SAT scores and grade point averages outperformed low-ability groups. Studies exploring the effect of homogenous vs. heterogeneous composition of ability and competence attributes, reveal that there is a general tendency for groups composed of diverse, relevant abilities to perform better than groups composed of members of similar ability.

Regarding demographical diversity, Ancona and Caldwell (1992) conducted a study of forty-five new product teams and found that group tenure heterogeneity was negatively related to manager ratings of team performance, defined as adherence to budgets and schedules. Thus, tenure heterogeneity seems to reduce performance. In a study of 87 process improvements, product development and administrative support teams from three organizations, Pelled (1995) found no support for the role of diversity (in terms of functional background, industry experience, education, race, age, gender, tenure) for group performance, even though she accounted for the role of process by analyzing the intervening effect of substantive versus affective conflict. Only race diversity had the anticipated stronger relationship with affective than

substantive conflict. A study addressed specifically at project groups, has looked at the role of composition for project performance (Katz, 1982). Katz found curvilinear relationships between the mean tenure of members in project groups and ratings of their groups' performance. He saw a lack of development of necessary role and status relationships in groups with low mean tenure, and suggested that groups with high mean tenure may have isolated themselves from important outside sources of information.

The following figure is presented in order to give an overview of the results of the reviewed studies on group composition. It summarizes the most central points.

Types of outcomes	**Types of composition variables**		
	Personal attributes	*Abilities and skillls*	*Demographic characteristics*
Process			
Cohesiveness	Homogeneity leads to cohesiveness	Missing empirical evidence	Homogeneity leads to cohesiveness
Conflict	Missing empirical evidence	Heterogeneity prevents 'group-think'	Heterogeneity leads to conflict
Performance	Inconclusive results, but heterogeneity is generally beneficial for creativity	Few studies, but heterogeneity seems beneficial	Few studies, but the ones on top-leader teams indicate that heterogeneity is beneficial for complex problems /tasks

Fig.7, Summary of research results for small group composition

2.3.3 The role of top management group composition for process and organizational performance

Even though projects are different from stable organizations in several respects, core groups share some of the characteristics of top management groups. This, in addition to the fact that no studies have been found on the role of top groups for project

performance, makes it relevant to draw heavily on the top management field of research.

Based in large part upon the reported small group research, a relatively new field of research, examining a central group of managers in organizations, has emerged. The expression 'top management team' entered organizational literature around 1980 (Bourgeois, 1980) and has been pervasive ever since (e.g. Bantel and Jackson; 1989; Eisenhardt and Schoonhoven, 1990; Fredrickson and Iaquinto, 1989; Hambrick, 1981; Virany, Tushman and Romanelli, 1992). In an effort to move beyond an examination of singular leaders at the apexes of organizations, researchers have widened their focus to the constellation of executives at the top. They roughly comprise what Cyert and March (1963), once called the 'dominant coalition'. In Hambrick and Mason's article from 1984, the 'upper echelon's' perspective is launched, arguing that organizational outcomes, strategic choices and performance levels may be predicted by managerial background characteristics. This paved the way for several studies on top management groups. Because of the convenient availability of data on top managers, researchers have focused predominantly on the demographic composition of top groups, with tenure, age, functional specialties and educational backgrounds as primary areas of interest (e.g.Bantel and Jackson, 1989; Fredrickson and Iaquinto; 1989; Murray, 1989; O'Reilly, Snyder and Boothe, 1993).

Although most studies have focused on how group composition affects performance related characteristics, there are some studies looking at the role of composition for the internal dynamics or **group process** of top management groups.

In a study of 24 top management groups, O'Reilly, Snyder and Boothe (1993) observed a significant negative association between tenure diversity and team dynamics (-.22 coefficient of determination). A previous study by O'Reilly, Caldwell and Barnett (1989) demonstrated the same tendency for diversity having a negative effect on integration, but here the opposed relationship was analyzed. Homogeneity in tenure was found to increase social integration and reduce turnover. In a study of 78

top teams, Glick, Miller and Huber (1993) observed that functional diversity positively affected the amount of rich communication (.29). Bantel and Jackson (1989) showed how increased functional heterogeneity among top management group members can enhance firm innovation. In their study of banks (1989), they found that the most important compositional aspects predictive of innovation was education level and functional diversity. This support for the hypothesis that homogeneity leads to integrative group dynamics is not sufficient to draw conclusions. As Hambrick (1994) argues, the relationship is substantively complex, not adhering to a simple linear link.

The opposite argument can also be given: too much homogeneity can lead to conformity and groupthink (Dess, 1987). Virany, Tushman and Romanelli (1991) argue that executive teams with high stability and homogeneity may suffer from inertia and little potential for change. In an attempt to resolve this contradiction, Priem (1990) argues for a curvilinear relationship between team composition and performance. In his view, performance is likely to suffer with extreme levels of homogeneity or heterogeneity. The appropriate degree of homogeneity/heterogeneity is contingent on how much variation exists in the firm's environment. In stable environments, more consensus is productive, whereas in dynamic conditions, more heterogeneity may be required. Relating to the projects' environment, once the plans have been settled, the environment is relatively stable. Intuitively, one can therefore not posit that most projects have dynamic environments and need heterogeneous core groups. In fact, the opposite may be the case. Anyway, these are interesting relations to analyze in a relatively unexplored setting.

In addition, studies of the effects of group composition on organizational **performance** have been prevalent. Murray (1989), studying different kinds of industries, found some empirical support for the fact that heterogeneity with regard to age and tenure was positively related to both short and long term performance. Drawing upon data on top management team composition in five U.S. industries, Norburn and Birley (1988) found some evidence that top management groups having marketing and sales experience, multiple company experience and wider educational

training will outperform organizations without these top group characteristics. Important to note is that these results showed quite clearly that the composition-performance relations were different across the five industries. In a study of 100 large companies in three industries, Finkelstein and Hambrick (1990) found that the average firm tenure of top group members was associated with both strategic and performance conformity. In a study of newly founded semiconductor companies, Eisenhardt and Schoonhoven (1990) found that the companies' rate of growth over the first four years was in part a function of the following characteristics of the founding groups: prior joint work experience, group size and variation in industry experience in the group. In order to sum up the research on top management group composition and its effect on both process and performance, an overall figure is presented below.

Types of outcomes	**Types of composition variables**			
	Age	Education	Tenure	Prior work -experience
Process				
Cohesiveness	*Missing empirical evidence*	Heterogeneity facilitates rich communication	Heterogeneity prevents team dynamics and integration	
Conflict	*Missing empirical evidence*	*Missing empirical evidence*	*Missing empirical evidence*	
Group think		Homogeneity leads inertial and little potential for change		
Organizational performance	Heterogeneity is positively related to performance	Functional heterogeneity enhancte firm innovation and performance	Heterogeneity is positively related to performance, but mixed results as anothe study reveals the opposite	Prior joint work experience affects rate of growth

Fig.8, Summary of research results for top management group composition

As the preceding discussion suggests, most research on the effect of top groups on organizational characteristics have focused on group composition. According to

Hambrick in his review article on top management groups (1994), relatively few studies have focused on how internal processes, structures or incentives of top management groups affect the performance of the whole organization. Even fewer have looked at the interactive effects of composition and process for organizational performance.

However, Janis (1972) initiated a research stream in which the internal processes of policy groups is seen crucial for decision quality and organizational performance. This issue was again taken up by Bourgeois (1980) who found that consensus on means was positively associated with performance of the 12 businesses he studied. With somewhat conflicting results, Dess (1987) found in a sample of paint companies that top management group consensus on both strategic means and objectives were positively associated with performance. Evidence generally supports the assumption that cohesive groups outperform noncohesive groups (McGrath, 1984; Shaw, 1981). In an extensive study of R&D project performance (measured both in terms of project quality and budget/schedule performance) (Keller,1986), group cohesiveness was clearly the strongest predictor of project groups' performance (.34). These results suggest that managers of project groups should encourage the development of cohesive groups. However, the picture is made more complex by research showing that conflict can be beneficial for complex problem-solving (Janis, 1972).

Eisenhardt and Bourgeois (1988) concluded in a clinical study of eight minicomputer companies that 'politics' within a top group, which they defined as 'observable, but often covert actions' consumes valuable managerial time and causes restricted information flows, which in turn leads to diminished organizational performance.

In probably the only study examining both demographical composition and process of top management teams (Smith et. al, 1994), using data from 53 high-technology firms, it was found that both team demography and process had a positive effect on performance (which was measured by return on investment - ROI). In terms of specific demographic effects, the heterogeneity of experience measure had a direct

negative impact on ROI (-.26). However, heterogeneity of level of education had a positive effect on performance (.38). With regard to the team process, the level of social integration was positively related to ROI (.23), but contrary to theoretical expectations, the level of communication frequency was negatively related to ROI (-.26). The figure below gives an overview of the main findings of the reported studies.

Types of outcomes	**Types of process variables**		
	Conflict	Group think	Cohesiveness
Organizational performance	Conflict prevents group think, which again is seen as positive for organizational performance	Groupthink deteriorates decision making and thereby performance	Consensus on strategic means and objectives is positively associated with performance
	Conflict or 'politics' consumes time and diminishes performance		Social integration is positively related to performance

Fig.9, Summary of research results for top management process and its effect on performance.

2.3.4 Discussion of theories and studies of small-group composition

There are many aspects of the presented body of research that can be criticized. Overlooking largely the positive contributions of the revised studies, I will here raise some critical objections and then suggest additional compositional dimensions to be included in the study.

The general objection to be raised towards the research on group composition, is that the concept of homogeneity - heterogeneity seems not really to have been discussed critically. The next objection relates to the selection of compositional dimensions, since many have their source in demographics. Analyzing first what there is about members of core groups that make them create high-performance projects, one may

ask whether demographics alone as a compositional trait is sufficient as predictor of human behavior and effort. Very often, these demographic attributes are used as proxies for unmeasured psychological constructs such as values, attitudes and commitment. Since the connection between a social category and the behavior is not always as straightforward, the direct examination of aspects like psychological profiles, values, commitment, identities and personality may alter the understanding. Although demographical compositional traits are found to have significant effects on a wide variety of organizational phenomena (Pfeffer,1983), they may not capture all the powerful forces in human behavior.

Demography captures the observable and 'cold' aspects of human characteristics. Group theorists have mostly been concerned with such human characteristics. Their implicit assumption is that given that the right skill and competence is gathered and the process develops in the right direction, performance is secured. An important part of human behavior is largely overseen; namely the transferred cultural and emotional elements that are central to most people. One of the few references to culture within the group compositional literature is Haythorn (1968, p.104) that put forward the importance of shared values as one of four hypothetical sources of composition effects. Although the concept of affect (or emotions) had a comeback in the 1980s, the study of values within psychology is still lacking (Etzioni, 1988). Because of the actuality of the subject and because professional values may be important in understanding composition and the role of the core group, this issue will be included in this study.

Another issue related to group composition is that only the effects of the observable and 'objective' differentiating characteristics have been studied. Recent research reveals for instance that what appears as salient differences from the outside, is not necessarily what the individuals themselves perceive as being different from the ´others´. The social construction of identity is based upon the objective demographical characteristics that people have, but the difference may be that people select one dimension as being more important than others when creating their self-identity.

Values and stable group identity indirectly reflect the drives and orientations of professional people, and can tell us something about their motivation. Another related issue has to do with people's attitude to their work. Although this embodies a professional orientation, it does not necessarily indicate the level of work involvement.

In order to open up 'the black box' of group composition, I will in the next chapters introduce some new aspects to be included in the analysis of group composition; namely group members' professional values, their subjective stable group identity, their motivational attitudes to their work and the degree of previous joint work experience.

2.3.5 Professional values in projects - a project or profession orientation

As core groups consist of professional members infused with traditions, norms and values, the role of professional values may be relevant in understanding core group composition and performance. Since Simon (1957) introduced the notion of 'bounded rationality', revealing the cognitive limits of human behavior, one has moved beyond rationalism. A view of human nature is emerging where the central thesis is that people make choices largely based on normative commitments and affective involvement's (Etzioni, 1988). Following this perspective, project members can not solely be seen as rational entities performing strictly according to the formal task and goal descriptions. For instance, the existence of knowledgeable and skilled professionals in a group does not automatically lead to a full exploitation of their resources. They have to be committed and willing to use their capabilities. Values will among other factors determine how committed people feel towards an organization or task. Values are generally perceived as enduring, stable preferences for some state of affairs over others (Hofstede, 1980). They concern what should be or the normative standards by which human beings are influenced in their choice among alternative courses of action (Etzioni, 1988).

When discussing the nature and role of professional values for project performance, the literature of the sociology of professions is highly relevant. The study of

professions and professionals constitutes a central and traditional field of theory and research within sociology (Abbot, 1988) and have ramifications to organizational theory (Raelin, 1985; Bailyn, 1985). Project members belong to different professional firms and associations and are more or less professionalized. This means that they belong to a profession that gives them an exclusivity of competence and task, in addition to a specialized expertise, autonomy in their work, commitment to fellow professionals and an ethical base and need for a collegial maintenance of standards (Kerr, Von Glinow and Schriesheim, 1977). Their educational background and employing firm are often most central in influencing their cultural orientation and professional values.

Professional values, as factors that influence the choice of means, help insure the primacy of ends. Each profession or occupation is directed to serve the interest of some constituencies and solve some societal or organizational problem. The professional values help the more or less professionalized organizational member choose where to direct the effort and priority over alternative courses of action. As for the project setting, the professional values may be about how a professional or occupational member relate to the goals in the project and the means to reach these goals. In addition to secure that the professional work is being done according to professional rules and ethics, they also serve to justify or provide meaning to professionals in their work. Within medicine, the ultimate aim is to save life, a professional value that justifies the existence of the professions of medicine and serves as a guiding rule in professional decision-making and behavior. Additionally, it constitutes a driving or motivating force within each professional leading to the mobilization of incredibly high levels of effort and competence. Professionals are therefore by many seen as the descendants of the Protestant work ethic in westernized societies. Professional values do not only reveal project members' attitudes and orientation to their work, but they may also indicate the degree of professionalization (Harries-Jenkins, 1970). Since professional values have to do with the execution of tasks and the involved relations, they do not interfere with the whole range of values guiding human life.

Professionals may be drawn to their employing organization or their professional organization. One may see a profession orientation as an indication of high professionalization and a project orientation as an indication of a low degree of

professionalization. Comparatively, professional values will indicate a project orientation if they are concerned with the goals of the project. Values oriented towards the profession deal with the professional issues or ambitions. This will typically be reflected by performance standards set by international professional organizations concerned with ethical, theoretical, idealistic or content-specific matters. A profession orientation relates to the actual execution of the profession while project values relate directly to organizational performance concerns and more pragmatic interests.

Relating this framework to the actual project setting, a 'project value' orientation would be reflected by a concern for the project, if time-and budgetlimits are held, if the process runs smoothly, how satisfied the client is etc. A 'profession value' orientation on the other hand, would be reflected by design and technical considerations, if the building fulfills professional expectations and results as a unique, creative and high quality product. Having described how professional values are understood here, a definition will be presented;

Professional values constitute the normative standards which more or less professionalized project members are influenced by when making decisions regarding both project means and ends. Professional values in a project are seen to be either related to the project, or towards the profession.

These professional values are most often not explicitly revealed by the organizational members and do not always coincide with the formal goals. One can parallel the process to Argyris and Schon's (1978) espoused theories (formal project goals) and theories in use (the real motives and goals). While a common formal agreement may have been reached about the project task and means to be used (espoused theories), the different actors may have quite different values and aims that are not talked about (theories in use). The construction example may illustrate this. Although both the architect, engineers, contractor and the client have agreed on a formal project goal, these persons are influenced by values arising from the professional field. The architect may want a building that shall be her or his grand symbol of uniqueness and talents, the engineer a building that exceeds all technical quality requirements and the client a building that satisfies the most central needs.

When analyzing core groups within projects, the issue is about the effect the mix of professional values may have in the group. Assuming that professional values influence behavior, an important issue is to explore what kind and mixture of professional values that secure a high performance. According to Hambrick and Brandon (1988) there is some evidence that homogeneity of values helps organizational performance by creating a unity of vision and smoothing communication. Relating to the chosen projects that consist of members with quite diverse professions and values, one may assume that there is a need for a certain degree of local or project-value orientation. Building upon this assumption, one may hypothesize that the more members are oriented towards project-considerations, the better the group is likely to perform.

2.3.6 Subjectively versus objectively defined diversity

Introducing the element of subjective perception brings in a new aspect to the understanding of groups. As a presentation of the relevant theories in this matter the self-identity and self-categorizing theories developed by British group researchers (Bruner, 1957; Tajfel, 1982, 1981; Turner, 1982; 1987), will be presented and their relevance discussed.

What accounts for heterogeneity according to the above-mentioned theories is the aspect that is activated as a function of the interaction between the characteristics of the perceiver and the situation (Bruner, 1957). The mere classification or categorization of oneself and others in groups influences the perception, attitudes and behavior of the individuals and groups involved. Briefly summarized, the self-identity and self-categorizing theories are about the self-concept, the cognitive component of the psychological system or process referred to as 'he self'. The self may be understood at least in part as a cognitive structure, a cognitive element in the information processing system. A central premise of the theories is that the self-concept comprises many different components. Any individual possesses multiple

concepts of the self. It is the particular situation that defines which ´self-concepts´ that will be activated.

Intergroup differentiation is shown to have several behavioral effects; from social stereotyping, group cohesiveness, memory distortions, illusory correlation, differential perception of homogeneity in the ingroup and the outgroup, differentiation and discrimination in particular context, ethnocentrism, co-operation and altruism, emotional contagion and empathy, collective action, shared norms and social influence processes (Turner, 1987, p. 50). It is suggested that categorization is the basis for intergroup processes that leads to stereotyping and hostility among group members. That is, categorization and stereotyping lead people to favor their own 'in-group' as superior and to develop a hostile attitude toward the 'outgroup'. Social psychologists have conducted numerous studies that attest to the existence of such intergroup processes (see reviews by Tajfel, 1982; Brown, 1988), and give support to several of the mentioned effects of the categorization processes.

If the line of reasoning in the above-mentioned theories is followed, one has to consider which demographical ´objective´ differentiating characteristics constitute the basis for self-identity and also differentiation from other groups. This implies that, in addition to studying different aspects of demographical heterogeneity, one has to question which demographical aspects project members are likely to identify with.

With this broad discussion on subjective categorization and perception of diversity, a new element is introduced to the study of group composition. The next chapter will elaborate more on which groups or identities members of core groups are likely to have and how that may affect performance.

2.3.7 Stable group identities among project professionals

The self-concept comprises the range of self-descriptions and self-evaluations subjectively available to the individual. It is structured into quite distinct constellations called self-identifications. These self-identifications or self-images are rather enduring and stable, but they may also be responsive to situational or external factors. The social identity approach focuses primarily on the concept of social rather than personal identity (Hogg and Abrams, 1988). For the purpose of this study, the social identity is most relevant and will be discussed further.

It is important to note that social identities are based upon the demographical categorizations previously presented, i.e. membership in social categories or groups of nationality, sex, race, occupation, family, religion and more temporary groups. When discussing the role of social identifications for project groups, one has to consider the wide range of group identities project members can differentiate themselves on. As the issue here is primarily about stable identities or stable self-conceptualizations, the categories may derive both from members' professional and personal life. Professionally related groups may be the profession, fellow colleagues and the project, while groups belonging to the private life may be family, religion, hobbies, nationality etc. In this study, members' self-identities will be categorized according to a professional-private distinction. For the purpose of the study, the following definition of a stable group identity will be used;

A stable group identity of project members is understood as the enduring self-image and perception these people have of themselves. Project people are here seen to identify with professionally or privately related groups.

Following the logic of professionalization, one may assume that project members will differ according to the degree of professional self-perception. For instance, while one member may identify and perceive herself primarily as an architect, another member speaking a distinct dialect may identify himself according to the region he comes from. Another again may conceive himself primarily as a family person and be more prone

to focus on his family and his role as a father. What may be interesting to inquire is to what degree project members have a stable identity towards professionally related groups versus privately related groups.

Assuming that the inclination to have a stable identification related to professional life, in contrast to social, may indicate a professionally oriented attitude and high job involvement, this may be seen to have a positive influence on performance.

2.3.8 Work involvement

Demographical characteristics indicate to a certain extent the resources the members of the core group bring in. Having argued for the inclusion of their professional values and their subjective perception of group identity, I have tried to incorporate some of their personal drive and feelings. But this does not capture all of their motivational orientation to their work. In this chapter I will therefore argue for the role of work involvement, a concept drawn from the work of Bailyn (1980).

The motivational aspects have so far not been paid much attention to within the study of work or top management groups. Most of the models and studies are built on the assumption that a group of people with a given pool of skills and competence will perform well, as long as the process is not too disruptive (Steiner, 1972). As previously noted, human beings have largely been seen as rational, self-interest seeking, focused actors devoid of affect. But human beings can not solely be seen as rational entities performing strictly according to formal task and goal descriptions. For instance, the existence of knowledgeable and skilled professionals in the core group does not automatically lead to a full exploitation of their resources. They have to be committed and willing to use their capabilities. In order to account for the more motivational aspects of work, I will try to grasp the level of work involvement among the members of the group. Work involvement is understood as follows;

Work involvement captures project members' attitudes towards their work in terms of satisfaction with their current work situation, the role work plays in their life and to what extent the content of their work constitutes a major drive in their live.

2.3.9 Prior joint work experience

Within the construction industry, there is a constant discussion on how to compose core groups. But the discussion is not primarily concerned with how the composition of projects can be made according to peoples' demographical background. The major concern of most actors involved, especially among the professionals themselves, is to get involved in projects where they know the other members beforehand. This gives security and is by many seen as a prerequisite for good performance, as it creates a smooth process and easy coordination. Joint work experience among the members of core groups may have a positive effect on performance as the members have developed and learned how to cooperate and communicate with each other. They are also likely to have learned how to complement and draw the best out of each other. This can make such groups focus on the work and the projects' challenges and problems, rather than on process issues. But this 'positive' view on composition based on personal preferences is not shared by everyone.

For instance, recent EU- regulations force state and local communities like the State Building Agency (Statsbygg) to let all jobs go through a bidding process. The selection will then be made according to market conditions and quality considerations. The firm with the lowest price offers and best quality or experience is most likely to win the bidding competition. Professionals within the Norwegian construction industry are not particularly fond of this market based selection of project members which they call 'indian marriages'. Except from market related arguments for such a rational, objective selection of members, there are other good reasons. One may assume that professionals that are familiar with each other will be more relaxed and less competitive. The lack of formality and distance may therefore, on the other hand, open up for gentlemen's agreements (I will help you in this project if you help me in the next etc.), avoidance of conflicts which can lower the quality of decisions taken and a less professional attitude as things get too familiar. In the discussion of this issue, one has to acknowledge that it has several facets and that the different solutions give advantages to different parties. In order to get a more balanced view, I will present some research results.

According to social network theory there is reason to believe that previous contacts among project participants will alleviate and facilitate the cooperation throughout the project process. This in turn is likely to influence productivity of the project and quality of result. A study of diffusion of technology within the Japanese construction industry showed that there is a significant and positive relationship between the project decision-maker's contact with prior users and the project decision to use the technology (Harkola and Greve, 1995). Following this line of thought, one can hypothesize that prior work contact among project participants is likely to favor a positive and cooperative atmosphere in the project.

In a study of what accounted for high growth among newly founded semiconductor firms, Eisenhardt and Schoonhoven (1990) found that members' past experience with members' heterogeneity in the industry gave the strongest predictive force. Evidence from Goodstein and O'Reilly's (1988) study in the electronics industry supports this argument. These authors found that executive teams that have worked together previously were likely to be more cohesive and have higher trust than teams without such experience. Similarly, Zenger and Lawrence (1989) found that individuals with previous work experience together communicated more often than people who had no such previous experience.

As previous work-experience among members of core groups is seen as quite important by industry people themselves and as it has proven to have significant positive impact on group process and performance, it will be further inquired here.

2.3.10 Summary

Throughout this chapter, theories and studies on grouprelated behavior have been reviewed in order to argue for a compositional perspective on group performance. The kinds of individuals making up the core group is here seen as an important determinant of group behavior. Therefore, the issue of group composition has been broadly discussed and some of the most important empirical results reported.

The empirical studies have mostly dealt with homogeneity or heterogeneity of groups. There are few conclusive findings. Heterogeneity may have both positive and negative effects on both process and results; the results depending upon which compositional characteristics are under consideration and what sort of groups are studied.

Since the issue of heterogeneity has not been much problematized within group literature and can be questioned for several reasons, a review of different approaches to the topic was given. The review revealed that the most studied dimensions within the field of top management group research are demographical characteristics. The limitations of focusing solely on such compositional traits were discussed. Discussing the issue of heterogeneity, a central point was made of the subjective perception of differentiation. For some reasons, researchers of group composition have largely neglected the importance of the self-identity and self-categorizing phenomena. On the other hand, the researchers of the social-categorizing perspective (Tajfel, 1981; Turner, 1982) do not deal with work groups and compositional issues.

It was therefore argued in favor of drawing in both the more subjective, identity-related, as well as the motivational and personal preference direction. The degree of work involvement and previous work experience among the members of the core group is here seen to play a significant role in determining the performance of projects. Since most studies of small group composition has not taken the issue of context or task seriously, this will also be paid careful attention to here.

2.4 Projects as an arena for group processes

As previously noted, a lot of research on top management groups has empirically linked demographical composition to performance. Few efforts have been made to investigate the more fundamental intervening processes. Considering that the development of a project is subdued to specific contextual factors and that the process can have its own dynamics, one may question how critical the composition is,

compared to the process. Smith's et. al. (1994) finding that the team process has its distinct effects on performance, left unexplained by demography, highlights the need for more research on process.

As I will try to build upon more recent and integrative perspectives, accounting for both the person and the situation, compositional as well as processual factors are included in this study to analyze performance. This chapter will therefore entirely be devoted to the issue of group process, an aspect that has many facets and shades. A basic feature of most social behavior is integration versus conflict, whether people are united or fragmented. Due to the fragmented and heterogeneous nature of construction projects and the need for goal-oriented effort and cooperation, these basic issues are considered highly relevant and will constitute the fundament of chosen indicators of the core group process.

2.4.1 Approaches in the study of conflicts

Adhocracy implies conflict, where specialists from different professions must work together on multidisciplinary teams, and where, owing to the organic nature of the structure, the political games that result are played without rules.

(Mintzberg, 1979, p. 462)

Projects, characterized by recognizable goals and time limits, cross-functional or diverse composition, tight interdependence and more flexible working modes, have brought up new forms of conflict situations and conflict handling modes. In contrast to earlier more formal and institutionalized causes and processes of conflict, conflicts in projects tend to be more informal and are just as likely to be handled off-line as they are to be the subject of formal negotiations (Kolb and Putnam, 1992).

Conflict in projects can take many forms. It may therefore be useful to give an overview of the most relevant theoretical approaches used to analyze organizational

conflicts, including project conflicts. This will shed light on different types of conflicts inherent in projects. The overview serves also to position the approach taken here. Although it is central, the handling or solving of conflicts, i.e. negotiation, will not be included.

General conflict theorists would perceive projects as an inevitable battleground of traceable differences, not regarding the characteristics of individuals, but the *structural* and intergroup attributes of the organizations. Following this view, structural factors such as the interdependence of activities, shared and limited resources, quest for mutual coordination, distinct time and budget limits and dynamic and stressful life cycles could be given as reasons for potential project conflicts.

In a *political* perspective, projects would be seen as a set of shifting coalitions (e.g. professions, departments, organizations, employees vs. managers) with different interests and resources (March and Olsen, 1976; Pfeffer and Salencik, 1978). Following this view, conflict in projects would be a result of the struggle and competition for influence, resources and control among these groups.

Conflict could also be understood as a result of the different *dispositional* or personal traits of project members (Nye, 1973). Psychologists have especially underlined how certain personality traits such as dogmatism, authority, need for power and Machiavellanism increase the conflict potential. At the same time, they have also underscored the motivational forces behind conflict. Conflict may also be a result of the meeting of different motives and interest.

Using the *cognitive* perspective in the study of project conflicts (Neale and Bazerman, 1991, Bazerman and Carroll, 1987) would be to explain how conflict is affected by and reinforced by cognitive limitations or 'bounded rationality'. A cognitive perspective takes the perceptions of the parties into consideration, regardless of any overt display. Conflict would accordingly be said to exist when there are *perceived* differences in interests, views or goals. In contrast, earlier conflict

researchers were mostly preoccupied with 'objective conflicts'. For a conflict to exist, one party had actually to behave so as to interfere with the aims of another.

Anthropologists would claim that conflicts in projects, both political and personal, can be understood as an opposition or clash of different *cultural* systems (Jehn, 1991; Barley, 1989; Kolb, 1987; Kolb and Bartunek, 1992). Adopting a cultural perspective means a greater appreciation for some of the understudied dimensions of conflict. According to Kolb and Putnam (1992), conflict and negotiation theories have had a tendency to center primarily on public conflicts with confrontational modes of managing the conflicts.

In addition to these various theoretical perspectives to study organizational conflict, a distinction can be made between static and dynamic or processual approaches. While many of the earlier approaches were rather static, recent researchers have put forward more dynamic and processual models of conflict by focusing on the various stages in a conflict process (Pondy, 1967) and the interaction of several interrelated factors (Schmidt and Kochan, 1972).

Conflict can be seen as a force beneficial for the process and performance as well as detrimental to the functioning of organizations and groups. According to Pondy (1992), reflecting on his initial paper on organizational conflict, the prevalent view on conflict has been to see it as a breakdown in standard processes, where conflict is a malfunction of some kind, inevitable and occasionally functional. This view is consistent with the basic image of organizations as harmonious and cooperative systems. Within the group literature a known proponent of this view is Steiner (1972) viewing conflict as a problem; a 'process loss' which needs to be and can be minimized or controlled since it is detrimental to the group performance.

The newer perspective on conflict and organizations (Pondy, 1992) takes the opposite view. Rather than being exceptions, conflicts are the rule of organizational life. Organizations are arenas for staging conflicts and far from being a 'breakdown' in the system, conflict is the very essence of what an organization is in this alternative

model. Conflict is then not only functional for the organization, it is essential to its very existence. Pondy cites Weick, who has observed that organizations consist of numerous pairs of opposing tendencies (e.g. risk-taking and risk-avoiding, creativity and efficiency). According to Weick, if there were no active conflicts within these pairs, then one of the polar extremes would gradually become dominant in each case, the diversity of behavioral repertoires available to the organization would diminish, the organization would lose its capacity for adaptation in the face of environmental change, and it would run a high risk of eventual failure (p. 260, 1992).

The more recent approaches to the study of conflict, advocates curvilinear associations between conflict and performance (Jehn, 1995) with low and very high conflict being detrimental for performance while moderate levels of conflict being beneficial for performance.

Conflict occurs at many different levels of personal functioning and social interaction. Psychologists, as well as decision-making theorists, have investigated conflict that occurs within oneself. Most negotiation and mediation theory and interpersonal communication models have typically focused on dyadic levels of conflict. Much of the research on 'group' conflict pertains to intergroup conflict, or conflict between groups. More recently the notion of intragroup conflict, conflict within the group, has appeared (Jehn, 1991a).

2.4.2 The study of conflicts in projects

Shifting focus to project literature, some have commented on the conflictual nature of projects (e.g. Kerzner, 1989; Wilemon and Baker, 1988), and several studies on the subject have appeared (Barker, Tjosvold and Andrews, 1988; Butler, 1973; Cleland, 1968; Evan, 1965; Kezsbom, 1989; Thamhain and Wilemon, 1975; Kirchof and Adams, 1982). By analyzing these studies in relation to general organizational conflict approaches, their view on conflict will be revealed.

The studies mentioned have either focused on understanding the sources of conflict (Kezsbom, 1989;1992), how various conflict issues are related to the different stages of projects (Thamhain and Wilemon, 1975), the role of conflict for performance (Evan, 1965), conflict as a phenomenon in projects (Cleland, 1968; Butler, 1973) or the conflict handling modes (Kirchof and Adams, 1982; Barker, Tjosvold and Andrews; 1988).

The main conflict issues mentioned are about struggles for resources, about goals and priorities, about the means, such as technical and administrative issues, unresolved prior conflicts and naturally, personal and leadership issues (Thamhain and Wilemon, 1975; Kezsbom, 1992). Assuming that the more recent study on project conflict (Kezsbom, 1992) describes actual project reality, it is interesting to note that disagreements arising from goal or priority issues were ranked as the main conflict source. These kinds of conflicts were seen as disagreements arising from lack of goals or poorly defined project goals, including disagreements regarding the project mission and related tasks, differing views of project participants over the importance of activities or tasks, or the shifting of priorities by superiors or customers. The author explains this finding by the multiproject and hybrid organizations of today with participants finding themselves serving on a variety of project teams, reporting both to the project and the line managers. There is no empirical evidence behind this explanation. The reason that goal or priority issues are ranked as the number one conflict source, can therefore also be explained by the heterogeneous nature of project members and the following diverse interests and identities meeting.

The studies reported all analyze conflict at the project or intergroup level. Most of the studies are oriented towards the formal, structural, technical, administrative, personal or political conflict aspects. The conflicts are in general a result of mixed motives or interests. The researchers are mainly concerned about the ´objective´ and observable kind of conflicts and do not inquire about the cognitive, cultural and emotional aspects. Their approach is rather static as they mostly focus on the sources

of conflict and do not pay attention to the different stages of conflict or the interrelations of factors.

The general view among the reported studies is to see conflict as a breakdown or dysfunctional element of projects. The purpose of revealing the causes of conflict is according to Thamhain and Wilemon (1975) to make project managers aware of them so they can avoid or minimize the situations leading to conflict. On the other hand, some studies discuss both the detrimental and beneficial function of conflict for performance (Evan, 1965; Kezsbom, 1989). In his study of governmental and industrial project groups, Evan found that interpersonal conflict was negatively associated with performance while technical conflict was positively associated with performance.

2.4.3 A 'diversity' based explanation of intragroup conflict

Opposed to previous theories defining conflict as inherent in the structure of organizations, conflicts are here seen as arising from the diverse backgrounds and identities represented in the core groups.

According to Kolb and Putnam (1992), these 'diversity-based conflicts' arise from the meeting between different social and cultural groups in the workplace. Society's conflicts are imported into organizations. Relating to the chosen setting, one can assume that the members meeting in core groups import the existing antagonisms or clash of interests their groups represent.

Conflict within the core group may not only be seen as a reflection of the group composition, but also as a reliable predictor of differentiation. In other words, where

there is perceived conflict in an organizational unit, one can also expect to find intergroup differentiation (Brown and Williams, 1984) [3].

One may question whether it is conflict within the core group, rather than conflict between groups that is addressed here. The distinction is not very clear. The project may be seen as an organizational unit with people employed, where the people at the top constitute the upper echelon. Because members of core groups cooperate intensively and meet face-to-face over a short period of time, they may develop tight relations and identify strongly with the core group. From this perspective, one can talk about intragroup conflict. At the same time, the members of the core group represent the interests and values of various groups; professions, occupations or firms. Diversity deriving from various group affiliations can cause intergroup conflict. From this perspective one could therefore anticipate discord in core groups as intergroup conflict. Considering that the core group pertains to a distinctive organizational unit and that its members are interdependent and have mutual interests in remaining there, it seems more appropriate to conceptualize their conflict as an intragroup conflict.

2.4.4 Developing concepts of intragroup conflict

When reading through articles and books about conflict, the variety and subtlety of definitions are striking. Pondy (1967) was one of the first to point to the fact that the term 'conflict' has been used at one time or another in the literature to describe antecedent conditions of conflictful behavior, affective states of the individuals involved, cognitive states of individuals or conflictful behavior, ranging from passive resistance to overt aggression.

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[3] This argument supports the Realistic Conflict Theory posited by Sherif and Sherif (1966), its central hypothesis claiming that 'real conflict of group interests causes intergroup conflict'.

Analyzing project performance, the focus is at the conflictual aspects that are most likely to affect performance. One may distinguish between perceived or latent conflict and manifest conflict. There may be difference of values and interests within the core group, but not necessarily an open disagreement about it. Considering the short time limits and the independent operation of members (both physically and professionally) in the core groups studied, a diversity of attitudes and priorities among members is not necessarily as negative for performance as it is seen to be for stable organizations. While groups in stable organizations can suffer under the pressure of suppressed and unresolved conflicts, this may not be the case for project organizations. This opens up for including an indirect aspect of conflict, capturing the degree to which project members have dissimilar priorities regarding the project. Such an element of conflict may to a certain extent indicate antecedent conditions for conflict.

Latent conflict, as an antecedent condition of conflict, is captured by core members' differentiating attitudes and interests towards central issues.

According to Pondy (1967), manifest conflict is any of several varieties of conflictful behavior. More precisely, it is the behavior which, in the mind of the actor, frustrates the goals of at least some of the other participants. The most obvious is open aggression, which is rare within organizations. Manifest conflict is often expressed by people raising objections, initiating open confrontations and discussions and is for the purpose of this study defined as;

Manifest conflict in core groups is found when members perceive there are openly expressed disagreements or objections within the core group.

The above definitions are very general and do not distinguish between different types or characters of conflicts. A common way to distinguish conflicts among many researchers is to differentiate between **task-related**; conflict substantive or technical, and **interpersonal**; conflict affective, relationship or emotional (Guetzkow and Gyr, 1954; Deutsch, 1973; Pelled, 1995; Jehn, 1995).

This distinction is based upon the thought that people are able to differentiate between task and person, and the proposition that task-related conflict has positive effects on performance while interpersonal conflict has negative effects on performance.

While interpersonal conflict may cause friction and a negative climate, task-related conflicts may contribute to the avoidance of groupthink, and lead to innovation and reevaluation of the status quo. Evan (1965) explored the beneficial and detrimental effect of interpersonal and technical conflict on performance of 65 laboratory R&D project groups. Here, the evidence being more persuasive for the detrimental effect of interpersonal conflict.

While Evan (1965) found that interpersonal conflict is negatively associated with project performance and that technical conflict is positively associated, recent studies have found little support for these propositions. In her study of groups in freight transportation firms, Jehn (1995) found no support that interpersonal conflict is negative to performance, while task-related conflict, up to a certain point, had some positive effect for nonroutine tasks. In another comparable study of engineering-based teams in the computer industry (Pelled, 1995) empirical evidence reveals the same results. There was no support for the hypothesized negative link between interpersonal conflict and team performance and the expected positive link between task-related conflict and team performance. When trying to understand why theories are contradicted empirically, objections can always be made to the way concepts are operationalized. Another issue here is about peoples' general ability to distinguish between people and task-related conflicts. Although the distinction looks theoretically appealing, people may not be cognitively able to separate the person from the issue. Affections and emotions are not necessarily put into two boxes, one for objective and rational explanations and the other for personal explanations. Everyone caught in a discussion about one's own professional convictions realizes that it becomes quite personal. One's work-related convictions or values are easily interchanged with one's personality and personal style. Therefore, it will not be distinguished between task-

related and interpersonal conflict, but rather between the different stages of conflict; latent and manifest conflict, as previously defined.

2.4.5 'Groupthink'

An interesting aspect of group processes indirectly connected to conflict and having consequences for the quality of decisions and performance, is groupthink (Janis, 1972). The theory of groupthink was developed from groups facing complex and ill-defined problems or tasks. Core groups in unique, large, complex projects may not necessarily encounter the same kind of challenges as Janis' top politicians, but group think can still be of influence for performance.

The notion that cohesive groups outperform noncohesive groups was not challenged until Janis (1972) introduced the concept of 'groupthink'. Group cohesiveness refers to the degree to which the members of a group are attracted to, like, identify with or want to remain in the group (Cartwright, 1968).

While earlier researchers within the group research field were more inclined to find the positive effects of cohesiveness, Janis (1972) managed to show that cohesiveness is likely to create conformity of norms and social pressures to think unidimensionally and reject nonconformists. He named these negative effects of group cohesiveness groupthink. At the same time, Janis (1972) argued that cohesiveness is a necessary but not sufficient condition for achieving groupthink. For a cohesive group to become a victim of groupthink, it must also be insulated from other groups, have directive leadership, and/or lack procedures for generating and appraising new options. Through a series of examples from political life he managed to illustrate that groupthink tends to affect decision outcome negatively.

In order to define groupthink and clarify the causal sequences of groupthink, the following figure is presented;

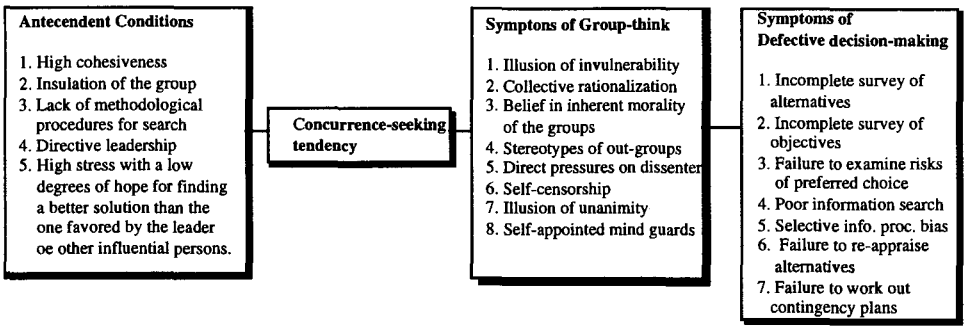


Fig. 10, Theoretical analysis of groupthink (Janis and Mann, 1977).

As the purpose is not to reveal the forces behind groupthink, but rather to use the term to describe the climate in the group, one may discuss if groupthink may be seen as an indicator of the conflict behavior in the group. The questions to be asked are whether a group may experience groupthink without necessarily being cohesive, whether groupthink indicates absence of conflict, whether the concept of groupthink may be used more broadly than its definition and finally, whether groupthink may develop in spite of perceived conflict among the members.

Cohesiveness is put forward as the main explanation of groupthink. As cross-functional core groups are not likely to be very cohesive, one may question whether groupthink can occur in non-cohesive groups. Janis (1972) has given other additional explanations of groupthink, such as directive leadership and lack of procedures for generating and appraising new options. In general, project leaders tend to adopt an autocratic and directive leadership style. Due to the time constraints and goal oriented focus in projects, the process is paid less attention to. Conflict may be suppressed because there is no time to generate alternative and critical views and options than the one planned for. One may therefore conclude that as core groups may encounter some of the factors leading to groupthink, cohesion is not a necessary premise. In other words, groupthink may also occur for diverse and less cohesive project groups.

In spite of the popularity of the concept, there have been few studies examining groupthink. Longley and Pruitt (1980) ascribe this to the theoretical imprecision of the concept and the following difficulty to find an appropriate operationalization of it. Janis' (1979) most recent definition of groupthink as concurrence seeking should largely resolve this problem. Longley and Pruitt suggest that if groupthink is to retain a purely negative connotation, it needs to be defined as 'premature concurrence seeking'.

However, there is a difficulty operationalizing this definition. The reason is, according to Longley and Pruitt, lack of theory about information-processing requirements of different kinds of tasks. According to them, research in this area should probably deal mainly with groups that are trying to solve novel, complex tasks of the type we call dilemmas. In such settings, decisions are likely to be better the more time that is spent on them, the more diverse opinions and views that are generated, the greater the number of ideas and so on. One may discuss whether the studied projects encounter completely novel, complex tasks as the group members have worked on similar tasks previously. However, as the participants are all new to each other and the projects studied are quite large, one may assume that there is some novelty and uniqueness to them.

Groupthink is often seen to have a negative effect on performance. Researchers that have addressed the role of heterogeneity (Jackson, 1992, Bantel and Jackson, 1989), have pointed at its functional effect in increasing the potential for conflict and avoiding groupthink. Without discussing it explicitly, they have paralleled conflict to the absence of groupthink. Janis' definition of groupthink will be used in this study (1972);

Groupthink in core groups indicates conformity and the inclination to avoid an airing of alternatives and low tolerance for deviants members or nonconformists.

If diversity is valued, there is a climate for conflicting opinions and open controversy. The presence of conflict indicates therefore an avoidance of groupthink.

2.4.6 Group cohesiveness

Group cohesiveness has a central place in theories of group dynamics. It is traditionally conceived as the degree to which the members of a group wish to remain in the group. Thus, the members of a highly cohesive group are strongly motivated to contribute to the group's welfare, to advance its objectives and to participate in its activities (Cartwright, 1968). When a group experiences high cohesiveness, members tend to express solidarity, mutual liking and positive feelings towards the group. Homogenous groups are likely to be more cohesive than heterogeneous groups. Recently, there has been a focus on the role of cohesiveness of top management groups for developing focused and high-performance 'teams'. In a review article of top management groups, Hambrick (1994) argues strongly for the importance of behavioral integration for the performance of such groups. The main point he makes is that unless members of top management groups engage in the internal exchange, i.e. collaboration and mutual adjustments required to formulate and execute organizational action, the group will not function efficiently. It will lack the integration needed to meet environmental shifts and challenges. One may question whether the issue of behavioral integration is that important for projects. Since members of core groups operate somewhat more independently than members of top management groups, behavioral integration (as defined by Hambrick) necessarily not have to be crucial. However, one may assume that even groups in projects need a minimum of integration in order to perform well. Including the concept of group cohesion may therefore be relevant in order to get a multifaceted picture of the dynamics of core groups. For the purpose of this study, the following definition is chosen;

Cohesiveness in core groups is reflected by how attracted members are to the group and how well members get along in terms of helpfulness, social relations and cooperation.

2.4.7 Project identification versus external group identification

The degree to which members are attracted to the group can be understood or perceived in different ways. The general and most common way to see this is in terms

of members' attractiveness to the particular group in comparison to alternative groups. One can therefore also see members' attractiveness to the group as a reflection of their degree of identification with the group. This may be particularly relevant for projects where members are drawn between the project and other internal or external groups. In order to capture different elements of group integration relevant for projects, the issue of group affiliation or identity is presented. The degree of group attractiveness can also be seen as the degree of members' belonging or identification with the project. As the social identity theory is presented and discussed previously in depth, I will rather concentrate on the actual group affiliations project members may experience in a project.

Cohesiveness within core groups may be captured by members' identification with the project (or project-related groups), in contrast to identification with external professional groups.

As previously mentioned, there is a typical dual orientation in projects. Projects are, even more than stable organizations, subject to this inherent conflict of interest. Professionals engaged in large construction projects are drawn and twisted between the client or project and their professional base, mother firm and peers. This is a constant issue and challenge for project managers and the client, who within construction feel that their interests are often neglected in favor of the discipline-based considerations. Professional recognition and accept is often more important for professionals than adhering to the project administrative and client-based requirements. Being too considerate towards those needs is often evaluated negatively among professional peers, as it is seen as servile and selling-out on autonomy and professional independence. These are traits that are critical for professionals' self-respect.

The degree to which members of the core group identify with their profession or project may be dependent upon their degree of professionalization; e.g. how strong the occupation or profession is, for instance in terms of exclusivity of conducting the profession, its social role, professional traditions, social interaction within the occupation or profession, type of occupational or professional organizations etc.

Other contingent factors are the longevity of projects and the degree of status or prestige. If a project endures for several years or has high prestige (e.g. the Olympics or prestige buildings), the members may be more prone to identify with the project. There is reason to believe that the professional or occupational ties will then be weakened. But projects' often tight time-limits, strong leadership and clear-cut goals, may on the other hand also bind their members up and create a high identity and motivation for it.

2.4.8 Constructive and destructive effects of conflict, groupthink, project identity and cohesiveness

In the following, the effects of manifest conflict, groupthink and group cohesiveness will be discussed. Conflict may threaten performance (Pondy, 1967). Professionals and specialists generally have strong ideas about their work, a fact which raises strong feelings when these ideas are attacked. Therefore, overt conflict has a tendency to lead to endless and intense discussions, discord, power-games and other time-consuming activities. Conflict may, from this perspective, be seen as a costly element that hinders the effective performance of the group.

On the other hand, conflict as a result of the professional diversity can be beneficial in groups assuming that conflict stimulates effective group discussion positively and prevents ´groupthink´ (Janis, 1972). Increased conflict may influence the decision-making process and outcomes of the top-level group in projects, leading to high quality and original decisions (Janis, 1972; Bantel and Jackson, 1989). The findings of a recent study of multicultural groups (laboratory setting), indicate that greater use of constructive conflict was associated with more valid and more important assumptions (Kirchmeyer and Cohen, 1992). The constructive conflict approach builds on the idea of conflict being a key to unlock the potential of group decision making The approach encourages variety, openness and challenge. Specific practices include searching out a variety of ideas and opinions, fully sharing information, openly

confronting differences and carefully criticizing alternatives, and should thus not be confused with practices of competitive conflict.

Turning to the concept of group cohesion, early studies presented mixed results for the relationship between cohesiveness and performance, although several recent studies have established more positive associations. When considering the clear evidence that cohesiveness results in increased pressure for conformity, it is likely that cohesiveness may have a negative effect on decision-making and performance (see section on groupthink). On the other hand, other empirical evidence (McGrath, 1984; Keller, 1986) indicates that cohesive groups outperform non-cohesive groups. It is therefore clearly justified to claim that the picture of group cohesiveness is quite mixed.

In this study, group identities form two distinct orientations or identities among project people; a project or a profession orientation. Building upon the previously mentioned studies on group cohesiveness and the general idea that people that are integrated have a tendency to perform better than disintegrated groups, a high level of project identification will here be seen to facilitate group cooperation and positively affect performance.

2.4.9 Summary

Shedding light on the processual aspect of groups, the role of conflict, groupthink and group cohesiveness have been discussed for the performance of project groups.

Conflict is a popular topic within organizational theory and has attracted interest from several disciplines. In this study, conflict is primarily understood as a result of diversity of group composition. When developing a concept of intragroup conflict, Pondy's (1967) model served as a frame. Both antecedent conflict conditions or indirect conflict as well as manifest conflict is included.

The role of conflict is put forward as an indicator of how constructive or destructive the process is for performance. Conflict is according to Steiner (1972) an element of ´process loss´, a disturbing friction hindering the process to develop smoothly. Other recent contributions have a more positive view on conflict and see it as a premise for making good decisions. Groupthink is connected to conflict as it may be seen as an indicator of conflict-free group climate. However, groupthink may have its own effect on decision making and performance, which makes it relevant to explore here.

Group cohesiveness is by many put forward as the main reason of groupthink and can from this perspective be disfunctional. But as most social entities need a certain degree of integration in order to perform well, the issue may be worth investigating further. Related to cohesiveness, the role of a common project identity is also seen as influential and will be further inquired. This may also give a more complete picture of the project process.

2.5 A positioning of the study in a theoretical framework

Throughout this review, the different theoretical concepts to be used have been defined and the theoretical foundation laid. One of the main purposes has been to give a background of the theories and relevant research studies in order to position this study. As the organizational study of projects is limited and the development of theories within this field is not scientifically founded, it was necessary to give a thorough review. In order to develop the study of project organizations as a field of its own, a solid theoretical foundation is needed, and to draw up some of the major lines, I will here clarify the theoretical positioning of the chosen research approach with emphasize on its contribution.

By focusing on temporary network organizations like construction projects, this thesis highlights a previously neglected field of study by many organization theorists. The emergence of more temporary and 'virtual' modes of organizing, also in traditional industries, make a claim for focusing more on these types of organizations.

Although studying technically oriented projects, the main perspective is rooted in organizational theory and especially in its ramification called organizational behavior. By adopting a group level perspective in explaining the behavior of project organizations, the study grows out of the evolving research field on top-management groups (Bourgeois, 1980; Bantel and Jackson, 1989; Eisenhardt and Schoonhoven, 1990; Fredrickson and Iaquinto, 1989; Hambrick and Mason, 1984, Hambrick, 1994). Earlier, the two dominant perspectives within the organizational field originated in sociology or psychology and were divided regarding the level and perspective of study. If studying micro-and macro level phenomena, the common approach was to look at the effect of organizational macrovariables on the attitudes and behavior of individuals. Except for the noted top-management group research, there are few studies with the approach used here.

By launching the concept 'core group', attention is drawn to a new phenomenon in project management theories (e.g. Cleland and King, 1988; Meredith and Mantel, 1989). By building upon small-group research (e.g. Steiner, 1972; McGrath, 1984; Goodman and ass., 1986) and observations of construction groups, the features of core groups have been delineated and a definition put forward. Constructing theoretical and operational definitions of unknown organizational phenomena may be seen as a contribution in itself. By developing a 'human' group level model of project performance, this study may also be seen to bring in something novel to the project management field as social group processes have to a large degree been neglected. This may hopefully initiate a new field of research within the study of projects.

The study draws heavily on small-group research (Steiner, 1972; McGrath, 1984, Goodman and ass., 1986, Hackman, 1983), especially the stream on group composition (see Jackson, 1992). Although following the major trend within the top-management group research (Bantel and Jackson, 1989; Eisenhardt and Schoonhoven, Murray, 1989; 1990, Pelled, 1995) by studying compositional dimensions such as age, educational level, industry and firm tenure, some new elements are introduced to the composition literature. I will especially highlight the distinction drawn between 'objective and subjective' diversity. Generally, most researchers have not distinguished between what differentiate people as seen from the outside, and what people feel differentiate themselves. Building upon social identity theory (Tajfel, 1982; Turner, 1982; 1987), the 'stable group identity' dimension is

developed as a concept, capturing project members' subjective self image. The combination of this element with group composition may be seen as an attempt to reconcile the American and European theoretical group research traditions and taking into consideration social-cognitive processes within the study of work groups.

The study of professional values is also relatively uncommon within the group research field, but including it as a compositional dimension may be seen as a way to include the hitherto overseen institutional elements or external expectations and norms. Inspired by the large body of research on professions and professionals (Abbot, 1988; Raelin, 1985; Bailyn, 1985), the issue was discussed broadly. As 'knowledge-based organizations' have become more important and constitute a larger part of the economy, the professional dimension should become an important issue to include and develop within the study of organizations and projects.

Few studies have examined the link between group composition and process in relation to organizational performance. Most previous studies on the subject have either focused at how group composition (Eisenhardt and Schonhooven, 1990; Finkelstein and Hambrick, 1990; Murray, 1989; Katz, 1982) or group process (O'Reilly, Snyder and Boothe, 1993; O'Reilly, Caldwell and Barnett, 1989; Glick, Miller and Huber, 1993) separately affect the end results. In order to achieve a more complete picture of these relations and their impact on organizational performance, it is highly recommended to combine them in future research (see Hambrick, 1994). Recently, empirical findings of two studies examining both composition, process and performance have been published (Pelled, 1995; Smith et. al., 1994), but so far there have been none on project groups. Another strength of the chosen approach, is that process is captured by different, but well-known elements of group process. The combination of conflict, groupthink, cohesion and project identifications as an issue of study has not been seen in other comparable studies.

Finally, it is worth mentioning that performance is generally defined by one criteria in most organizational studies (Steers, 1975). The inclusion of two relatively different indicators such as productivity and quality and the intent to study these independently may give rise to a more faceted and complete picture of project behavior.

3. RESEARCH MODEL AND HYPOTHESES

Throughout the previous chapter it has been argued theoretically for the variables and relations in the research model. Here, a more fine-grained research model will be presented together with the specific hypotheses, which can be seen as explanatory expressions of the stated problem.

3.1 Research model

Models are representations of reality. A research model is seen to represent the characteristics of some empirical phenomena, including their components and the relationships between the components, logically arranged among concepts (Nachmias and Nachmias, 1981). Integrating theories on project performance, top management and small groups, social identity, sociology of profession and group processes, the pattern of a model emerges.

There are different ways to interpret the main theoretical perspectives introduced. One is to see them as different alternative theories to predict project performance. Basically there are two main alternative explanations presented. Inspired by the work of Smith et. al. (1994), these are called 1) the composition perspective and 2) the process perspective. Combining both makes a third; 3) the intervening perspective. The composition perspective suggests analyzing project performance from aggregating group members' compositional characteristics. This perspective has been widely used by the top management group researchers and is supported by different theoretical traditions. Small group research has for decades analyzed group behavior as a result of the demographical composition of the group members, among others aspects. The composition organizational perspective proposes that organizational behavior best can be interpreted and understood by the members' observable demographic characteristic (Pfeffer, 1983) and as introduced here; by values and identities of the group members. Although there are few empirical studies that have

investigated directly the process through which the top management group's composition influences organizational outcomes, several social-psychological explanations for the linkages have been proposed. The theoretical perspective presented in the chapter on group process is based on the long social-psychological tradition of analyzing the interactions among group members. Adapting this perspective on projects means analyzing the process of core groups in relation to performance. The process perspective involves understanding how composition and process may be related to project performance, with process accounting for parts of the variation in performance that demography leaves unexplained. The third perspective combines both alternative explanations by proposing that group demography influences project performance entirely through group processes. For all three perspectives, it is important to note that the chosen variables will explain only some of the variance of performance. There may be other strong explanations to why projects perform well, not captured by this model. In order to provide for a better understanding of the three alternative perspectives, a more fine-grained research model is presented below.

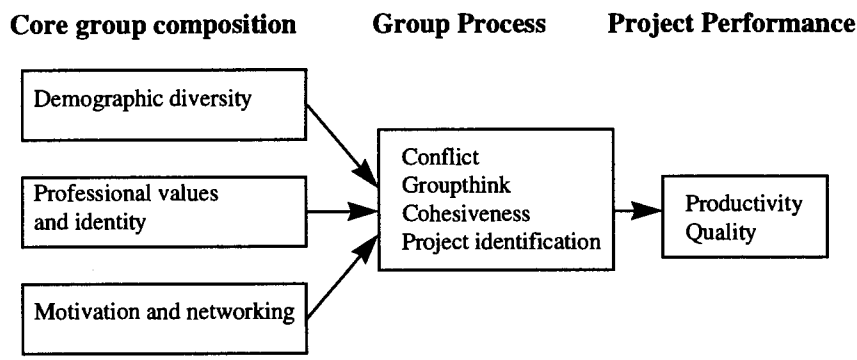


Fig.11, Overall research model.

3.2 Main assumptions

Any approach to the study of organizations is built upon specific assumptions about the nature of individual and organizational behavior. The main assumptions and prevailing perspective used will be presented.

The first assumption concerns the basic view of organizational behavior. At the core of the model is the relationship between the core group and performance. The perspective used is inspired from the 'upper echelon' or 'top-management' perspective (Hambrick and Mason, 1984) which is grounded on the overall assumption that the group of top managers have an influence on the decisions, strategy and overall performance of the organizations. Transferring this perspective to projects, the core professionals, manager and client are seen as the most influential people for the strategic decisions and performance of the project. The approach taken is based on the individual-centered perspective of psychological models. This 'active strategy' perspective is in contrast to the view taken by population ecologists, that organizations are subject to external forces and events. In the latter perspective organizational behavior is analyzed from structural organizational properties, either internal or external. In contrast to studying properties at an individual level, structuralists study variables arising from the environment, the population, or ideological or technological subsystems.

The second assumption is about individual behavior. Most models on group effectiveness see individuals as rational actors initially, but they all emphasize that group concerns may override the assumed ability and inclination of individuals to rationally deliberate, evaluate and examine issues, problems and so on. The position taken here is in a high degree based upon Etzioni's (1988) view that sees individuals as able to act rationally, but influenced and affected by social values and norms. This new paradigm is based on the decision-making model assuming that people also make decisions on the basis of emotions and value judgments. From a rational perspective, the interference of values and emotions is seen to distort decision making and lead to dysfunctional group processes. A more positive view will be taken here as values are seen to be a motivating force.

The approach chosen also reveals a functionalist interpretation as both composition and process are analyzed in relation to their function for the performance in project organizations. Traditionally, both researchers and practitioners have idealized homogenous, integrated and harmonious organizations. The more recent organizational perspectives, gaining increasing support, see diversity and conflict as a possibility for change and survival, instead of a threat (Pondy, 1992). Such a positive view on diversity and conflict is also taken here, thereby following the main approach within the study of top management groups. Although focusing primarily at how conflict generally influences performance, it is acknowledged that there may be curvilinear relations between conflict and performance, such as to open for a more faceted understanding of the functions of conflict.

The scope of the research model is substantially macro, as it focuses on the performance of projects. Although the model draws attention to the premises for group-processes and pays attention to processes, it is rather static in its function. Opposed to the recent development towards more dynamic group-models, this model does not capture the complex interplay between people, task, technology and time. Its purpose is, however, not to describe how groups really function and develop, but rather to inquire whether some elements of the core group has a significant impact on the performance of construction projects.

Focusing on the composition of groups means focusing on group structure. Group composition is a central premise, an input-factor and structural feature influencing the process and performance of the group and the larger project-organization. Including conflict, groupthink, cohesiveness and identity orientations will however also shed light on the more processual and developmental aspects of groups.

3.3 Hypotheses on compositional effects on project performance

The first set of hypotheses seeks to answer the first research question, about the direct effect of group-composition on performance. The basic idea guiding the first hypotheses is that the composition of diverse project professionals is important for

achieving synergy and good performance. This follows the general trend of studies within the study of top management groups that has put forward a positive view upon diversity. When solving complex, non-routine problems (generally finding place in turbulent, discontinuous environments), groups with diverse composition (regarding demographics) are more innovative and make better decisions (Bantel and Jackson, 1989; Murray, 1989, Finkelstein and Hambrick, 1990). According this line of research, to management groups that are composed with people with diverse functional backgrounds, educational level, age and experience are likely to produce better results than homogenous groups. These findings may be interesting exploring in the project setting. As core groups include the same types of occupations or functional specialties across construction projects, diversity of functional background is not an issue of diversity. However, as professionals of different age cohorts, diverse educational level attained and differing level of functional experiences are likely to show differing attitudes and perspectives, these elements will be inquired here.

Hypothesis 1 :

Within core groups in construction projects, heterogeneity with respect to age, educational level and positional and industry tenure is positively associated with project performance (both productivity and quality).

Contrary to this hypothesis, diversity with regard to demography may also be detrimental to groups' functioning as it may create more tension and less group integration (Pfeffer, 1983). Although there is wide support for the thought that a variety of professional attitudes and perspectives is beneficial for decision making in groups, there is some evidence that homogeneity of values helps organizational performance by creating a unity of vision and smoothing communication (Hambrick and Brandon, 1988). Although the above elements of demography are usually seen as proxies for certain values and attitudes, the relation does not need to be that straightforward. Assuming that diversity with regard to demographical characteristics does not necessarily reflect the more fuzzy, evaluative elements, one may ask whether diversity of demography is best exploited when there is a certain common value orientation among core group participants. Since construction projects consist of members from different units and backgrounds, they are likely to suffer from too much diversity if there is no common orientation or goal. Assuming that projects need

to unite around some common values, a preponderance of project values within the core group is seen to have a positive impact on project performance. The hypothesized relation between values and organizational behavior is supported by theories and studies on values (England, 1967; Hage and Dewar, 1973; Hambrick and Brandon, 1988).

Hypothesis 2:

Within core groups in construction projects, a dominance of project values is positively associated with project performance.

The next issue concerns the subjective self-identifications of project members. Based upon the social identity theories (Tajfel, 1982; Turner, 1987), two major identity-orientations have been argued for; professional (profession, peers, project,etc.) and one personal or social (age, nationality, family, sex, religion, etc.). Project people identifying with their professional activity reveal a high involvement in their work, but also a professional orientation (Bailyn, 1980). Analyzing this issue from a performance perspective, one may assume that the more project members identify with professionally oriented groups, the higher their effort and professionality will be. People identifying more with professional groups than private may be seen to pay more attention to their professional life and probably also perform better.

Building upon the same line of thought as in hypothesis 2, one may question whether the stable identities of core group members should be homogenously oriented towards professional groups.

Hypothesis 3:

Among members of core groups in construction projects, stable identities oriented towards professional groups (as opposed to personal) are positively associated with project performance.

Accounting for the motivational aspects, the issue of work involvement is also included in the analysis of group composition. Building upon the work of Bailyn (1980) and general theory on motivation, it is here hypothesized that work involvement has a positive influence on project performance.

Hypothesis 4:

Within core groups in construction projects, the degree of work involvement among members is positively associated with project performance.

According to previous studies on top management groups (Eisenhardt and Schoonhoven, 1990) and studies on the role of networks for diffusion of technology and performance (Harkola and Greve, 1995), members' network or previous joint work experience is seen to have a positive effect on performance. This is based on the general idea that previous contact and interaction amongst project members is likely to favor a positive and cooperative atmosphere.

Hypothesis 5:

Within core groups in construction projects, previous work experience among members is positively associated with project performance.

3.4 Hypotheses on process effects on project performance

The next hypotheses are indirectly based upon the central premises of social-psychological models of group behavior, i.e. that group process (e.g.Steiner, 1972, Hackman and Morris, 1975; Gladstein, 1984) has a direct effect on group performance. Conflict, groupthink, cohesiveness and group identity are put forward as main elements of the group process.

Previous studies indicate that conflict can be beneficial to project performance if the project is complex and unique, requiring innovative solutions throughout the project process. But when projects are simple and repetitive, requiring no creativity and changes throughout the process, conflict could be detrimental to performance. The projects to be studied are to a certain extent complex and unique, and as already noted, conflict derived from diversity may therefore be beneficial for decision-making and performance.

Evidence suggests that disagreement about the job being performed may be beneficial for performance (Jehn, 1995). The appearance of controversy and conflict indicate diversity of opionion, knowledge and attitudes which can lead to increased creativity, innovation and reevaluation of the status quo. Conflict allows for a thorough airing of alternatives and thereby avoidance of 'groupthink' (Janis, 1972). Although not taken into consideration here, the effect of conflict on performance is influenced by how it is handled.

Hypothesis 6a:

Conflict (both latent and manifest) within core groups in construction projects is positively associated with project performance.

Having argued earlier that there may be curvilinear associations between conflict and performance, these relations will also be inquired here. In a study of work groups and management teams, it was found that conflict was positively related to performance, up to a certain point (Pelled, 1995). Too much conflict turned out to be negative for performance. The following relation is thus put forward.

Hypothesis 6b:

In core groups in construction projects there will be a curvilinear effect of conflict (both latent and manifest) on project performance, such that conflict will only be positively related to performance up to a certain point, after which it will have a negative effect.

The opposite aspect of conflict in groups is found when there is no behavioral manifestation of conflict. It has been argued for using groupthink as an expression of suppressed conflict or absence of overt conflict. In the theory of groupthink, Janis, (1972) claims that with high levels of conformity, suppression of alternative and deviant views and alternatives is present. This may indirectly be seen as an indication of low tolerance for open discussion and controversy. Groupthink tends to deteriorate decision-making and therefore also performance.

Hypothesis 7:

Groupthink within core groups in construction projects is negatively associated with project performance.

Group cohesion is a multifaceted phenomenon that entails both attraction and satisfaction with the group. It reflects a cooperative and integrative spirit in the group and is therefore seen as an indicator of a well-functioning group acting like a 'team'. Members of socially integrated groups are seen to experience higher morale and satisfaction than disintegrated groups. But more importantly, they are often also seen to exhibit greater efficiency in the coordination of tasks (Shaw, 1981; McGrath, 1984; O'Reilly, Caldwell and Barnett, 1989).

Hypothesis 8:

Cohesiveness within core groups in construction projects is positively associated with project performance.

Related to the above hypothesis follows the proposition that members that feel attracted to a group are likely to identify more with the group than with other external reference groups. Having argued theoretically that members of project groups are likely to either identify with the project group or with the external professional group, and that project identification may lead to members' fulfilling the project's goal, the following hypothesis is put forward;

Hypothesis 9:

Identification with project groups (rather than professional groups) among members of core groups in construction projects is positively associated with project performance.

3.5 Hypotheses on compositional effects on group process

Inquiring about the effect of composition on performance requires detecting if composition affects performance indirectly through the role of process. This was named the intervening 'perspective' and hypotheses addressing the role of composition for process will be presented.

Several demographic studies have used process arguments to explain empirical relationships between the heterogeneity of groups and organizational outcomes. Generally, researchers have argued that group heterogeneity is negatively related to integration and positively related to conflict (see Jackson, 1992). Empirical studies have found that heterogeneity is associated with increased group conflict (Wagner, Pfeffer and O'Reilly, 1984). Assuming that project people of different age, educational level and tenure have dissimilar experiences, backgrounds, beliefs and values, heterogenously composed groups are likely to experience conflict. This is likely to yield for both latent and manifest conflict.

Hypothesis 10:

Within core groups in construction projects, heterogeneity with respect to age, educational level and positional and industry tenure is positively associated with conflict (both latent and manifest conflict).

While diversity may stimulate conflict, one may expect the opposite to be the case for groupthink, to a certain extent groupthink indicates a conflict-free climate. Bringing together different people may secure that pressures towards uniformity may be avoided, so that disagreements are discussed and critical feedback gets on the table.

Hypothesis 11:

Within core groups in construction projects, heterogeneity with respect to age, educational level and positional and industry tenure is negatively associated with groupthink.

Homogeneity or similarity is generally proved to produce integrative and cohesive group processes. This proposition is also supported by recent studies showing that

heterogeneity has a negative effect on integration (O'Reilly, Caldwell and Barnett, 1989).

Hypothesis 12:

Within core groups in construction projects, heterogeneity with respect to age, educational level and positional and industry tenure is negatively associated with group cohesiveness.

Professionals are generally drawn between their profession/mother-firm and the project, a factor that may cause disruption and disintegration. Assuming that a unity around project values may have an integrating effect on the group and prevent conflict, the following relation is hypothesized.

Hypothesis 13:

Within core groups in construction projects a dominance of project values is positively associated with cohesiveness.

Past experience among project members is seen to facilitate cooperation and open up for a smooth process. Empirical evidence reveals that executive teams that have worked together previously are more cohesive, communicate more and have higher trust than teams without such experience (Goodstein and O'Reilly, 1988; Zenger and Lawrence). The opposite is also likely to be found, that previous work experience will secure a positive work atmosphere and less conflict.

Hypothesis 14:

Within core groups in construction projects, previous work experience among members is negatively associated with conflict (latent and manifest conflict).

Project members that have developed relations through earlier work experience, may form cohesive work bonds. Although people belong to different firms and entities, such informal 'networks' are widespread within construction. Developing strong bonds and ties may lead to cohesive groups that are likely to favor both agreement and groupthink.

Hypothesis 15:

Within core groups in construction projects, previous work experience among members is positively associated with groupthink.

Hypothesis 16:

Within core groups in construction projects, previous work experience among members is positively associated with group-cohesiveness.

3.6 Control variables

In order to establish other factors may be correlated with performance, it is necessary to investigate other variables that are expected to have an influence. The function of control variables in empirical research is to reduce the risk of attributing explanatory power to independent variables that in fact are not the cause of the variation in the dependent variable. Control variables are used to test the possibility that an empirically observed relation between an independent and a dependant variable is spurious. The selection of control variables is based upon general theories and general insight from the construction practice.

Group size

Group size has not received much theoretical attention, but may have a considerable impact on group dynamics and performance. Small group research indicates that larger groups have more diverse opinions (Bales and Borgatta, 1966). Also, they have more opportunities for subgrouping than small teams (George, 1980). This allows conflict to air rather than to be repressed. Another reason for including the group size is that it indicates whether there is overlap of roles in the construction setting, a factor that indirectly also captures the project method used. Initially, each project of a certain size needs the ten functions described as positions of the core group here. However, the tighter control and the more centralized project method used, the number of people may shrink down to 5-6 people, because a project manager is likely to cover the role as design group and site manager, or the architect or consulting

engineer to cover the role of design group manager. Other combinations reducing the group size are also found. These factors may both influence the group process and performance as a smaller group may be easier to coordinate and manage.

Project duration

The projects to be studied have different duration. The time perspective may have an effect on both process and performance. According to Longley and Pruitt (1980), time pressure encourages groupthink. The opposite may be the case for conflict, in that long project duration may encourage and open up for conflict. Longer project duration may also allow for the development of tighter work bonds and a more united core group.

Lately, there has been a pressure towards tighter time-schedules and overlap between design- and construction. This again requires careful planning and more resources spent on coordination and communication, which can increase management costs. As there is a tendency to make more mistakes when the timelimits are tight, a shorter project duration may not necessarily be cost-effective. Since the issue of project duration can have interesting effects on performance, it will be included as a control variable.

4. METHOD

This chapter presents the decisions taken regarding method used. The section on research design will outline how the proposed relations or hypotheses are tested empirically as to whether the composition and process of the core group affect project performance. The field investigation designed to test the aforementioned hypotheses consisted of two main studies; a cross-sectional pilot study and a cross-sectional survey. The main study also included a qualitative participant observation. But before outlining these decisions, I will present the scientific paradigm influencing this research.

4.1 Philosophy of science orientation

The scientific approach used in this study follows the basic paradigm of most theories and studies within the organizational field, a research field with a dominantly American influence. Although there exist traces of more hermeneutic approaches within the organizational sciences, the basic scientific paradigm is to a large extent based on a positivist view upon science and knowledge production. Since this study is largely influenced by this tradition, I will pinpoint some issues that are important and set critical premises for the subject of study.

A positivist approach implies that the whole is studied or understood as the sum of its constituent parts. The view that behavior is a sum of the characteristics of the group members and their composition, is built on the general assumption that 'reality' is reducible to the sum of the 'least constituents' that compose it. Through this perspective, often referred to as atomism or particularism, the world is perceived as a world of things (here individuals) which must be labeled, categorized and classified if understanding and a possible manipulation of them are to be achieved (Schwartzman,

1986). As such, the concern of delineating characteristics of people is tied directly to the search for determinants of group and organizational behavior.

In her critical review of group studies, Schwartzman (1986) suggests adopting an anthropological approach to reorient the research on work group effectiveness. Although this study is based on the positivistic tradition, it does, however, pay attention to the qualitative elements and tries through the triangulation of methods to give a more complete analysis of the quantitative results. It is an attempt to balance out some of the piecemeal and narrow perspective of a positivist approach.

Another central premise of positivist science is the idea that there exists a verifiable and observable world to explore. It is believed that by refining the measurements and methods, one can get closer to revealing 'the truth'. However, although supporting the idea that I as researcher can reveal parts of the 'objective' world by using well developed measures, I acknowledge and try to incorporate that the world is also socially constructed by each individual and culturally influenced. A consequence of this is that the degree of people's subjective and cognitive constructions may be captured objectively through scientific methods is limited. Another limitation regarding the search of 'the thruth' in organizational behavior, is that culture interferes and sets major premises for people's dispositions and behavior. A plausible consequence of such a fact is that one rather than searching for 'universal truths' should search for 'local truths' within distinct, culturally homogenous units. The 'truth' may in other words be rather relativistic.

This perspective has greatly influenced the research approach taken here as the research setting is limited to the construction industry. It is believed that by doing research on a culturally defined unit, the measures and methods developed could incorporate these

cultural dimensions and thereby be more valid. Another reason for developing theories of a culturally specific unit is that it gives the researcher the possibility of going more in depth and interpreting the issues and findings according to the intentions of the actors. As I have been working within the construction industry for three years and have previously done research within this setting, this should lower the possibility of misinterpretations and bad measuring.

Finally, a positivistic science also assumes neutrality and interest free research. As a researcher I do not believe in a politically neutral science as any position or perspective chosen may be seen as an advocate of some parties' interests such as company owners, workers, managers or professional groups. Therefore, I will be specific and outline the interests I am pursuing in this study. By only focusing on the core managers and professionals instead of the construction workers, one could say that I have adopted an 'elite' or top perspective. To this I will answer that a construction project to a large extent is a joint effort from many thousand people and that site people or craftsmen may be just as important as professionals for the final result.

By focusing on productivity as a performance criterion, primarily the interests of the owners or investors of the project are paid attention to. The society or the users of the building may not necessarily benefit from an efficiently run project process. Although the inclusion of quality as a performance indicator does to a certain extent capture the users' interests, I acknowledge that the present study has certain limitations and that other performance indicators should be included in order to consider the interests of the public, the physical environment, future generations etc.

4.2 Research design

The most relevant designs allowing to test theory and to probe causal relations are experiments, quasi-experiments and correlational field studies. These research designs

differ regarding the extent to which they meet the criteria of comparison, manipulation and control, the three essential components to establish that the independent and dependent variables are causally related. The classic experimental design is one of the strongest logical models for inferring causal relations and it has therefore been extensively used within psychology and consequently also within the study of groups. Experiments are usually conducted in laboratories which place severe restrictions on the generalizability of the results. Keeping the classic experimental design as a model of logical proof, scientists have developed a number of quasi-experimental designs (Cook and Cambell, 1979). What distinguishes quasi-experiments from classical experiments is that they rarely occur inside a laboratory and never involve the random assignment of units to be studied. Their structures involve one or more treatments, measures taken after the treatment, and usually, more than one unit receiving each treatment. Quasi-experiments are like randomized field experiments in all ways except that treatment assignment is by self-selection or administered rather than by chance (Cook, 1983).

In recent years, leading group researchers have argued for the need to study groups as intact social systems, in a context that involves time, situation and task (McGrath, 1986). One of the reasons for contradicting results, it is argued, is that one has not studied groups in realistic organizational settings and thereby failed to taken the task into account. Seeking to avoid this pitfall, the laboratory experiment is therefore ruled out as a possible design alternative. In addition, a laboratory experiment would not allow for an analysis of the role of the core group regarding the performance of the whole project. The quasi-experiment would be relevant if one could induce changes on the independent variable by manipulating the composition of core groups in projects. Implementing this approach in real-life projects is quite unrealistic, however, researchers are hardly allowed to manipulate or decide the recruitment and composition of central professionals and managers in large construction projects. Another problem with this quasi-experimental field approach is that time and resource limits are easily overrun, as it would be necessary to wait for the projects to end before being able to measure performance. Most large construction projects are time-consuming. They often last from six months to four years.

As the experimental and quasi-experimental designs do not suit the purposes of the chosen research problem, the *cross-sectional, multivariate method of analysis* results as the most relevant research design. As the chosen performance indicators only can be measured after the projects have been completed, the chosen research will be conducted retrospectively. It is, however, important to note that this type of correlational design offers no alternative to randomization, which is the only technique that disrupts any systematic relationship between the characteristics of the units of analysis and their exposure to the independent variable (Nachmias and Nachmias, 1981).

The chosen cross-sectional research design will allow the drawing of inferences concerning the relations among group composition and performance. Establishing a relation in empirical research mostly consists of determining whether values of one variable covary with values of one or more other variables. A main problem is that these associations or correlations do not necessarily imply causality. Necessary, but not sufficient conditions for causality are covariation between the studied relations, nonspurious observed covariation and a distinct time order, the causal variable occurring prior to the effect.

Relating to the topic of inquiry, one of the central premises of causal relationships will be met. Group composition precedes group process, and both sets of variables temporally precede the dependent variable; i.e. project performance. In this respect, the model fulfills the premise of the causal variables occurring prior to the effect, however, an objection that may be made to the model regards the actual measurement of the process. As people will be asked to indicate their perception of the process after their participation is ended, one may question whether the performance may affect the perception of the process. This may disrupt the elegant temporal order of the variables in the model. Measuring some compositional aspects and process retrospectively may open up for peoples' rationalization of past events in regard to how performance turned out.

The second premise of causation may also be met if covariation between the studied variables is found. The third premise of causality is harder to verify. Even if the study reveals an association between composition, process and performance, this could be due to other variables than the one studied. Although testing whether the observed relations between the independent and dependent variables are nonspurious by including several control variables, there is still a risk of attributing explanatory power to unidentified variables. Considering that projects are not isolated from extrinsic factors, that they are complex organizational devices and that they endure for a certain time, several factors may interrelate and have an impact on the studied relations. Therefore, it must be kept in mind that every research model is limited in capturing the complex reality of organizations.

4.3 Pilot-study

Before conducting the actual study, it was necessary to do a preparatory and more inductive pilot study. The main purposes were basically to get an initial empirical grasp of the proposed theoretical elements and to test the chosen measures, hereby assuring that I would end up with a representative set of items for each question.

Through interviews with members of core groups in construction projects, it has been possible to gain a deeper insight and understanding of the industry, the practice of construction projects and the actors involved. This means getting a 'thick' description of the field of study. There was a need to get a touch of the 'real world', in order to see whether the theoretically developed research model seemed to capture important and relevant factors. Before starting the extensive theory testing, I wanted to make sure that I was focusing on issues and variables that were central for project performance.

Additionally, it was necessary to find out whether the chosen operationalizations or questions were meaningful to the people engaged within large construction projects. Question wording is according to Sudman and Bradburn (1982) a crucial element in maximizing the validity of survey data obtained by a question-asking process. The fact

that seemingly small changes in wording can cause large differences in responses has been well known to survey practitioners since the early days of surveys. However, the tendency to adopt accepted and reliable measures across a wide variety of settings is widespread. Considering that people may differ substantially with regard to culture and language across different countries, industries and organizations, there is a danger of getting unreliable data. One may end up measuring other issues than the ones intended. Since several measures were developed in English speaking cultures, I needed to make sure that the translations were right and captured the intended phenomenon. People within the construction industry are not very conscient and knowledgeable about organizational issues, which can cause misunderstandings and deviating perceptions of the same words. Acknowledging that words and sentences are perceived very differently across cultures, one of the purposes with the pilot study was to make sure that the members of the core groups understood the questions and items as intended.

Another concern when constructing a questionnaire is to assure that the given set of situations or behavior captured by the items is adequately sampled. In other words, it requires that the researcher becomes acquainted with all the items that are known to belong to the content population. This is called sampling validity (Nachmias and Nachmias, 1981).

In order to sum up the main purposes of the pilot study, the main questions guiding the pilot study are presented below;

How do people within construction perceive the core group? Who are its members and how do the group function and work?

Does the core group seem to play an important role in influencing the performance of construction projects?

Which factors related to the composition and process of the core group seem to be most important?

Which group identities of the members are most prone to influence their relation to the project and performance?

How do processes enroll within the core group?

How do members of the core group conceptualize phenomena such as conflict, cohesion, identity, quality etc.?

Which general factors concerning the organization and performance of construction projects are relevant to include in the study?

How do construction professionals understand or conceptualize the questions posed?

Do the items selected capture the most important alternatives present for the respondents?

4.3.1 Interviews with members of two core groups

In order to explore the aforementioned issues, two construction projects that were primarily aimed at office or educational purposes, of a certain size and just ended, were found. Through the good relations developed with the Building State Agency, I managed to get access to two projects concerning the planning and construction of two schools. The projects had just been completed, they were nearly of the same size and task complexity, and even the project methods used were alike. Geographically they were situated in different parts of Norway.

Although the population consists of project units, the core group is the actual unit that data is collected from. Therefore, I will also clarify how I defined the actual participants of this group. As Hambrick points out there have been many different conceptualizations of top groups or teams, from asking the CEO to identify the members of the top group, (e.g. Bourgeois, 1980; Fredrickson and Iaquinto, 1989; Hambrick, 1981) to define the groups according to formal titles using published sources. Such an approach can range from restrictive definitions covering only the 'inner-circle' of 3-5 people (O'Reilly, Snyder and Boothe, 1993) to the inclusion of all officers, ranging from an average group size of about 20 for large firms (Wagner, Pfeffer and O'Reilly, 1984) and 10 for medium-sized firms. Considering that the position and number of officers included in the operationalization of top groups may influence the results achieved, it is necessary to be clear about how to define the core group.

The approach chosen was to ask people in the construction industry about who they conceived belonging to the core group. As the answers centered around the members of the design group (in Norwegian called 'prosjekteringsgruppe') with some additional managers, I decided for including the following members. The members were also interviewed in the pilot study;

Managers	:	*project manager*
		design group manager
		site manager
Client and consultants	:	*client*
		user-representative
		architect
		structural consulting engineer
		heating-and-ventilation consulting engineer
		electrical consulting engineer
		main contractor

In general this amounted to a total of 10 people. As some projects are more centralized by having managers covering all three management-roles (both project, design and construction) or professionals sharing multiple roles, some core groups consisted of only 5-6 members.

Because of problems of getting access to all the members, 6 members of each project were interviewed, a total of 12 people. However, looking at both projects together, I managed to talk at least once to all the main actors. The interviews were initially planned to last 1 hour, but as all the participants were eager to share their experiences, the interviews lasted around 2 hours with each participant. The interviews were semistructured, as a set of questions were developed.

The questions constructed were open-ended, mainly gathered from previously developed measures, but with the inclusion of some newly made. Since a deeper understanding of the members' perception of the questions and issues was needed, some things were pursued more in depth by letting the interviewees talk freely when necessary. Since several of them were negative towards tape-recording, running comments and answers to each question were written.

Based upon written notes, an overall report on each project was written while impressions were fresh, i.e. within 24 hours. Since the pilot study was mainly intended to give an overall picture of the field of study and test the measures, the reports were brief. The pilot study served more as an input and insight into the field of study, and the analyses of the data were thus not meant to be extensive and too structured. Therefore I did not develop a protocol, as suggested by several case researchers.

The main impressions and insight obtained through these interviews made me redefine the initial research model through the inclusion of some additional dimensions. It also helped me largely in adjusting the chosen measures to the actual setting and culture. Since this study was just preliminary, I will not report the findings per se, but rather let the insight and impressions come through when defining the core group and the actual project setting, when discussing the measures developed, and finally, when analyzing and commenting upon the results from the main survey.

4.4 Pretest of questionnaire

The insight gained through the pilot study was of great help in focusing on certain issues and developing items that seemed to be meaningful and relevant for people within the Norwegian construction industry. In order to heighten the validity of the questionnaire, a final pretest of the questionnaire was conducted.

Collecting data about core groups in projects is very time-consuming and given the time and resource constraints, a full pretest with data collection and analysis was discarded. The pilot study conducted was extensive and thorough, so the questionnaire was tested on a limited group of people. A group of fellow colleagues (4-5) read through the questionnaire and gave feedback on the wording and format of the questionnaire. These people are all researchers and more or less acquainted with questionnaire designs. After having cleared inconsistencies and bad wording, a set of people representing the major professions and occupational roles of core groups, was

contacted. Separate meetings or interviews with four professionals, two engineers, a project manager and an architect were held. They were asked to read through the questionnaire carefully and give feedback if there were things they did not understand, that were unclear or that they reacted to. As I asked them to be very critical and talk as they completed the questionnaire, the meetings ended up being fruitful dialogues giving the necessary feedback.

Finally, the reference group appointed for the research project was also of great importance in influencing the questionnaire design. This group consists of people representing the major disciplines and roles within construction projects. Having regular meetings with this reference group during the research process, the opportunity was used to discuss and get feedback on the questionnaire as well. This was very useful as these people knew the research topic and the theoretical basis. They gave very precise and critical comments on the general approach and details regarding the questionnaire.

4.5 Survey

In this chapter a brief overview of the major decisions taken regarding the survey, the population, selected units of analysis and data collection will be given.

4.5.1 Defining the population and the units of analysis

By taking into account that the role of top groups changes across industries (Murray, 1989; Norburn and Birley, 1988) and that the task is shown to have a substantial impact on both relations and processes in such groups, the survey is restricted to one industry and similar projects. This allows to control for the role of task and technology, which elements are of increasing importance within the group research field. There has been,

and is, a tendency to adopt a universalistic approach in group studies, generating general theories on groups in such diverse fields as sports, juries, political groups and manufacturing. Several leading theoreticians now make a cause for controlling or taking the role of task and technology into consideration (McGrath, 1984; 1986; Hackman, 1989; Gist, Locke and Taylor, 1989). Additionally, focusing on one industry opens up for developing more precise and correct measurements and methods. This is especially relevant regarding the measurement of productivity. Using productivity as a performance indicator requires that the technology or input/output measures are comparable. Given the selection of productivity as the dependent variable, the study had to be limited to projects within one industry and of comparable technologies.

The construction field, having long traditions with the project management approach and an intricate set of relations amongst actors, is chosen as the empirical setting. The fact that I had developed good relations with this industry in Norway and had good access to data, also played a major role for selecting this industry. Due to a economic recession in Norway during the years 1989-1993, the units of analysis selected were few. The fact that the population was limited to construction projects that were alike regarding task and size, restricted the amount of units to only around 30-40 in Norway. As Sweden is quite similar regarding culture and construction practices, Swedish construction projects were included as well. This would double the units of analysis in the study and secure a sufficiently large sample of projects on which to conduct statistical analyses.

In this study the role of project size is also controlled for through sampling. Construction projects can range in size from a small amount of people to several thousand, which can have considerable impact on several organizational phenomena. Since the focus is primarily on the role of the core group, the size-variable has been kept. Given that large construction projects represent the major organizational challenges, it was decided to focus mainly at projects exceeding substantial size.

In order to be able to include project performance as a dependent variable in the study, only projects that are completed have been relevant for the study. The projects should

not have been completed too long ago in order for the members of the core group to memorize the process. Taking all these factors into consideration the following population was defined for the actual study;

The population of the study are Norwegian and Swedish construction projects exceeding 5.000 m2, directed primarily towards the construction of buildings for office and educational purposes, and of a limited duration (varying from 1-4 years), completed the period 1993-spring 1995.

Regarding the actual construction projects to be included in the study, I will characterize them on the basis of the figure presented on page 10 where projects were defined. The chosen projects include, mostly known technology and tasks so they cannot be said to be extremely unique. However, being both large, visible and prestigious for the involved professionals, the design and use of materials may be quite original. Therefore, on the 'unique continuum' they must be placed in the middle. As for the dependence on the environment, these projects are mostly dependent on the client or owner of the buildings. There may be some pressure from local communities regarding the localisation of the building in the landscape and its design etc., but generally there seems to be little interference from the external environment.

The chosen approach, limiting the population to one industry and projects of a comparable size and technology have certain advantages, but it also set some limitations on the data. As the units of analysis are quite alike, one gets a strong selection of the independent variables. Which means that the variation of the independent variables will be smaller than including projects from different industries and sizes.

The chosen approach also limits the generalizability of the results. Whether results will be generalizable across projects or building types and across industries remain to be seen. On the other hand, the selection of projects that are alike on several dimensions heightens the internal validity of results in that several factors than the ones to be studied are controlled for. Using this approach, the research strategy chosen has some similarities to the natural experiment.

4.5.2 Describing the setting in construction projects

Construction work is according to Eccles (1981) based on a set of stable relationships between a general contractor and special trade subcontractors. Williamson (1975) located it between markets and vertically integrated hierarchies in his continuum of alternative contracting modes. A project in the construction field is by some seen as a quasifirm (Eccles, 1981) or a set of hierarchical contracts (Reve and Levitt, 1984) or hierarchical documents (Stinchcombe and Heimer, 1985). Its products are unique, site-produced, labor-intensive, highly dependent on local conditions and have not been subjected to much mass production or standardization. Through evolution, the building projects have become a process with definite and discrete stages; predesign, design and construction. Although every project passes through these stages, there exist a wide array of approaches to handle the process. The contracting modes, which are the most popular topic of discussion within construction practice, will not be dealt with here.

The total building process is often fragmentary, both in place and time. Given the complex interplay among the various units; contractors, project managers, professionals, craftsmen, firms and client, and the traditionally low formalization and control of operations, one can wonder why most construction projects turn out so well. Reality reveals that there is an invisible and hidden net of traditions, norms and relational forms rooted in the long history of the construction field. Exsamples such as the pyramids of Egypt, the grand medieval churches in Europe and other old buildings, easily make us remember the past of the construction industry. On the basis of this, we can see the professions have had time to develop.

4.5.3 In search of the units of analysis - the projects in the population

The title above indicates that the units of analysis were difficult to trace, as it appears that once a construction project is formally completed, it is 'dead and buried'. Formal and structured registration of historical project information was almost non-existent for

the projects studied here, both publicly and amongst the firms involved in the projects. The research process started at this stage as it took around 4-6 weeks to locate the actual units of analysis and the main participants. Since these trivial facts can be of importance and help to other researchers, an accurate description of the data sources is given.

It appeared that there was only one formal source that could give some information of ended construction projects in Norway for the years to be studied; The State Map Agency (Statens Kartverk). The information available from this source was very poor for the purposes of this study. It contained the clients' name, the county, the building type, total square m2 and date of project termination, but gave no information regarding the client's or participants' names and working addresses. This source defined the population to contain 38 units, but with little specification of where to find these 38 units. Through the State Building Agency (Statsbygg), the main public construction projects were identified and an overview in a magazine called Byggenytt contributed in locating the largest private construction projects. Using these sources, 37 construction projects were identified, matching almost the initial number defined by the State Map Agency which was 38.

In Sweden the search for the population units was a lot easier as there is a formal registration of all construction projects through a consultancy company. In Sweden 27 projects appeared to fulfill the population criteria. The total population was finally defined to consist of 64 construction projects. Since this is a limited number of projects, the study covers the whole population of projects.

4.5.4 In search of the informants - the members of the core group

Having traced the actual construction projects to be included in the analysis, the next challenge was to obtain names and addresses of the members of the core groups. What seemed to be an easy matter from the outside, ended up being both time-consuming and frustrating as few firms had preserved lists of the core members participating in these

large projects. After a while I felt more like a detective in search of the lost project participants than a researcher trying to do a serious study.

The project manager of each project was contacted in order to get information of the main participants, who all were employed in different firms. The project manager was usually employed by the contractor or a separate project management firm. As some of these informants were unavailable, overworked, in new sites, abroad or uncooperative, information about core group members on several projects could not be gathered. Where contact was established, it appeared that several of the project managers did not have complete names and addresses of the most important project members they had worked with intensively during the last 2-3 years! This caused much extra work as I had to check up firm addresses and phone-numbers for more than half of the respondents. Despite the effort put into this process, 4 project units in Norway were lost during this stage. Because there were formal registrations of both projects and participants of such large construction projects in Sweden, this stage was unproblematic here.

Full lists containing names and addresses of core group participants in 33 projects in Norway and 27 in Sweden were now available, a total of 60 construction projects.

4.5.5 Data collection by mail questionnaire

As problems were anticipated in getting busy project members to answer questionnaires, telephone interviews were considered. But people working in projects are often difficult to reach by phone as they switch from the office to the building sites and meetings in other places. One also had to consider that the respondents were spread geographically. In the end the mail questionnaire turned out to be the cheapest and most practical way to collect the data.

Since the data collection was anticipated very time-consuming, two engineering students at the Technical University in Luleå administered and collected the data in

Sweden. As the questionnaire was translated into Swedish, careful attention was paid finding equivalent and precise wording and expressions in Swedish. In Norway the data collection was administered by me, while two students of sociology did the follow-up by phone.

The data collection was divided into two parts. The first part concerned data about members of the core groups, i.e. their demographical backgrounds and perceptions of the group process. A 9-page questionnaire regarding these data was sent to each of the 6-10 members of each project. See appendix 4. A total amount of 474 questionnaires was sent to participants of 60 large construction projects in Norway and Sweden. The second part of the data collection concerned general data about projects' duration, organizational matters and productivity data. This 6-page questionnaire was enclosed with the 9-page questionnaire to each project manager of the 60 projects. See appendix 5. A cover letter presenting the purpose of the study was enclosed, as well as a stamped, self-addressed envelope. After 2 weeks of the first mailing, the response rate in Norway was very low, only around 18 percent, so a follow-up questionnaire was sent. After another 4 weeks, a follow-up was sent again. People were in general very reluctant to answer, so a follow-up by telephone was needed for around half of the respondents. Finally, after many weeks of persistent and intensive telephone calls, the response rate reached 54% in Norway. Contrary to the problems encountered in Norway, the data-collection went very smoothly in Sweden as the response rate reached 56% with the need of only one mail follow-up. A plausible reason for this may be that there was a recession in Sweden when the study was conducted allowing people to spend time on filling out questionnaires. In Norway the opposite was encountered, since there was an economic revival, the construction firms were busy engaged in new projects and did not have time to spend on 'unproductive' activities.

Another factor complicating the data collection and lowering the total response rate of the project units of analysis, was that data were needed from different sources. In order for a project to be included, data from a sufficient amount of core group members were needed as well as information regarding productivity and general project features. Needless to say, the response rate suffered under these conditions. Just to exemplify

this, many project managers in Sweden were very reluctant to give productivity data, fearing that this information would be used against them. Having initially acquired nearly a full dataset on core group information, (60 out of 64 possible project units), several project units were lost because productivity data lacked, a total of 23 project units was lost. Despite the problems encountered with the data-collection, I managed finally to achieve a sufficient number of project units to conduct the productivity analyses on, a total of 37 units. See the table below for an overview;

TABLE 1: Response rate of projects

Data:	Norway	Sweden	Total units	Resp. rate
≥1 response Questionnaire core group (60/64)	33	27	60	93%
≥3 responses Questionnaire core group			55	85%
≥5 responses Questionnaire core group			39	60%
Response Questionnaire project manager	29	19	48	80%
Full response set (>3 responses core group, general data and productivity data)	24	13	37	57%

Since the response rate of core group members (data about composition and process) varied considerable between projects, the table needs to be explained further. The first three lines in the table show the response rate. When accounting for that, the responses from core group members varied across project units. The number shows that many project-units will be lost if one is to include only projects with 5 or more responses in the analyses, only 39 units fulfill this criteria. In order to secure that the sample is sufficiently large to justify statistical analyses, it was decided to include those projects that had 3 or more responses from core groups members, a total of 55 projects are qualifying to be included. Such an approach follows also the general trend of most researchers studying top management groups (meeting with Susan Jackson, 1994) who also encounter the problem of obtaining full data sets from these groups. But in order to check for the eventual impact of differing response rates, additional data analyses

will be done. In order to show how the average response rate is between projects and how the distribution is regarding the differing response rates, two more tables are presented. Tables 2 and 3 give an overview of response rates for core group data regarding all project units in the study. It is shown that only 2 responses were obtained for some projects, 7-9 responses were obtained for other projects.

TABLE 2: Descriptive statistics of response rates core group data

Variable	Mean	Std Dev	Minimum	Maximum	N
Response rate %	,64	,19	,2500	1,0000	60
Number of responses	5,12	1,72	2,00	9,00	60

For a better overview of how the responses differed between projects for data about core groups, a table showing the frequencies of different number of responses is presented.

TABLE 3: Frequency table for responses of core group data

Value Label	Value	Frequency	Percent	Percent
Number of responses	2,00	5	6,7	6,7
	3,00	8	15,0	21,7
	4,00	7	11,7	33,3
	5,00	15	25,0	58,3
	6,00	12	20,0	78,3
	7,00	8	13,3	91,7
	8,00	4	6,7	98,3
	9,00	1	1,7	100,0
	Total	60	100,0	100,0

4.6 Describing units lost for the productivity analysis

So far, the project units described that have been included in the data analyses have been presented. In this section, however, I will give a description of the project units that were lost throughout the data collection. This is necessary in order to establish whether this happened randomly or if there were any specific reasons for dropping out. One could expect people to be reluctant as to giving out information if the projects were unsuccessful or there were happenings during the project process that people did not want to reveal. Luckily I have some information about most of the projects that were lost, enabling me to describe these units quite well.

However, there were 4 project units that I did not have any information about. These were lost early in the data collection because names and addresses were disclosed. I managed, through a call to the project managers, to get some background information. It appeared that the project units in question were not particularly different from the ones included. They were directed at constructing universities and offices in different parts of Norway. Nothing particular had happened during the process and the result was considered satisfactory by several people.

For the remaining project units, there is either obtained general information from the project manager or one or more responses from the core group members. Additionally, some of the project managers were asked to check up on the information given. There are different ways to describe these units. I have decided to make a comparison based on descriptive statistics and general data about the projects. Regarding the technology and task, there is nearly an equal distribution of office and educational directed projects that got lost. There were unfortunately a slight overrepresentation of Swedish projects missing on the productivity analyses. Since there were no significant differences regarding Swedish and Norwegian projects, this is not a bias. On the next page, a table showing descriptive statistics such as means and standard deviations is presented. See table 4.

TABLE 4: Descriptive statistics of core group variables for units included and not included in the productivity analysis

	Project units in the productivity analysis N=37		Project units not included N=23	
Variables	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**
Age diversity	.16	.06	.15	.06
Educational level	.15	.06	.16	.06
Positional tenure diversity	.63	.22	.56	.24
Industry tenure diversity	.47	.21	.50	.28
Project values	.85	.15	.86	.19
Stable prof. group identity	.23	.14	.21	.19
Work involvement	-.10	.49	-.01	.64
Previous work experience	.41	.19	.48	.24
Task related conflict	.63	.12	.58	.16
Interpersonally related	1.47	.23	1.43	.19
Groupthink	-.04	.44	.08	.42
Cohesiveness	3.25	.32	3.32	.29
Project identification	.48	.21	.37	.25
Group size	8.11	1.22	7.61	1.27
Project duration	2.65	1.30	1.95	1.07
Productivity	.51	.20	Missing data	
Quality	3.24	.15	3.31	.18

The table above reveals that the differences between the variables of the two groups of project units are minimal. Except for a few variables such as work involvement and project duration, the differences are very small. These data thus indicate that there is a random loss of project units. In order to reduce the possibility of drawing false conclusions, some information regarding general data about the projects will be presented. This information was not necessary for the main analyses, but gathered because it is of general interests for construction people. These variables concerned general features about the projects such as the amount of time spent on design versus construction (in relation to total duration), the degree of project methods and plans used, the contractor system used and the occurrence of unforeseen events (change of prices, public regulations, bad weather conditions, environmental claims, new users etc.).

TABLE 5: Descriptive statistics of general data for units included and not included in the productivity analysis

	Project units in the productivity analysis			Project units not included		
Variables	**Mean**	**Std. dev.**	**N**	**Mean**	**Std. dev.**	**N**
Degree of duration - design (est. of total project duration)	.81	.16	17	.77	.12	6
Degree of duration - construct.	.56	.17	28	.65	.18	10
Degree of overlap design and construction	.42	.20	17	.45	.23	6
Use of project methods (on a scale from 1=not used to 4=frequent	2.68	.58	36	2.67	.64	12

Table 5 does not reveal any great differences between projects included and not included in the productivity analysis. This table gives additional support to the conclusion that the final sample is random. Finally, an overview of the way the project units are distributed regarding contractor system used and the occurrence of unforeseen events will be given.

TABLE 6:Frequencies regarding general data for units included and not included in the productivity analysis

	Project units in the productivity analysis N=37	**Project units not included N=23**
CONTRACTOR SYSTEM		
Main Contractor (Hovedentreprise)	16.2%	0
General Contractor (Generalentreprise)	10.8%	13%
Separate Contract (Delte entrepriser)	35.1%	8.7%
Design Construct Method (Totalentreprise)	24.3%	21.7%
CM Construction Management	5.4%	4.3%
Other	5.4%	4.3%
Missing	2.7%	47.8%
UNFORESEEN EVENTS	Yes=29.7% No=67.6% (2.7% missing)	Yes= 8.7% No=43.5% (47.8% missing)

Table 6 shows a slight difference for how project units are distributed regarding contractor systems, however, a major problem is that data about half of the project units are missing for the data on the right-hand side. Despite the last difference found revealing that there may be a small bias regarding structural features, the overall impression is that the project units lost seem not to differ significantly from the ones included. Such a finding opens up for treating the final units as a randomized sample and using significance tests.

4.7 Participant observation of a core group in action

Jick (1979) has outlined the benefits of combining different methodologies in the study of the same phenomenon, which he calls between-method triangulation. A key advantage of the approach is that it entails a more comprehensive investigation of the phenomena; one method compensates for another method's limitations. As Jick pointed out, 'it is here that qualitative methods, in particular, can play an especially prominent role by eliciting data and suggesting conclusions to which other methods would be blind'.

As the main methods used were indirect and quantitatively oriented, I felt a need to observe the phenomena of study as they occurred in their natural settings. The main virtue of observation according to Nachmias and Nachmias (1981) is its directness, that it makes you able to study behavior as it occurs. This, in turn, enables the generation of firsthand data that are uncontaminated by factors standing between the investigator and the object of research. As the purpose of this qualitative part of the study was not primarily to infer causality, but rather to get a richer and wider impression of core groups and their processes, the least controlled method of observation was chosen, namely participant observation. Getting access to a construction project in progress, allowed me to assume the participant-as-observer role and closely observe what was really going on in a 'real' setting.

The qualitative impressions of observing a core group out in the field will not be used to draw conclusions, but rather to develop better measures and give a more holistic analyses of the quantitative data. There is a danger doing quantitative research and that is the distance created between the observed people and the researchers. The danger is found especially in translating theoretical constructs wrongly and to misinterpret the quantitative findings.

4.7.1 Describing the project and data collection

The chosen project was directed towards the construction of a university building and was in the construction stage when entering the process. The main steel fundaments had just been installed. Having established good contact with the project director in the State Building Agency through his participation in my reference group, I got easy access to this project. However, establishing a good relationship with members of the chosen core group remained a major challenge. I approached this first by having an informal lunch meeting with the project manager at his workplace. This also gave the opportunity to get background information about the actual project. The next step was to join in a regular meeting to meet the participants of the core group. The first meeting I participated in was a regular site meeting (byggemøte) at the construction site, generally held every second week. This meeting included all the members of the core group. The second type of meeting was a planning meeting (prosjekteringsmøte) generally hold at the architects' office and without the participation of the site leader and the contractor. At my first encounter with the core group, I prepared a short summary of the research project that was handed out to everyone. Initially, before the meeting started, I introduced myself and assured them that all information acquired about the project would be kept confidential. My participation in the group was noticed and remarked upon the two first times, also due to the fact that I was a woman. The percentage of women in the construction sector is usually very low, around 2-3 %. But after a while my presence went unnoticed, also because I avoided commenting the events when asked about my opinion and did not write running comments during the meetings. I usually wrote down my main impressions and comments afterwards, in my

office. The participant observation started out in January 1995 and ended in June the same year. As I was heavily engaged in conducting the survey during the same period, the participation in the group was sporadic, but amounted to around 10 meetings. The meetings lasted around 2 - 3 hours each.

5. MEASUREMENT OF VARIABLES

Operationalization of variables is the process of 'translating' theoretical constructs to empirical indicators. Construct validity, which can be defined as 'the extent to which an operationalization measures the concept which it purports to measure' is essential to obtain general validity of the research study. The general framework recommended for operationalizations of variables (Churchill, 1979) was used in this study, with the exception of testing the instrument within a validation sample due to limited units of analysis and resources. The procedure used entailed the following activities; (i) Developing a pool of usable items for each construct, based on definitions of the constructs, previous empirical studies and contextual meanings and words. (ii) Testing these items, through experts, colleagues and members of construction projects (pilot study). The above activities have already been described in the previous chapter. The study included measures for compositional demographics, identities, previous contacts and motivational attitudes, as well as processual aspects and productivity and quality. Following below there are descriptions of these measures, how they were computed, their data sources and scale items. The chapter starts with an overview of compositional variables, followed by process variables and finally, performance variables.

5.1 Variables related to group composition

As Pfeffer (1983) has suggested, demography needs to be assessed in ways that enable the researcher to capture the distributional and compositional effects of variations in group demography. Typically, such approaches attempt to capture the relative homogeneity or heterogeneity of the group or organization. A number of such measures are available (e.g. Pfeffer and O' Reilly, 1987), but Allison (1978), in a thorough review, observed that the coefficient of variation (the standard deviation divided by the mean) provides the most direct and scale-invariant measure of

dispersion. He noted that 'for variables like age where utility is neither strictly increasing nor especially relevant, the flat sensitivity of the coefficient of variation makes it the appropriate choice (1978:877). Thus, to obtain a sense of the profile heterogeneity recommended by Shaw (1981), coefficients of variation for the separate demographic variables of age, educational level and tenure (in position and in industry) in the group were used. This was done to assess variation across project groups. A score of zero indicates perfect homogeneity along the given dimension.

Age : Question 19

Degree of heterogeneity of age

The coefficient of variation of each group was found. The coefficient of variation is measured by taking the standard deviation and dividing it by the mean.

Gender : Question 20

This variable was originally included in the research model, but will not be analyzed since there were so few women among the respondents, a total of 5 women in Norway and 4 in Sweden, 3% of all respondents.

Educational level or years of education: Question 22

Degree of heterogeneity of educational level;

The coefficient of variation of each group was found.

Tenure in actual position: Question 23

Degree of heterogeneity of positional tenure;

The coefficient of variation of each group was found.

Tenure in industry field : Question 24

Degree of heterogeneity of industry tenure;

The coefficient of variation of each group was found.

Professional values: Question 17

Most studies conducted on professional values so far are qualitative case studies (Wuthnow, 1986; Kelly, 1991). The few quantitative studies found had only developed measures for distinct professions (Massè and St. Arnaud, 1981). No study is found that define and operationalize general professional values or values relevant for the

professionals of the construction sector. New items have to be developed in order to capture professional values in the particular setting to be studied.

As professional values in projects become particularly salient through the development and evaluation of the task to be solved, i.e. the construction of the building, it was decided to find a way to capture people's rating or evaluation of different performance criteria. Being an issue of constant discussion and disagreement, such a measurement would make it possible to capture the diverse value orientations. In order to develop relevant performance criteria, I used an approach developed within current research on quality at the Institute of Marketing at the Norwegian School of Economics and Business Administration, which is used to detect quality-dimensions. This question is meant to capture people's professional orientation or attitudes to project work. In order to capture the respondents' own performance criteria I asked the following questions;

Which of the building projects you have participated in over the last 5-10 years would you characterize as the most successful?

What made this building project successful?

The last open-ended question generated the criteria and vocabulary that people used to evaluate their work and results. It appeared as a most effective way to reveal people's own perceptions and attitudes related to their professional activities. Through this process I discovered that many did not think about the building as the end result, as I had initially expected, but considered a successful project completion or process as the final result as well. The items selected were the answers that most people mentioned and that captured the various orientations to performance represented among the participants in construction projects.

After having tried out different questions, I found out that asking people about what made them proud of their work when having finished a project, was a good way to capture their professional drives and orientations to work. This question was finally used as a measure to capture their professional values;

Below you will find listed different qualities of a building project. Which are important to you in order to feel professionally proud of your performance in building projects?

Set 1 close to the dimension that make you most proud; a 2 close to the dimension that make you secondly most proud and a 3 to the third dimension. See next page for items.

1. Building delivered without mistakes and errors	*PROJECT*
2. Good overview of development and economy	*PROJECT*
3. Deliver buildings that create satisfied users	*PROJECT*
4. Create buildings that are good both in terms of design and technical solutions	*PROFESSIONAL*
5. Finish project according to goal and requirements	*PROJECT*
6. Ability to work with new problems easily	*PROFESSIONAL*
7. Find new technical or design solutions and methods	*PROFESSIONAL*
8. Good in team work	*PROJECT*
9. Develop environmentally healthy buildings	*PROFESSIONAL*
10. Deliver buildings that are well located in the environment	*PROFESSIONAL*
11. Create motivation and involvement in project	*PROJECT*

Since each participant was asked to define the groups according to 1st, 2nd and 3rd priority and assuming that the first priority choice is the group the person identifies most strongly with, only the number 1 priority group was selected to measure each members' main professional value guiding them in their work.

2 categories out of 11 were then formed

As the locals-cosmopolitans distinction resulted both as a theoretically good and a generally reasonable way to categorize the professional values, it was decided to divide the existing categories into 2 groups; PROJECT related values and PROFESSIONALLY related values like noted already. The distinction of items into a project group and a professional group was made according to whether criteria was oriented towards project related purposes or professionally related purposes.

Proportion of members with project related values

The sum of answers for project values was found and divided by the number of respondents in the group. This measure indicates the proportion of people with project values in the group. The selection of project values was made as it is seen to be important for securing good project performance.

Question 14: Stable group identity

Originally I started out with a generally accepted measurement of group identity, the group identification scale developed by Brown et. al. (1986). See appendix 6. Testing these questions out during the pilot study, I soon discovered that it was of no use as none of the respondents understood the questions! People had problems understanding what identity and identification meant, so that I had to use another term. The intention was to detect people's own or subjective stable self identity. The measure also captures what kind of picture or image people would give of themselves on a general basis as identity also reflects people's self-perception. Assuming that the way people would present themselves in a neutral setting, such as at a friend's house, would give an indication of a stable self-identity, the following question was used.

Given that you would present yourself to a new person that you meet at some friends' house, which of the following aspects would you talk about? Set 1 close to the aspect that you would first mention; a 2 close to the next and a 3 at the third aspect you would mention.

The following aspects were set up as alternatives:

1. The project you are engaged in	*PROFESSIONALLY-RELATED*
2.Profession or occupation	*PROFESSIONAL* "
3. The company you work for	*PROFESSIONAL* "
4. Home	*SOCIALLY RELATED*
5. Nationality or the ethnic group you belong to	*SOCIALLY* "
6. Political or religious belonging	*SOCIALLY* "
7. Family situation	*SOCIALLY* "
8. Hobby and leisure interests	*SOCIALLY* "

2 categories out of 8 were formed

As the main interest was to detect the degree of professional identification in the groups, the distinction among professional and socially related groups was made.

Proportion of members identifying with professional related group

The sum of answers for the professional groups was found and divided by the number of respondents in the group. Since the purpose was to detect how identity influenced performance and since a professional orientation (rather than a social) was seen to be influential, the proportion of members identifying with professionally related groups was found.

Work involvement: Question 13

When trying to grasp professionals' orientation or involvement in their work, there were different motivation or commitment scales available. As the intention was to find an operationalization that was suitable for professionals, the work of Lotte Bailyn (in collaboration with Schein, 1980) seemed particularly relevant. She has developed a complete index of work involvement containing four variables; career satisfaction, work satisfaction, importance of time for family and personal life and work orientation. Since the issue of career was not irrelevant in this study, I used only two variables from her index; work satisfaction and work involvement and adapted it to the setting and industry following the feedback received through the pilot study. The question was structured as follows:

Below follows a set of statements concerning the relation you may have to your work: Please indicate the extent to which you agree with the following statements by circling the appropriate number;

1. If I had to start to work in another industry I would be very frustrated and unfulfilled.

5. My main satisfactions in life come from the work I do.

Following, the items belonging to the same question, but capturing work involvement were;

2. I like to think about my work, even when I am off the job.

3. My only interest in my job is to get enough money to do the other things that I want to do.

4. I wish that I were in a completely different occupation.

Each participant was asked to range the following statements on a 1 to 4 scale ranging from disagree strongly, disagree, agree and strongly agree.

Items 1, 2 and 5 were kept as they were, while values for items 3 and 4 were changed so that 1=4, 2=3, 3=2, 4=1 The higher value, the higher work involvement.

Validation of work involvement measure

Convergent validity

The most common way to assess internal consistency of a measurement scale is to find Cronbach's Alpha, which indicates item-of-same-construct convergence and reliability. The reliability analysis revealed an Alpha of .08 for the 5 items which are considered low. It is here important to note that a high Alpha not necessarily is necessary for formative measures, as the items may capture different dimensions indicating a phenomenon. The items selected obviously capture very different dimensions of work involvement. A factor analysis will be conducted in order to detect these dimensions.

Discriminant validity

Factor analysis indicates item-of-different- constructs divergence. A 3-factor analysis was conducted for the work involvement items and the results are reported below.

TABLE 7: 3-Factor solution with Varimax rotation for the variable work involvement.

The factor loadings which have a considerable size are outlined.

	Factor 1	Factor 2	Factor 3
Work involvement -item 1	**,83537**	,19983	-.17158
Work involvement -item 2	,03402	**,81484**	-,21278
Work involvement -item 3	,03845	,01682	**,92784**
Work involvement -item 4	**,83439**	-,04954	,25328
Work involvement -item 5	,11231	**,73239**	,33827

The table reveals that three factors emerge from the 5 items, showing that some items are related and considerably divergent from others. If one compares the factor loadings with the items, a structure emerges which reveals that the items capture different dimensions of work involvement. The data reveals three interesting factors.

Factor 1 is composed of items 1 and 4 which are concerned with satisfaction with industry- and occupation. Factor 2 involves items 2 and 5 which are indications of the central attitude towards work and life. Factor 3 on the other hand is only composed of one item and captures the value people pay to other factors versus their job. It indicates if people are motivated from intrinsic factors, such as the content of the work, or if they are motivated from extrinsic factors, such as pay. These three factors are interesting despite revealing quite different dimensions of work involvement. For the purposes of this research, factor 1 was chosen. The reason behind this choice was that this factor seemed most relevant for explaining project performance. While factors 2 and 3 were seen to indicate very general motivational attitudes towards life and work, factor 1 is more related to the satisfaction with the current work situation. Whether people have their main interests in their work or whether they are motivated from intrinsic or extrinsic factors is seen to be less influential for the effort put in the project process than the role of attitudes to industry and occupation. Believing that frustrations arising from dissatisfaction in the current job may be more influential in influencing the productivity of the project, this element was chosen to include as indicator for work involvement. **As the term work involvement does not capture what factor 1 really indicates, the variable will be denoted occupation and industry involvement hereafter.**

Previous work experience: Questions 7 and 8

Since this is not the most focal issue in this study, social proximity was not analyzed extensively measuring the degree of contact or the number of direct contacts among project participants. This study limited itself to measure the number of people that had

previous work experience, which means that one does not know the degree of contact, but only whether they know each other previously through work-experience.

The questions read: *Have you worked together with any of the other participants in the project previously?* (Yes and No category)

If the answer was yes; Which of the following persons in the project have you worked together with previously?

The different positions were listed and people were asked to make a sign for each person they had previous work contact with.

Degree of previous work relations in the group

The number of relations each person had previously with others members of the core group were summed and then by the total number of relations possible. The average number of previous work relations was developed for each group.

5.2 Variables related to group process

As it was not possible to measure process by observing the groups in action, the members themselves were selected as informants. By asking each member about how she or he perceived the process and aggregating the data by finding average measures, one may assume that the picture that develops is quite realistic. At least it takes into account group members own perception of the process.

Latent conflict: Question 5

Building upon Eisenhardt and Bourgeois' work on top management teams (1993) I defined latent conflict as disagreements about key decision areas for a building project. The goal and key-decision-area questions were inspired by Bourgeois (1980), but adapted to the actual setting. I wanted to capture the degree to which people disagreed about what decisions were of importance for reaching a good project performance. The dimensions below capture issues regarding the different project stages organization of the project. In many ways, this measure captures differences of opinions and is therefore an antecedent to conflict. When there are differences of priorities, this may

also indicate that various aspects of the project is paid attention to. But high degrees of latent conflict may create frustrations and demotivation such as to make it interesting to explore.

The question read: *Here is a list of various decision areas which may be relevant for a building project. How important did you find each of these decision areas to be for the achievement of a good project performance in this project?*

1. *Room program or plan of rooms*
2. *Building plan*
3. *Economic budgets*
4. *Pre-planning stage*
5. *Bidding documents*
6. *Type of management contracting*
7. *Contract specifications*
8. *Selection of project and site manager*
9. *Composition of project members*
10. *Others (please specify)*

The responses were on a 1 to 4 scale ranging from 'not important', 'some importance', 'important' and 'very important'.

Averaging standard deviation on each item for group

Following the considerations of Eisenhardt and Bourgeois (1993), the average standard deviation for each item for the group was found. The procedure was as follows. First, the standard deviation for each item for all members was found. Then all standard deviations for all items in the group were found and divided by the number of items to find the average standard deviation.

Manifest conflict: Question 6

The question on manifest conflict was derived from Astley (1978). Following this operationalization, it was measured by asking people to indicate quantitatively the

extent to which they disagreed with the suggestions and opinions of each of the other members in the group.

The question read: *How often, during your participation in the project, have you found yourself in open disagreement with the suggestions or proposals of each of the following project members?*

The position of each member was listed. The response was on a 1 to 4 scale, ranging from 'constant disagreement', 'often disagreement', 'sometimes disagreement', and 'rarely or never disagreement'.

Mean disagreement scores for the team were then computed. It was found by the following procedure;

Mean conflict score for each member;

This value was found by summing up the values for each person and dividing it by the number of members in the group that the person had disagreements with minus 1 (the person answering).

Overall mean conflict in the group;

This value was found by summing up the average values of the members of the core group and dividing it by the number of total members that answered the questionnaire in the group.

Groupthink: Question 12

Unidirectional measures of groupthink can be employed, such as the number of possible solutions voiced. Such an approach was taken in the two experiments that have been inspired by Janis's writing (Courtwright, 1976; Flowers, 1977). From these operationalizations, the following items were employed to operationalize groupthink: number of solutions proposed, number of agreements and disagreements with other group members and number of facts introduced into the discussion. Building upon these studies and interviews with professional members, I developed this question;

We ask you to put yourself in the following situation: You are participating in a typical design meeting in this project. Below you will find some statements describing

the atmosphere (or climate) of the design group. To what extent do you agree with each of the following descriptions of the situation?

(See below.)

1. I perceived a pressure to agree with the other members of the group

2. I was encouraged to make suggestions and comments.

3. I felt that my suggestions were discussed in a constructive way with the others in the group.

4. I felt that it was acceptable to disagree with the others in the group.

5. I perceived that each issue (idea, proposition) was thoroughly discussed when there was a need to do so.

6. I kept my arguments (or views) to myself when I was in disagreement with the other participants.

The responses were on a 1 to 4 scale ranging from 'disagree completely', 'disagree', 'agree' and 'agree completely'.

Values for items 1 and 6 were kept as they were. Values for other items were changed so that 1=4, 2=3, 3=2, 4=1. The higher value, the higher groupthink.

Validation of groupthink measure

Convergent validity

An analysis of reliability using Cronbach's Alpha was used on the 6 items. The Alpha score was .56 which indicates that the measure is quite one-dimensional and shows a satisfying reliability.

Discriminant validity

The factor analysis indicates item of different constructs divergence. A 2-factor analysis was conducted for the items and the results are reported in the table.

TABLE 8 : 2-Factor solution with Oblimin Rotation for the variable groupthink. The factor loadings which were of a considerable size are outlined.

	Factor 1	Factor 2
Groupthink -item 1	-,06498	**,53705**
Groupthink -item 2	**,58488**	,11152
Groupthink -item 3	**,60573**	-,15733
Groupthink -item 4	**,38526**	-,18566
Groupthink -item 5	**,48138**	-,27799
Groupthink -item 6	-,36954	**,55248**

The table shows that two factors emerge from the 6 items, showing that some items are related and considerably divergent from others. Factor 1 captures items 2, 3, 4 and 5. These items can be seen as the reverse side of groupthink as they point to an open climate for discussions and disagreements. This may be an indication of creative group processes. Factor 2 may instead be seen to capture the direct manifestation of groupthink as it indicates the perceived suppression to agree with the others or keeping arguments for themselves. It is interesting to note that these factors capture different dimensions of groupthink. **Having to select one of these as indicator for groupthink in this study, factor 2 was seen most relevant.** While factor 1 seems to involve a different understanding of groupthink than defined theoretically, factor 2 more directly measures the essence of groupthink. Groupthink is theoretically defined as conformity of norms and social pressures to think unidimensionally. This is well captured by item 1 and 6, which are about pressures to conform in the group.

One-way analysis of variance

This type of validation is common for studies of groups across organization (see Smith et. al, 1994). As each member is used as informant of the group process, one generally expects members to have consistent opinions about what has happened. If the difference of responses results greater within groups than across project groups, there are signs that the measurement is not perfectly valid.

Analysis of variance was conducted for the groupthink measure to determine if there was greater variability in the ratings between organizations than within organizations. The F-ratio was not significant (F=0.93, p=.58) which means that there was not a significant difference across project units. This is generally seen as a weakness regarding validity of the measurement. What can be argued in this matter is that a lack of between groups difference is not necessarily a problem as the issue is about how group process affects performance, which can be unaffected of small differences between project groups. Regarding within groups difference, the argument changes. One can question whether there is groupthink in a group when people vary in their perception of it. Generally, the more people perceiving groupthink, the higher degree of groupthink. In this matter, averaging responses is not the best strategy. On the other hand, one can also argue that a difference of opinions means that the group is disintegrated and that people differ in their relation to the group. As project groups consist of people with different roles residing in different places, they may also have unique, independent relations to the group creating different perceptions regarding the process. This may be a realistic picture of of the group. And if this is a realistic reflection of what is happening, why should it then be a problem.

Although not having used this here, other studies have examined the standard deviations of responses in groups, a factor that also can be of interest and of importance for the performance. It was considered using these indicators as well, but as the number of variables is substantial, they were discarded.

Group cohesiveness:Question 9

Group cohesiveness is here defined according to Festinger (1954) who states that group cohesiveness is 'the resultant of all forces acting on members to remain in the group'. The forces acting on a member to remain in a group has at least two types of components: a) forces that derive from the group`s attractiveness and b) forces whose source is the attractiveness of alternative memberships. Recognizing that cohesiveness may have diverse manifestations has led some investigators to construct composite indices. One such index was developed by Seashore (1954) and is here adapted to fit project groups. Seashore sets up three questions (see below) for measuring

cohesiveness, but here only two are used. The one that is omitted here is the following; 'Do you feel that you are really a part of your work group?' Instead, I tried to capture to what degree people identified or belonged to the project group compared with other outside groups. See section on temporary group identities.

When using the other two questions developed by Seashore, one of the problems that came up was to decide the type of group people should define their attractiveness to. Projects involve several groups and although the same members are involved throughout the project, they belong to different groups in different stages. For instance, when a building project gets started a design group (prosjekteringsgruppe) is formed. Most often this is a group that works isolated from the construction people. When the design stage is completed, the drawings and estimations are handed over to the contractor and subcontractors that are responsible to set up the building. Although most of the members of the design group join the construction stage by participating in construction meetings on site, they definitely belong more to the design group than to the construction group on site. On the other hand the site people still feel that they are a part of the design group as they participate together with design group members in construction meetings at the site. When deciding which group to select as the main group, it had to be the design group since most people could feel they were a part of it. Following Seashore's measure, each person in the core group was here asked the following questions about the *design group*;

'If you had the chance to complete the project with other participants, how would you feel about replacing the design group?' People were asked to answer to what degree they agreed or disagreed with the following statements;

1. *I would have disliked it very much*
2. *I would have missed the cooperation*
3. *I would have been indifferent*
4. *I would have been happy*

The responses were on a 1 to 4 scale ranging from 'disagree completely', to 'disagree', 'agree' and 'agree completely'.

Answers no.1 and 2 remained the same. values no. 3 and 4 were changed, which meant that value 1 was changed with value 4, value 2 with 3, and the opposite; value 3 with 2 and value 1 with 4. The higher the value, the higher cohesiveness.

Mean cohesiveness score for each member:

All values were summed and divided by items answered , i.e. 4.

Mean cohesiveness score for the group:

Mean person values were summed and divided by the number of members that answered the questionnaire.

Validation of cohesiveness measure

Convergent validity

An analysis of reliability using Cronbach's Alpha revealed a negative Alpha of -.54.

Discriminant validity

Confirmatory factor analysis indicates item-of-different constructs divergence. An oblimin confirmatory factor analysis was tried, but it appeared that only one factor was extracted so that the solution could not be rotated.

One-way analysis of variance

Analysis of variance was conducted for the cohesiveness measure to determine if there was greater variability in the ratings between organizations than within organizations. The F-ratio was significant ($F=1.99$, $p<.00$) which means that the difference across project units was greater than within.

Cohesiveness: Question 10

Building upon Seashore's composite index of cohesiveness, I included another question; *'Compared to other projects you have participated in, how does this project compare with regard to the cooperation between members?'* People were asked to range the following statements on a 4-point scale from 'very bad', to 'bad', 'pretty good' and 'excellent';

1. The way we get along together

2. The way we cooperate

3. The way we help each other.

Mean cohesiveness score for each member;

All values were summed up and divided by items answered, i.e. in most cases 3.

Mean cohesiveness for the group;

Person values were summed and divided by the number of respondents in the group.

Validation of cohesiveness measure

Convergent validity

An analysis of reliability using Cronbach's Alpha revealed a high item-of-same-construct convergence and reliability with an Alpha of .82.

Discriminant validity

Confirmatory factor analysis indicates item-of-different constructs divergence. An oblimin confirmatory factor analysis was tried, but it appeared that only one factor was extracted so that the solution could not be rotated.

One-way analysis of variance

Analysis of variance was conducted for the cohesiveness measure to determine if there was greater variability in the ratings between organizations than within organizations. The F-ratio was significant ($F=1.45$, $p<.02$) which means that the difference across project units was greater than within. This validates the cohesiveness measure.

Composite index for cohesiveness?

The recognition that cohesiveness may have diverse manifestations has led some investigators to construct composite indices. Seashore computed intercorrelations among the answers and found them all to be positively correlated. In this study, the cohesiveness measures were found to be intercorrelated with a coefficient of ,4397. A single index of cohesiveness could be computed, but since both measures were correlated and the last question captured better cohesion as an element of group process, the question-10 measure was chosen as an indicator for group cohesiveness. The main reason for selecting this cohesiveness measure (asking how people cooperated throughout the project) is that it asks more directly about the process than the other question. Question 9, revealing how people would react towards replacing the

design group, asks indirectly about an evaluation of the group in retrospect. This question would have functioned better if it could have been answered during the project execution, something that would not have been possible here. Such a question functions well for a stable group in action, a situation which the measure seems to have been developed for.

Temporary group identities: Question 11

The reason for using this measure was that the members of building projects belong to several groups at the same time. Capturing which group(s) they felt they belonged most to during the project process was seen to be a more adequate and specific measure to capture the aspect of cohesiveness omitted from the Seashore measure ('Do you feel that you are really a part of your work group?'). The measure included is also a way of capturing the temporary group identity.

Originally I started out with a generally accepted measurement of group-identity, the group identification scale developed by Brown et. al (1986). Testing this out during the pilot study, I soon discovered that the respondents had problems understanding the questions! Especially the word 'identification' was poorly comprehended. The measurement was also inadequate as it referred to only one group. This led me to find other ways to measure people's group affiliation or identity. As project members may feel attached to several groups at the same time, defining the groups that project members could belong to was the first step. I discovered that in a construction project people have a wide variety of groups they may identify with; the design group, the site group, the different professional groups such as architects, civil engineers etc, people's professional firms, in addition to the client and project management group.

Asking people which group they felt most attached to resulted as an appropriate way to measure group affiliation. Trying out different alternatives I ended up with the following question;

'Which of these groups did you feel a part of during the work with this building project?' Pick out three groups. Set 1 next to the group you mostly felt a part of; 2 next to the group you felt second most a part of and finally 3 in the same fashion.

The following groups were set up as alternatives; the client, the users, the design group, the architects, the consulting engineers, mother firm and others as an open alternative. This question measures which groups the person identifies with and feels a part of, but it does not measure the intensity and degree of identification or belonging. The most relevant information to get out of this question is whether the person identifies with the project or the profession. Here this was captured by the following categorization: Client, user and project were seen as belonging to (1) project related groups, whereas architects, consulting engineers, contractor and company were seen as (2) professional groups.

Since each participant was asked to define the groups according to 1st, 2nd and 3rd priority and assuming that the first priority choice is the group the person identifies most strongly with, only the number 1 priority group was selected to measure each members' group affiliation while working in the project.

Another way of measuring this could be to consider both 1st, 2nd and 3rd priority choice and calculate whether the majority of groups selected (at least 2 out of 3) are within group number 1, 2 and 3. The problem with this measurement method is that a clear profile may be difficult to discover.

2 categories out of 7 were formed

Existing categories were grouped into 2; no. 1, project related groups and no. 2, professionally related groups.

The following groups were listed, here followed by their categories;

1. The client	PROJECT
2. The user(s)	PROJECT
3. The design group	PROJECT
4. The architects	PROFESSIONAL
5. The consulting engineers	PROFESSIONAL
6. My mother-firm	PROFESSIONAL
7. Others (as an open alternative).	PROFESSIONAL

It appeared that 'others' was often filled in with contractor, site people etc. Since these groups are professional groups, the 'others' responses were defined as professional.

Proportion of members affiliated to project

The sum of answers for group no. 1- project was conducted and divided by the number of respondents in the group.

5.3 Variables related to project performance

Quality of end-results: Question 3

This is meant to capture the quality of the building. It appeared that there are few available measures of the quality of office buildings. Preiser, Rabinowitz and White (1988) are amongst the few that have worked seriously with the subject as they have conducted several studies on post-occupancy evaluation. They deal especially with the assessment of building performance through post-occupancy evaluation, or POE. As their book did not present any measurement method, I contacted Dr. Preiser in order to find out if there was any available. In reply they sent me their building evaluation questions which were used here in this study. These were adapted to the setting and turned out as follows;

How did the quality on the building turn out in comparison with the specifications and requirements that were developed early in the project:

1. *Exterior design*
2. *Interior design*
3. *Functional solutions*
4. *Temperature, lighting and acoustics*
5. *Flexibility of use*
6. *Security*
7. *Maintenance*
8. *Buildings materials*

The responses were on a 1 to 4 scale ranging from 'extremely poor quality', 'poor quality', 'good quality' and 'excellent quality'.

Idealistically the most appropriate would have been to do an occupant survey in order to get a 'user'- based measurement of quality. In practice, this was impossible given the limited resources. Such an approach would have required sending questionnaires to a sample of occupants of each of the 64 buildings included in the study. As this is a large, complete study in itself, such an approach was discarded. What I was left with, was a combined expert and user evaluation of the buildings. The members of the core group were asked to define the quality.

Mean quality score for each member;

Summing up the values for each person and dividing on total items.

Overall mean quality score in the group;

Summing up the average values of the members of the core group (respondents) and dividing on the number of respondents.

Productivity : Question 21

The method to be used for measuring productivity is called DEA (Data Envelopment Analysis), which defines a non-parametric frontier which serves as a benchmark for efficiency measures. The term describes what it conveys; a front function enveloping all the observations. The location of the frontier relative to each observed unit is constructed as an artificial benchmark unit. This benchmark is a linear combination of efficient units in a sample. The assumption is that no project unit can perform better than the frontier technology. The efficiency measure results as a number between zero and one where the 'ones' indicate the front, the 'best practice' units. Rolf Albriktsen at ECON has for several years been developing this method for the construction industry and has therefore been responsible for doing the actual analysis. Certain assumptions are built into the model used for the purposes of this study. These are outlined below;

Output

In this analysis we have used the number of squared-meter produced building, measured as total floor space.

Input

Two input factors are used in this study: 1. Design costs defined as resources used on architects and consultants to design and plan the building project. Time spent by the client, if any, is also included. The average hourly pay of consultants is used to calculate this effort.

2. The second input factor is construction costs, which constitute what the client has paid to the contractors executing the work.

Relation between design costs and construction costs

Originally we assumed there was a relation between the effort and costs put into the design stage and the construction stage and that there is a substitution between these two on a given amount of produced m2.

Relation between input and output

This DEA-analysis assumes that there is no parametric relation between input and output, but that the data themselves decide what is more efficient.

Scale properties

In the model we have assumed variable returns to scale. This implies that a proportional increase in all the input factors of around 1% leads to an increase in production of less than 1%. It is thereby assumed that there are no considerable economies of scale.

Homogeneity of units

The method assumes homogenous projects regarding task and technology. It was therefore decided to exclude some of the project units that were very special or very different from the others. Additionally, extremely large projects were excluded as these projects are easily defined as better practice projects because of the size. Several tests were conducted initially, checking homogeneity and the effect of size.

6. RESULTS AND ANALYSIS

Having laid out the theoretical foundation and method used, the next stage is to present the results from the data analysis. What does the empirical reality of construction projects reveal? Does the core group play any role for project performance at all? And does the empirical relation behave like hypothesized? These are some of the questions that this chapter will answer. But first I will briefly present and discuss the analysis procedure.

While comments on the results will be given consequently, the discussion of the results in relation to the overall model, measurement, data collection, theoretical and methodological implications will be discussed more thoroughly in chapter 7.

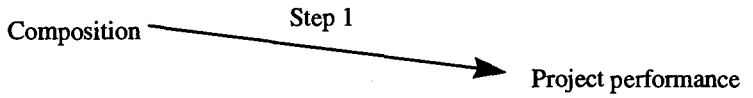
6.1 Data analysis

Multivariate statistical methods can roughly be divided into two types; explorative and confirmatory methods. As the proposed study seeks to test if certain relations hold empirically, confirmatory methods will be employed. When it comes to defining the actual statistical method to be used it may be useful to start with the type of variables the data represent. This study is composed of continuous variables only.

Confirmatory methods can either be structural (correlational) without any specific dependent variable, or predictive (dependence), aiming to predict one or more dependent variables out of several explanatory variables (Lillestøl, 1989). For predictive methods, it is the dependent variable(s) that defines the method to be used. As the performance measures here are continuous, both regression analysis and analysis of variance and covariance are relevant. For the purposes of this study, regression analysis was seen to be most relevant. The data analysis involves quantitative data as well as a qualitative observational data. Both will be used when analyzing the results.

A key objective of the quantitative analysis is to see if composition has a direct effect on performance (the demographic perspective), described as step 1 in the figure on next page. Or if there is an indirect effect on performance through process with process playing an independent role (the process perspective), described as step 2 and 3 on the next page, or if group demography influences performance entirely through process (the intervening perspective), step 4. See figure on next page.

Step 1 : Compositional effects on project performance



Step 2: Compositional effects on project performance controlled for process
Step 3 : Processual effects on project performance
Step 4: Compositional effects on process

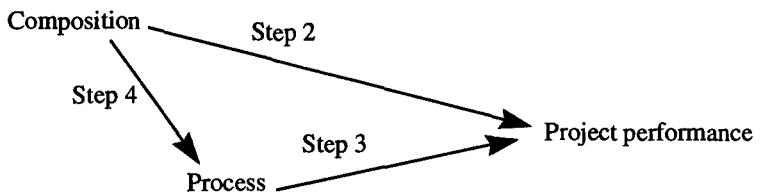


Fig.12 , Analysis procedure

6.2 Descriptive statistics

In order to get an idea of the character of the included variables, the means and standard deviations of all 17 variables are presented. See table 1. In order to establish whether the response rate of each project regarding core member data has an influence on the variation and means of the variables, a separate table of projects with higher response rate is included. While the full set of units include projects that will be included in the analysis, which means projects with three or more responses from core group members, the second set only includes projects that have 5 or more responses.

TABLE 9: Means and standard deviations of all variables in the study

Variable	All project units ≥3 responses, N=55 Mean	Std. dev.	Project units ≥5 responses, N=39 Mean	Std. dev.
Age diversity	.16	.06	.16	.06
Educational level diversity	.16	.06	.16	.05
Positional tenure diversity	.62	.22.	.61	.21
Industry tenure diversity	.48	.20	.47	.18
Project values	.85	.16	.87	.14
Stable prof. group identity	.22	.15	.24	.14
Occupation and ind.	00	.51	.03	.45
Previous work experience	.45	.21	.45	.20
Latent conflict	.63	.12	.64	.10
Manifest conflict	1.46	.22	1.45	.21
Groupthink	-.02	.43	-.01	.34
Cohesiveness	3.28	.31	3.31	.34
Project identification	.43	.22	.43	.22
Group size	7.98	1.27	8.26	1.21
Project duration	2.48	1.29	2.33	1.33
Productivity	.51	.20	.49	.15 (N=27)
Quality	3.27	.16	3.27	.15

Comparing the descriptive statistics of both data sets, the difference is too small to discount a substantial impact of response rate on the results. However, separate regression analysis will be conducted for both data sets to see if a lower response rate among some projects does have an impact on the results. Since standard deviations are quite small, the differences of the variables across project-units is not very large. However, there should be sufficient variation to conduct regression analysis.

In order to detect intercorrelations among variables, a table showing bivariate correlations among all the variables is presented on the next page.

TABLE 10:Correlations among variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
1. Age diversity	-																
2. Educational level diversity	-.08	-															
3. Positional tenure diversity	.37 **	-.05	-														
4. Industry tenure diversity	.40**	.05	.20	-													
5. Project values	-.06	.14	.27**	-.01	-												
6. Stable professional group identity	-.13	-.05	-.22*	.04	.03	-											
7. Occupation and ind.	-.02	.10	.08	.11	.21*	-.20	-										
8. Previous work experience	.05	. 12	-.27**	-.06	-.01	-.02	.17										

* p≤ .10 ** p≤ .05 *** p≤.01

TABLE (continues):Correlations among variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
9. Latent conflict	.15	.01	-.02	.17	-.05	.07	.14	.06									
10.Manifest conflict	-.02	.16	.00	.02	-.16	.08	-.00	-.05	-.00								
11.Group think	-.19	.16	.06	-.20	.19	.03	-.02	.15	-.06	-.04							
12.Cohesiveness	.18	.18	.19	.14	.23**	.02	.14	.03	.03	-.33***	.35***						
13.Project identification	.05	-.04	.25**	.03	.03	.13	-.14	-.26**	-.10	-.04	.02	.01					
14.Group size	-.15	-.00	-.08	-.21	-.02	.15	-.11	-.33***	.03	.06	-.06	-.03					
15. Project duration	.30*	.01	.01	.18	-.00	.17	-.04	-.38***	-.11	.06	-.10	.05	.23	-			
16.Productivity	.02	-.03	-.01	-.12	-.14	.09	-.35**	.05	-.07	-.30**	.39***	.12	.00	-.14	.01		
17.Quality	-.00	-.15	.14	-.02	.16	-.14	.15	.01	-.33**	-.21*	.18	30**	-.04	-.01	.03		

* p≤ .10 ** p≤ .05 *** p≤.01

The table above indicates multicollinearity between some of the independent variables. Age diversity is for instance correlated both with positional tenure and industry tenure. This is natural and the purpose of keeping age diversity may be asked. However, it was decided to be included because these variables most likely have different functions for performance. Other interesting relations were the positive

correlation of cohesiveness with groupthink. This confirms the theory on groupthink and is reassuring regarding the validity of these measurements. As expected, groupthink was negatively correlated with manifest conflict. Project duration was negatively related with previous joint work experience in the group. As for the relations of variables with productivity and quality, these will be commented in relation to the regression analysis.

According to Berry and Feldman (1985), the question is seldom about whether there is or is not multicollinearity, but to what extent. It is a common problem in most studies. Multicollinearity does not - except for the case of perfect collinearity - violate the assumptions of regression analysis. The major effect of multicollinearity is on significance tests and confidence intervals for regression coefficients. When high multicollinearity is present, confidence intervals for coefficients tend to be very wide, and t-statistics for significance tests tend to be very small (Berry and Feldman, 1985, p.41). That is, unacceptable levels of collinearity will be indicated by insignificant regression parameters. However, in order to inspect the problem, Berry and Feldman recommend that a regression analysis for each independent variable should be run, with one independent variable as dependent variable, and the other independent variables as independent variables. R-squares close to 1.00 for this model indicate unacceptable levels of multicollinearity. The results of these tests are reported in the table below and indicate satisfying levels of multicollinearity with R-squares far from 1.00.

TABLE 11: Test of multicollinearity using regression analysis

Dependent variable	R-squared (adj.)
Age diversity	.41
Educational level diversity	-.14
Positional tenure diversity	.27
Industry tenure diversity	.31
Project values	.16

Stable group identity	.08
Work involvement	.13
Previous work experience	.05
Latent conflict	.15
Manifest conflict	.08
Groupthink	.13
Cohesiveness	.31
Project identification	.09
Group size	.13
Project duration	.14

6.3 The role of significance testing

The use of significance testing is based on the premise of random selection of units of analysis. As the description of variables that were lost during data collection revealed no specific differences with the ones included in the productivity analysis, the sample was seen to be randomly selected. Which means that every unit has had the same probability to be in the selected.

However, the low number of units of analysis and the adoption of statistical tools for both correlation and regression analysis make it necessary to discuss the role of significance testing. The significance of estimates is traditionally considered to be an important feature of the estimated parameters. The significance level (1%, 5%, 10% or more) reflects the chance of error we are willing to risk in rejecting the null hypothesis when it is in fact true (Mohr,1990). It reflects the degree to which relations between variables in the sample can be generalized to the population itself, based on probability theory. In this study, I have observations of about 50% of the targeted population which consist of construction projects for office and educational purposes exceeding a certain size.

An important note when using significance testing regards the factors that determine whether a result will be statistically significant. Mohr (1990) notes in his book about significance testing that the variance of the sample or population units affects the significance level. The larger the variances, the larger the denominator of *t* and therefore the smaller the *t* statistic becomes altogether. In other words, the larger the variances, the less probability for obtaining a high significance level. The variances of the variables are not especially high as a lot of the variance has been ruled out by aggregating or calculating means from individual level to group level. This fact may affect the significance level positively. But an even more relevant factor to focus at is the case of sample size. One of the problems in the study has the available units of analysis. Even though the study was enlarged to include Sweden, the number of project units to conduct the analysis on was quite low.

A crucial factor affecting the significance levels is the sample size. The larger the subsample sizes, the smaller the denominator of t and therefore the larger the t altogether. Large samples are very accurate and this makes it possible to draw inference to the population with little chance of error. Since one has little control over significance levels or population variances in general, sample size emerges as the most obvious way to affect the results of classical inference. In fact, with sample sizes of 500 or 1,000, almost any sample relationship will be statistically significant, and the test loses its significance.
(Mohr, 1990, p. 59)

From this, it is quite obvious that the following analysis or significance levels will suffer under the limited number of observations available here. For as large numbers influence the significance level positively, small numbers are, to contrary, seen to influence the *t* negatively. It is important to keep this in mind when reading through this chapter. Even though I will primarily relate to significant relations, I will try to use the significance level in a non-mechanical way, opening up for including results with significance levels of both 10% and 15%. Usually significant results are those that have significance levels lower than 1% or 5%.

6.4 Effects of core group composition on project performance

The following hypotheses to be tested belong to the 'composition perspective' and deal with the direct effects of the composition of the core group on project performance. Hypotheses 1 to 5 consider how different aspects of the composition of core groups affect both productivity and quality. It was hypothesized that diversity of age, educational level and tenure in the core group would have a positive influence on performance. Additionally, I also expected that a dominance of project values, a stable professional identity, occupation and industry involvement and previous joint work experience would affect performance positively. As productivity and quality on the building result as very different performance indicators, separate analysis were conducted.

TABLE 12: Regression of Composition of Core group and Productivity and Quality

	Dependent variables	
Independent Variables	**Productivity** Beta (Sig.T) **(N=37)**	**Quality** Beta (Sig.T) **(N=55)**
Age diversity	.05 (.78)	-.08 (.63)
Educational level diversity	-.02 (.88)	-.21 (.14)
Positional tenure diversity	.11 (.59)	.08 (.64)
Industry tenure diversity	-.11 (.56)	.05 (.73)
Project values	-.10 (.61)	.15 (.31)
Stable professional group identity	.11 (.52)	-.14 (.34)
Occupation and industry involvement	-.32 (.08)*	.08 (.55)
Previous work experience	.12 (.55)	.05 (.73)
R-squared	.16	.10
Adjusted R-squared	-.06	-.04
F	.71 (.67)	.69 (.69)

* $p \leq .10$ ** $p \leq .05$ *** $p \leq .01$

Comments :

The results in Table 4 provide no support for these hypotheses. The relations are nonsignificant for demographical diversity dimensions, group identity and previous work experience among participants. These results indicate that there is no direct impact of composition on project performance. The regression analysis testing the compositional perspective gives the following conclusions;

H1 (effect of demographical diversity), H2 (effect of project values), H3 (effect of stable professional identity) and H5 (effect of previous work experience among core group members) are rejected. H4(effect of occupation and industry involvement) was also rejected, but here the relation was inverse from the predicted one. Occupation and industry involvement had a significant negative effect on performance.

R-squared is .16 which is considerably low and means that this model has little predictive force. Adjusted R-squared is negative which can be ascribed to the considerable number of variables in relation to units of analysis, a total of 10 variables compared to 37 units of analysis in the productivity analysis and 55 for the quality analysis.

For the significant relations, the relationship between occupation and industry involvement and productivity is negative ($b=-.32$, $p\leq.08$), contradicting the expectations following hypothesis 4. This finding also contradicts the basic idea of motivational theory; i.e. that motivated people perform better than unmotivated people. When trying to understand such an unexpected finding, it may be of help to understand how involvement was measured. It was measured just after the project was finished, which can indicate that occupation and industry involvement is a result of, rather than a premise for, project performance. The following logic may be present. People that have contributed very intensively to the project may be very exhausted and consequently also very demotivated immediately after the project is completed. So a high effort may create low occupation and industry involvement thereby explaining the finding of low involvement creating high performance projects. Such an interpretation seems reasonable according to the impressions I got through

the pilot study of two large construction projects that were just completed at the time of the interviews. Some of the professionals; e.g. the architect and consulting engineers, revealed some frustration about the industry and project work in general. They felt that they worked too hard with too little reward and recognition in return. As there was a recession in the construction industry at that moment, the hourly rate was quite low compared to more prosperous times. Additionally they felt that little feedback was given to individual project members after the project was ended. Sharply contrasted with the situation during the project process, when there was a constant pressure and demand all day around. However, despite these negative feelings it seemed that these professionals had put in much effort and done well in the project. Their professional pride and values made them perform the best they could in order to secure a good result.

Another interpretation of the same finding may be that occupation and industry involvement is disconnected to performance such as to violate the assumption that positive attitudes toward work influence performance positively. It may be that professional pride and values make professionals perform the best they can despite their actual negative involvement in their work. This is an interesting thought that would be interesting to explore further.

Another finding worth mentioning even if it is not significant on 10% level is the finding contradicting H2 about project values having a positive effect on performance. Results show that diversity of educational level has a negative effect on quality ($b=-.21$, $p\leq.14$). It may be that a group with mix of educational levels creates inconsistent priorities as professionals with longer education may have other demands than people with shorter education. Inconsistent professional judgments and priorities may lead to pragmatic solutions rather than a unified high-quality result.

Regarding the measurement of quality, one has to consider that it is defined by the core group members and will therefore be influenced by members' feelings towards the process and the degree to which they felt their own interest come through. Such a measurement will also be less objective as one can assume that people are less critical

towards their own performance than others. This means that results for quality should be evaluated more critically.

6.5 Effects of core group process on project performance

The following set of hypotheses to be tested are connected to the process perspective, which purports that process will have a direct and independent effect on project performance. While both manifest and latent conflict (H6a and H6b), cohesiveness (H8) and project identification (H9) were hypothesized to have a positive effect on project performance, groupthink (H7) was hypothesized to have a negative effect. In order to see if process had a separate and substantial impact on project performance, the process variables were added to the composition variables. A significant change in R2 would demonstrate the influence of group process on performance. The results of the hypothesis testing using regression analysis are presented in the table below.

TABLE 13: Regression of Composition and process of core group and Productivity and Quality

	Dependent variables	
Independent Variables	**Productivity** Beta (Sig.T) (N=37)	**Quality** Beta (Sig.T) (N=55)
Age diversity	.24 (.29)	.01 (.93)
Educational level diversity	.01 (.94)	-.22 (.11)
Positional tenure diversity	.05 (.79)	.05 (.73)
Industry tenure diversity	-.03 (.88)	-.07 (.63)
Project values	-.14 (.43)	.03 (.80)
Stable professional group identity	.09 (.61)	-.07 (.62)
Occupation and industry involvement	-.18 (.31)	.16 (.25)
Previous work experience	.13 (.51)	-.00 (.96)
Latent conflict	-.04 (.83)	-.37 (.01)***
Manifest conflict	-.32 (.10)*	-.08 (.59)
Groupthink	.51 (.01)***	.08 (.57)
Cohesiveness	-.12 (.54)	.26 (.11)
Project identification	.01 (.93)	-.08 (.52)
R-squared	.40	.32
Adjusted R-squared	.08	.11
F	1.27 (.29)	1.53 (.14)

* p≤.10 ** p≤.05 ***p≤.01

Comments:

Results show that for the relationship between group process and project performance, step 2 on the figure 12, the process model is supported by a significant change in R-squared,
(.40 - .16 = change of .24). The above finding confirms the process perspective that claims that process plays a substantial and independent role for project performance. Here it appears that composition has no effect in comparison with the process that accounted for a substantial increase in R2. The same tendency was found (with a .19 change of R2) for process added to composition in a regression analysis in a comparable study conducted on top management groups (Smith et. al., 1994).

This last regression analysis reveal several significant findings. As opposed to the first analysis testing the composition perspective and showing no significant relations between composition and performance, there are significant relations here. Both manifest conflict and groupthink is seen to have considerable impact on productivity, but not the way it was assumed, thereby disconfirming the hypothesis. However, latent conflict appeared to have a negative impact on quality, while cohesiveness had a positive effect on quality. Before discussing the unexpected strong relations, I will just summarize the findings in relation to the hypotheses.

None of the process hypotheses are confirmed, thereby rejecting H6a and H6b (effect of conflict), H7(effect of groupthink), H8 (effect of cohesiveness) and H9 (project-identification).

Partial support was found for H8 as cohesiveness was found to have a significant positive effect on quality.

While a certain degree of conflict is generally seen to have a positive effect on decision making and organizational performance, the results reveal the opposite here. Manifest conflict, which was here measured by capturing diversity of attitudes towards professional issues, did not have any significant effect at all on productivity. Instead it had a significant negative effect on quality ($b = -.32$, $p \leq .10$), thereby

contradicting Hypothesis 6a. However, interpersonally related conflict, measured by openly expressed disagreements among core group members, did have a significant negative effect on productivity (b= -.36, $p \leq .03$). These findings all contradicted Hypothesis 6a. The other significant finding concerned groupthink which here had a strong positive influence on productivity (b =.51, $p \geq .01$), thus contradicting Hypothesis 7.

Hypothesis 6b predicted curvilinear associations between conflict and project performance. These were tested out by doing polynomial analysis. None of the tests confirmed the hypothesis thereby violating any assumptions about conflict being beneficial up to a certain point. The relations found between conflict and performance are linear.

Cohesiveness was found to have a positive effect on quality, but this result need to be examined more closely. As previously mentioned, quality is rated by the core group members, which may be biased when evaluating the results of their own effort. The positive association between cohesiveness and quality may as well be a result of people being affected by how well they cooperated. Therefore, one has to be careful drawing strong conclusions regarding this finding.

The above results are interesting although they contradict general theory on group processes. The relations are strong considering that no significant effects were found for composition. There may be many explanations behind such findings, but maybe one of the most central is that temporary organizations may have characteristics that make them quite different from stable organizations. Characteristics regarding the task, the members as well as the time-limits place other demands than for stable top management groups, e.g. on how the process should be dealt with. Indications are that the heterogenous, intensive and short-limited character of projects maintain so much potential for conflict, that the challenge is not to create conflict and a open discussion climate, but rather to suppress conflict. These and other relevant issues will be discussed further in the next chapter.

When discussing the phenomenon of groupthink theoretically, I argued that groupthink probably could indicate the opposite of conflict, namely a conflict free climate. In order to detect whether these variables captured the two sides of the conflict coin, I regressed these two variables against each other with the groupthink score as the dependent variable and interpersonally related conflict as the independent variable. The regression analysis revealed that these variables were completely unrelated and captured different dimensions of the group process. R-squared was 0.01 and $b = -.02$ and $p < .38$, which indicated that there was no correlation. This finding is also supported by the initial correlation analysis that showed no significant relation between these two variables.

Discovering that groupthink was unrelated to conflict, I wanted to analyze the correlation between cohesiveness and groupthink further. Regressing the groupthink score (dependent variable) and cohesiveness (independent variable) showed that cohesiveness had a significant positive effect on groupthink ($b = .43$, $p \leq .00$). Looking at the initial correlation analysis showed that this same relation was present with a correlation coefficient of .31 ($p<.01$) between groupthink and cohesiveness. This confirmed the general theory on groupthink which sees cohesiveness as its main premise.

6.6 Effects of composition on group process

This section will test for the indirect effect of composition on project performance. This was named the 'intervening perspective'. Following the general view of research on group composition, demographic diversity was seen to affect conflict positively (H10), groupthink negatively (H11), and group cohesiveness negatively (H12). The results of the tests of the hypotheses will be presented in tables 15, 16, 17 and 18.

TABLE 14: Regression of compositional diversity and latent conflict (N=55)

Independent variables	**Latent conflict** Beta (Sig.T)
Age diversity	.29 (.06)*
Educational level diversity	.05 (.69)
Positional tenure diversity	-.06 (.64)
Industry tenure diversity	-.28 (.06)*
R-squared	.09
Adjusted R-squared	.02
F	1.33 (.26)

* $p \leq .10$ ** $p \leq .05$ *** $p \leq .01$

Comments: Hypothesis 10 predicted that demographic diversity would be positively associated with conflict. This model does not get much support as the variables showed little explanatory power of both latent and manifest conflict. See tables 15 and 16. Age diversity did however did however affect latent conflict positively (b = .29, $p \leq .06$), while industry tenure diversity affected manifest conflict negatively (b=.28, $p \leq .06$). Table 16 reveals that there are no significant relations between compositional diversity and manifest conflict.

TABLE 15 : Regression of compositional diversity on manifest conflict (N=55)

Independent variables	**Manifest conflict** Beta (Sig.T)
Age diversity	-.02 (.85)
Educational level diversity	.16 (.25)
Positional tenure diversity	.01 (.91)
Industry tenure diversity	.02 (.85)
R-squared	.02
Adjusted R-squared	-.04
F	.36 (.83)

* $p \leq .10$ ** $p \leq .05$ *** $p \leq .01$

The next tables present the results of the test of (H11); the negative effect of diversity on groupthink and (H12); the negative effect of diversity on group cohesiveness.

TABLE 16: Regression of compositional diversity and groupthink (N=55)

Independent variables	**Groupthink** Beta (Sig.T)
Age diversity	-.17 (.26)
Educational level diversity	.17 (.21)
Positional tenure diversity	.17 (.23)
Industry tenure diversity	-.18 (.21)
R-squared	.11
Adjusted R-squared	.04
F	1.57 (.19)

* p≤ .10 ** p≤ .05 ***p≤ .01

TABLE 17: Regression of compositional diversity and group cohesiveness (N=55)

Independent variables	**Group cohesiveness** Beta (Sig.T)
Age diversity	.12 (.41)
Educational level diversity	.19 (.15)
Positional tenure diversity	.14 (.32)
Industry tenure diversity	.04 (.75)
R-squared	.09
Adjusted R-squared	.02
F	1.29 (.28)

* p≤ .10 ** p≤ .05 ***p≤ .01

Comments: Analyzing if diversity with regard to age, educational level, positional tenure and industry tenure affect groupthink negatively (H11) and cohesiveness negatively (H12), showed that none of the hypothesis were confirmed. But if one accept significance levels of around .20, then several interesting relations emerge. For groupthink, only age diversity and industry tenure diversity affected groupthink

negatively, while educational level diversity and positional tenure diversity influenced groupthink positively. Whereas for cohesiveness, educational level diversity influenced group cohesiveness positively (p=.15). Summing up the results regarding the consequences of diversity on process, the following can be said;

H10 has some support since age diversity affects latent conflict positively. The finding of a negative effect of industry tenure diversity on latent conflict contradicts the hypothesis.

None of the other hypothesis were confirmed, thereby rejecting both H11 (diversity having a negative effect on groupthink) and H12(diversity having a negative effect on cohesiveness).

The next hypotheses to be tested regard other compositional dimensions such as project values and previous work experience among core group participants. Hypothesis 13 predicted that a dominance of project values would affect cohesiveness positively. One would assume that the more homogenous the core group is regarding project values or goals, the more cohesive the group.

TABLE 18: Regression of project values and group cohesiveness (N=55)

Independent variable	**Group cohesiveness** Beta (Sig.T)
Project values	.23 (.08)*
R-squared	.05
Adjusted R-squared	.03
F	3.12 (.08)

* p≤ .10 ** p≤ .05 ***p≤ .01

Comments: The results in table 19 show that there is a positive relation between project values and cohesiveness, thereby confirming H13. The relation is interesting because it shows that values add explanatory power in explaining process and that it maybe should be paid more attention to when studying compositional effects.

The next set of hypothesis deal with social networks and the role it is playing for process. It was hypothesized that previous work experience would prevent conflict or negatively affect conflict (H14), that it would increase the tendency for groupthink (H15) and positively affect cohesiveness (H16). The tables 20, 21, 22 and 23 show the results from the analysis.

Comments: Contrary to expected, none of the hypothesized relations got confirmed. The degree of previous work contact did not have any influence on the group process, as captured here. This does not only contradict theories on social networks and previous studies on the subject, it also contradicts a widespread myth among construction people; that the best results can be obtained by groups knowing each other in beforehand.

TABLE 19 : Regression of previous work experience and latent conflict (N=55)

Independent variables	**Latent conflict** Beta (Sig.T)
Previous work experience	.06 (.64)
R-squared	.00
Adjusted R-squared	-.01
F	.21 (.64)

* p≤.10 ** p≤.05 ***p≤.01

TABLE 20: Regression of previous work experience and manifest conflict (N=55)

Independent variables	**Manifest conflict** Beta (Sig.T)
Previous work experience	-.05 (.70)
R-squared	.00
Adjusted R-squared	-.01
F	.14 (.70)

* p≤.10 ** p≤.05 ***p≤.01

TABLE 21: Regression of previous work experience and groupthink (N=55)

Independent variables	**Groupthink** Beta (Sig.T)
Previous work experience	-.05 (.70)
R-squared	.00
Adjusted R-squared	-.01
F	.14 (.70)

* p≤ .10 ** p≤ .05 ***p≤ .01

TABLE 22: Regression of previous work experience and group cohesiveness (N=55)

Independent variables	**Group cohesiveness** Beta (Sig.T)
Previous work experience	.03 (.82)
R-squared	.00
Adjusted R-squared	-.01
F	.04 (.82)

* p≤ .10 ** p≤ .05 ***p≤ .01

Summing up the results regarding process effects of project values and previous work experience, revealed some support for the hypothesis.

H13 was supported as homogeneity of project values did influence group cohesiveness positively (b = .23, p< .08). Previous work experience among project participants did not have any effect on process, H14 (conflict), H15 (groupthink) and H16 (cohesiveness) were rejected.

6.7 Replication of analysis for project units with higher response rates

In order to find out whether the response rate would have an effect on the results, regression analysis were conducted for those projects that had 5 or more responses from core group members. The results are presented in the table below. The results from the original data analysis are included in brackets.

TABLE 23: Replication of regression of composition of core group and productivity and quality

	Dependent variables	
Independent variables	**Productivity** Beta (Sig.T) **(N=26)**	**Quality** Beta (Sig.T) **(N=38)**
Age diversity	.49 (.12) (b=.05)	-.08 (.63) (.08)
Educational level diversity	-.36 (.12) (b=-.02)	-.15 (.33) (-.21)
Positional tenure diversity	.00 (.98) (b=.11)	.13 (.64) (.08)
Industry tenure diversity	-.32 (.30) (b=-.11)	.18 (.36) (.05)
Project values	.11 (.62) (b=-.10)	.36 (.05)*(.15)
Stable professional group identity	.01 (.95) (b=.11)	-.12 (.47) (-.14)
Occupation and industry involvement	-.04 (.84) (b=-.32)*	.24 (.18) (.08)
Previous work experience	-.21 (.45) (b=.12)	.11 (.54) (.05)
R-squared	.23	.24
Adjusted R-squared	-.09	.04
F	.70 (.68)	1.24 (.30)

* $p \leq .10$ ** $p \leq .05$ *** $p \leq .01$

In the table above one can see that there are some differences of results from the original analysis. While the first analysis did not reveal any significant impact of composition, this analysis shows that age diversity has a positive impact on productivity, while diversity of educational level has a negative impact. These findings are only significant on a 12% level, but are still worth mentioning since the impact is considerable on productivity and differ substantially from the original analysis. The other significant result is the positive relation found for project values and quality,

which was originally not present. Contrary to previous results, occupation and industry involvement had no effect on productivity. Regarding the other variables, it seems that the findings are quite consistent with the data set with 3 or more responses from core group members.

TABLE 24: Replication of regression of core group process and productivity and quality

	Dependent variables	
Independent variables	Beta (Sig.T) **(N=26) Productivity**	Beta (Sig.T) **(N=38) Quality**
Latent conflict	-.08 (.66) (b=.01)	-.46 (.00)**(-.36)**
Manifest conflict	-.38 (.12) (b=-.36)**	-.14 (.29) (-.14)
Groupthink	.14 (.51) (b=.44)***	.82 (.59) (.07)
Cohesiveness	-.00 (.97) (b=-.11)	.32 (.07)* (.24)*
Project identification	.09 (.62) (b=.94)	-.01 (.92) (-.09)
R-squared	.18	.35
Adjusted R-squared	-.00	.25
F	.95 (.46)	3.6 (.01)

* p≤.10 ** p≤.05 ***p≤.01

Interpersonally related conflict and groupthink show nearly the same impact on productivity as found in the original analysis, although the effect of groupthink is not significant. Other consistent results are the positive impact of cohesiveness on quality and the negative impact of task related conflict on quality. All in all, one may conclude by saying that there are no large differences in results from the original analysis. One can disregard the effect of differing response rates for these process variables.

One can not draw the same conclusion from the analysis on composition. Although only significant on a 12% level, two compositional variables show significant different effects on productivity. Such a finding is understandable as one can not fully capture compositional diversity when there is a lack of information about several group members.

The relevance of response rates for studies on group composition was discussed informally with Susan Jackson who has conducted several studies on group composition (Bantel and Jackson, 1989; Jackson, 1992). It appeared that she generally used data of groups that had more than 50% responses. Such a strategy was considered, but the limited number of project units available prevented it. A lot of effort was put in to obtain more than 50% responses from core group members of all projects, but this turned out to be impossible for some projects as people did not respond to three follows-up by phone. However, the results reported here show that the response rate matters to compositional diversity variables and should be taken seriously in future studies. Surprisingly, none of the researchers of top management groups have mentioned or discussed this issue in the reported articles.

6.8 Summary of empirical results

In order to give an overview of the presented results, I will present a table showing the hypotheses that were confirmed and those that were rejected. Only the relations that had significant relations significance level lower than 10% were accepted, although having been included in the previous discussion. A broad discussion of these results and the implications following them will be presented in the next chapter.

TABLE 25: Empirical results of hypotheses testing

Hypotheses	Relations		Results
H1	Demographic diversity	Performance	Not supported
H2	Project values	Performance	Not supported
H3	Stable prof. group identity	Performance	Not supported
H4	Work involvement	Performance	Not supported - Significant negative effect
H5	Previous work experience	Performance	Not supported
H6a	Conflict	Performance	Not supported - Significant negative effect
H6b	Conflict (curvilinear effect on)	Performance	Not supported
H7	Groupthink	Performance	Not supported - Significant positive effect
H8	Cohesiveness	Performance	Partially supported - Positive effect on
H9	Project-identification	Performance	Not supported
H10	Demographic diversity	Conflict	Partially supported - Age diversity - task related conflict
H11	Demographic diversity	Group-think	Not supported
H12	Demographic diversity	Cohesiveness	Not supported
H13	Project values	Group cohesiveness	Supported
H14	Previous work experience	Conflict	Not supported
H15	Previous work experience	Group-think	Not supported
H16	Previous work experience	Cohesiveness	Not supported

7. DISCUSSION AND IMPLICATIONS

When approaching the world of construction projects, a basic belief was that a critical group of people could be very influential for the performance of these projects. Since construction projects are short-lived, focused and of a limited size, I expected this core group to be even more influential for performance than top management groups usually are for the performance of large corporations. Based upon this basic thought, it was further expected that the composition of the core group would be especially important and predictive of both the process and results. In order to avoid some of the shortcomings of previous studies on group composition, several types of diversity were accounted for by examining both demography, values and identity. Enlarging the traditional scope of such studies from a single outcome to several outcomes was also an attempt to improve the model. By adding the role of process as an intermediate factor, I hoped that the picture I would get of project composition and performance would be more faceted.

However, despite all these improvements and efforts, group composition did not turn out to seem to have any empirically strong effect on project performance. Here discounting the effects found for the analysis with 5 or more responses as the results were not sufficiently reliable. This study found little (nearly no) support for the notion that composition of the core group affects project performance directly or indirectly through process. Actually, only process itself seemed to matter. However, this finding alone is not sufficient for discarding the role of the core group as the process was revealed to be extremely important. Both conflict and groupthink were found to have substantial and independent strong effects on both productivity and quality, although these relations contradict relevant theory.

The study disproves central assumptions and theories of group behavior that have been widely confirmed in previous studies, but one has to question the strength of these results as they may not be completely reliable. It is therefore risky to draw any strong conclusion based on the mentioned findings. So before discussing the results and validity issues more broadly, I want to pinpoint the major limitations of the study.

Starting out with important limitations, the first is about the number of projects. The findings must be said to be unstable as there are few units of analysis. When doing statistical analysis, it is quite important to gather data about a sufficiently large sample. Secondly, the results can not be generalized to all kind of settings as the study is focused at construction projects. It is necessary to test out these relations in other construction projects and in different industries before drawing any firm conclusions about the effect of core groups for project performance. However, it is worth mentioning that empirical findings from a study on technical teams of different organizations in the US came to similar conclusions. Pelled (1995) did not find any significant relations between diversity (functional background, industry experience, education, race, age, gender, tenure) and group performance. Additionally, conflict was also not found to have the anticipated effect on performance. This partially supports the presented findings and more importantly, make a claim for questioning the generalizability of group theories to all types of settings and industries.

When trying to understand why none of the hypothesis got confirmed, the role of task and technology becomes central. Many of the hypothesis were drawn from theories and studies developed for groups and teams facing unique and unpredictable tasks, like the daily situation confronting many management groups. Originally it was assumed that project groups could have some similarities with top management groups, but the results indicate that this may have been a wrong assumption. It appears that the tasks of the core groups are so different to place completely different demands on process.

The third important limitation of the study directs attention to the performance indicators used. As the measurement of quality suffers of several shortcomings and is therefore not a reliable measurement of the evaluative and more long-term considerations, the findings are more valid for productivity. As discussed previously, productivity is a measure capturing the efficiency of organizations. It does not tell anything about how well the end-result turned out regarding normative evaluations and long-term considerations. So if drawing any conclusions, it must be that the results acquired yield for the internal effectiveness of projects and not necessarily for the external effectiveness. It may well be that compositional diversity and conflict may have the predicted positive effect on

creativity, design and quality of the buildings. Distinguishing between internal and external effectiveness makes a claim for a contingency approach to group studies. Such a conclusion may be seen as an important contribution since the issue has previously not been paid much attention to within the study of groups. Using a contingency perspective on group performance means that there is no one best way to organize groups and that the organization or management of groups has, among several things, to be adapted to the kind of effectiveness desired.

When discussing these results, it is important to keep in mind that it is difficult to make clear conclusions based on negative findings. Negative findings may according to Meehl (1990) be a result of improper deduction (from theory to model and hypotheses), methodical weaknesses (lack of ceteris paribus conditions) and a research setting on the basis of which the theory cannot be generalized - as well as the theory actually failing to achieve support in a critical test. Leaving these issues aside in the section on validity and limitations of the study, I will first discuss the findings as if existing theory is falsified. This means that I will discuss the results without regard for methodical weaknesses first. The findings will be commented by using both interview data, the impressions got through the participant-observatory study and relevant theory about the issues. Then, limitations and contributions of the study will be presented.

7.1 The missing role of group composition

Within the study of stable, large organizations, the composition of the top management group has proven to be of importance for how these organizations perform. There is wide empirical support for the fact that diversity of managers' backgrounds both in terms of education, experience and tenure has a beneficial effect for both decision-making and performance. Also the role of previous work experience has been proven to have a significant effect on performance. As this study is the first testing out the role of composition (especially compositional diversity) for temporary organizations, one may question why empirical results differ so much from those of stable organizations.

As opposed to top-management groups that endure for several years and make people similar through years of socialization processes, construction projects are by their nature diverse as each new project involves professionals from diverse firms and occupations. The 'virtual' nature of construction projects, having no common physical location and long-term cooperation does also contribute to keeping the project composition 'diverse'. Achieving diversity may just not be as important for decision-making and performance within construction as there already is a spirit of newness and originality in each project that prevents it from becoming homogenous in thoughts and perspectives. It is also difficult to obtain sufficient variation of diversity across projects when conducting research on a selected industry. Variation got ruled out as all construction projects are more or less diverse.

One may also question whether the tasks solved are so 'unique' as to require diverse composition. Initially my assumption was that core groups would have to deal with unclear and complex tasks, but this may just seem so to an outsider. It is probable that for the members actually participating in these projects, having attained long experience within construction, the tasks are regular and straightforward. In that case there may be little need for a diverse composition of the core group.

The composition of professionals in large construction projects most often takes place through a bidding process. Although personal preferences may play a role, the selection is largely based on competence and price criteria. There is, in other words, a high probability that the process is quite rational, thereby securing that the right competence and experience is assembled to solve the task. This also makes it difficult to achieve differentiation of composition. The picture may not be the same for large organizations as they are more subject to internal political moves as top-managers like to have 'courts' of sympathizers around themselves. The recruitment of top managers is also more subject to institutional processes. One can therefore argue that the composition of projects does not matter empirically here because it has already been paid careful attention to.

The professional way in which most large construction projects are handled may not only secure a high competence level. It also secures that the participants have well-defined roles to fulfill, a fact that may discount the role of the individuals occupying the positions. As the construction industry is one of the oldest industries we have, it is heavily infused with traditions, norms and rituals. A plausible explanation for why peoples' background and composition do not have any impact on project performance may be that most activities are ruled (by norms and traditions) so that little space is given for individuals to make an impact and for great errors to be produced. The positions are so well-defined that they disclose any great personal influence. Construction work is multidisciplinary, thereby not requiring integration of problem and task solving. Each professional works on problems and tasks relevant to his or her own discipline. The composition may not be as crucial as each professional function independently.

During my participation in several project meetings, I was struck by the smooth and efficient flow of the meetings. Considering that most of these meetings involved 8-12 participants representing different professional and firm interests, there was an almost unnaturally 'civilized' atmosphere in the room. It may be that the project I followed was exceptional, but regardless of that, it appeared that the expectations and norms of how each professional role should be met were very strong. Compared to other meetings I have participated in, construction meetings were exceptionally well-organized and structured around a predefined agenda. Even if there were disagreements, people talked when they were expected to talk and dealt only with matters that they had competence in. Although producing creative and unique buildings, it is apparent that the process is highly bureaucratic and leaves little space for irregularities, biases and feelings.

Another factor playing a great role, setting major premises for the work and maybe discounting the role of composition may be technology. In many cases, construction technology like specific materials or preconstructed parts are chosen early in the project process such as to limit the options and thereby also the influence of professionals. This trend is becoming more common as time limits are tighter and the rationalization of work processes evolve.

One of the new elements of this study was the issue of professionalization, captured here by detecting whether project members had a stable identification with their professional or social life and whether they had professional or project values. A stable professional identity and an orientation towards the project regarding motives and values were expected to be positive for performance. None of these expectations were empirically confirmed. Since the approach is quite new and unexplored, one may criticize both the measurement and method used to capture these fuzzy and evaluative elements. However, it may also be that people identifying with their social life may be just as professionally oriented as those only living for their work. Or it may be that the stable group identity of people is disconnected to their orientation in a work setting. Regarding professional values, it may look like the question of whether people are oriented towards their profession or project does not really matter to the productivity or quality of the final results. Since there have been few studies linking this issue to performance, I find it difficult to draw any conclusions from my results. However, one should not disregard the influence of such factors based upon the negative results obtained here. It is probable that professional values are still important; not for short-term, project-based performance, but for more long-term concerns regarding the use of the building.

At last I will point to the fact that in order to fully understand the results it is important to keep in mind that productivity is a measure of how efficient a project is run and that it does not tell us anything about how well the building will function. The quality evaluation of the building is also relatively short-termed and based on predictions of how well the building seems designed for future activities. Such an understanding of performance will of course set certain limitations and determine which factors may play a role.

7.2 The unexpected findings regarding process

The empirical results regarding the role of process are very clear. Its features are crucial for an efficient project progress, but not the way general theory about group processes predicts. The suppression or avoidance of conflict is obviously one of the best ways to

achieve high productivity in construction projects. Contrary to my expectations and relevant theory, both cohesiveness and project identification had no effect on project performance. Although these are unexpected results theoretically, the world of practice has another opinion:

'These results do not surprise me at all. This is what I have always said to my people even though they don't like to hear it. There is only one way to manage projects efficiently and that is the 'stalinistic' mode of managing. Democracy may seem appealing, but has never functioned in construction.'
Expressed by a project director when presented the results of the survey, Spring -96.

Personally believing in broad participation and democracy, the empirical results and the comment above were not what I hoped to conclude with. But having a certain insight in the industry and in projects in general, I hope to amplify the understanding of the reported findings.

The first issue coming up is that project processes seem to be unlike ordinary organizational processes, at least processes within stable organizations. The time perspective, whether short-term or long-term, obviously has an important role for people's behavior. Another important factor is the fact that projects are extremely fragmented and divided by different interests, which make them highly vulnerable to conflict and disintegration. The challenge does not seem to lie so much in creating conflict as in trying to balance different parties and keep conflict under control.

Secondly, the findings also reveal that projects are, more than other things, dynamic processual events. Project performances seem to be shaped by the daily events and happenings, more than by planned strategic decisions. Such an impression was also confirmed to a great extent when presenting and discussing the results with a group of project people. Specific events and the way the process is dealt with were seen as very important for the final results.

Having participated in site meetings, I also got a clear picture of where and how process evolves. It appeared to me that construction projects are indeed intensive and concrete.

If compared to the formal and stiff board rooms of managing directors, one can truly say that construction is another 'ballgame'. In order to understand why process seems to play such a great role I will refer to my first impressions of a meeting in a construction site. This may also give some necessary background information of the industry.
This is how I perceived the event.

'I arrived a little earlier to the site meeting and was shown around by the project manager. Foundation work had just started and men in orange working suits and helmets were busy involved with the steel fundaments. It was a dark, cold winter morning and I asked myself how these people managed to work outside with 10C below. The project manager and I walked up a steep, steel stairway to the barrack. People had already gathered and were sitting close to each other around the table, in a tiny room. Getting in from the cold, the atmosphere was warm and welcoming. The smell of coffee was strong. Because we all sat squeezed together in a barrack, there was an intimate tone in the room, like we were all in the same boat. No wonder people were engaged in the process, I thought to myself. The hammering noise in the background was a constant reminder of what the challenge and task was. The other thing that struck me sitting there was that in this setting the role of status, positions or titles was ruled out. There is no room for snobs in a shabby barrack.' Impressions from a site-meeting, Spring -95.

This small story is a reminder that construction projects deal with concrete, material things and that the atmosphere and process is quite different from what is happening in many large, stable organizations. Individuals and groups are heavily influenced by external circumstances and will necessarily be influenced by the technology and present physical environment. The climate within construction projects seemed to be status-free, open and tolerant, leaving room for controversies and disagreements. It appeared to me that little 'groupthink' was present during the meetings I participated in. Another factor playing up to such an understanding is the fact that the construction industry is very male-dominated and 'macho'. The tone is direct, rough and reminds of a boys' gang. In such a masculine world, it appears that standing up for one's ideas and rights, not showing weakness and subordination to others, are important values. I would assume that these are also modes to get respect and legitimacy from other professionals. The encounters I have had with construction people throughout the years support such an

interpretation of the construction industry. I will here refer to an informal gathering, this time in an Irish pub with two construction men. A project manager told a story about a person X in a subordinate positions from a contractor firm who tried to get a deal directly with him without passing through his manager Y.

'This construction guy X is really stupid, thinking that he can try to cheat on me. I would be dead in the system if I would negotiate under the table, after the tendering. And this was someone from the floor that didn't even take the time to clarify with his boss (Y). This director Y may be smart intellectually, but he is not able to keep up with his boys. I had to call him up and tell him; you have to keep control of your guys. None of mine would have dared to do anything close to that. No, if you ask me, Y is not tough enough, he has to tighten the belt.'
Expressed by a project manager at an informal gathering, fall -95.

This is just one example revealing some of the culture within construction and giving some support to the myth of construction idealizing the strong, active, ruling boss. Another aspect of the 'masculine' culture of construction is the suppression of emotional or social issues and the neglect of psychological needs of participants. However, this does not seem to matter at all to performance as cohesiveness had no effect on productivity at all. The unexpected negative impact of work involvement on productivity indicates the same. The working climate and people's attitudes to work do not really seem to matter that much. There are three plausible explanations to this. Firstly, people may be so professional that they will perform well no matter how bad the working climate is with fellow project participants. Secondly, project participants spend most of their working time with fellow colleagues in their mother firm and do not really bother about the group climate in the project. The third explanation may be that the projects included in the study are to a large extent large, visible and prestigious to participate in. Whether it be schools, universities or office buildings, several of the reported projects received publicity in the local newspapers and design prices. This is an important factor that may well have influenced the motivation, effort and professionality of the participants, thereby discounting the role of social group elements.

7.3 Validity issues and limitations of the study

In the first part of this chapter the issue regarding the interpretation of negative findings was raised. According to Meehl (1990) a 'radical' Popperianism- that is to perceive theories as 'falsified' when they fail to achieve empirical support - is inadequate as the empirical rejection of a theory in itself has to be verified. Based on this I will here discuss the validity of the model and measures and point to the limitations of the study.

It might be that general theory on group composition and group processes is valid for temporary organizations and that the negative findings of this study is a product of lack of basic and sufficient conditions for conducting the study. One can hardly achieve the full 'truth' in social research, but a basic requirement is to be critical to the way research is conducted and point to the validity threats. I will base the following discussion on Cook and Cambells' (1979) typology of internal and external validity.

Internal validity refers to the approximate validity with which we infer that a relationship between two variables is causal or that the absence of a relationship implies the absence of cause. External validity refers to the approximate validity with which we can infer that the presumed causal relationship can be generalized to and across alternate measures of the cause and effect and across different types of persons, settings and times.

Cook and Cambell, (1979) p. 37.

7.3.1 Internal validity

Considering that the study may have led to false negative findings I will here point to limitations regarding validity. As the research process may be seen as a set of decisions, I will discuss validity in relation to the different choices which have been made. Maybe one of the most important decisions taken regards the actual research model.

The research model

Although the model was designed such as to secure high internal validity, one cannot oversee the fact that third variable alternative interpretations may impact the dependent variables. By including control variables and accounting for the task, technology and size when picking project units, some of the alternative influencing factors were accounted for. It is also worth mentioning that the data collection originally included a wider set of variables that was thought to influence performance. Among these are the total duration of projects in months, the bidding mode, the number of contracts, the contracting system, time used on formal meetings during the project process, time of overlap between design and construction and external events that were unforeseen. Checking the impact of each of these on performance, none of these variables had significant impact. It is a shortcoming that these analyses are not included in the study, but as one of the major problems was the limited degrees of freedom, the number of variables had to be restricted. These results are anyway encouraging regarding the internal validity of the model, but it is important to remember that one can never achieve full control of all the factors that may influence a certain relation.

A strength of the model was initially that the input-process-output variables followed a logical, sequential time order. But this elegant temporal precedence is partly violated by the study since both attitudes, identities and process were measured after the projects were completed. How well the project performed may, among other events, have influenced the way the participants perceived the process retrospectively. Attitudes, work involvement and stable identities are also variables that may have suffered under this. Actually, the unexpected finding of occupation and industry involvement having a negative impact on productivity is an example of this phenomenon. Ideally, data should have been collected at three different stages; at the beginning of the project, during the project process and after the ending of the project. As the projects endured from 1-4 years such an approach would have required time and resources not available for this study. An issue moderating the negative impact of possible subjective post-rationalizations of members' project experiences is that all variables result from aggregating individual-level responses. Although ruling out some of the variance, such an approach may be positive regarding members' distortion of past events as it averages out

individuals' extreme responses. After all, it may not necessarily be the case that all members have changed their opinions about the process after the project ending.

Selection of units and drop-outs

The selection of units in the analysis is not made by random and can be criticized for being too narrow. The scope of the study could have been broadened to include projects of all sizes as the role of size could have been controlled statistically. When it comes to the type of projects chosen, the DEA-method set certain limitations, as only homogenous project units could be chosen. The specific selection of units can therefore have had a definite impact on how the chosen variables behaved.

Another factor related to the units included is the drop-outs, the units that were lost throughout the data collection. Originally I started out with 64 projects, but several were lost on the way as respondents did not have time or wanted to answer the questionnaire. Although data were acquired data for 55 projects regarding composition, process and quality, 18 of these had missing data on productivity. The regression analyses using productivity as a dependent variable suffered under this. The power of the analyses would have been considerably heightened if I had acquired productivity data on these 18 project units. Initially I thought that the main reason for lacking responses on productivity was a bad questionnaire design. After having called up each of these project managers several times, however, it appeared that they either had not kept track of the expenses on the project or were reluctant to give the information for fear that it would be used against them. The project managers in Sweden were the most negative towards giving such information. So although not having achieved as good a response set as expected, can be said to my defense that a great deal of effort was put into heightening the response rate. Data collection was extended several months and several follow-ups on phone were made.

Measurement of theoretical constructs

Construct validity is what one is concerned with when there is a possibility that the constructs used do not represent the theoretical constructs appropriately. First, I will just point to the fact that most measures have been validated and found acceptable in the chapter on measurement. Here I will only point to the most important limitations for

certain constructs and oversee the ones that have been proven to function. Although I have paid, careful attention defining the constructs in this study according to widely accepted theoretical definitions, and adjusted already developed measures to the construction setting through the pilot study, objections can be made to several constructs.

The issue of construct validity of effect variables, here productivity and quality, is important to raise as these set major premises for the empirical results. The measurement of productivity by the Date Envelopment Analysis is both a widely accepted and purposeful way of capturing the efficiency of the project. Another strength is that productivity is measured on a different level than the independent variables. This also heightens the general validity of the study.

On the other hand more objections to the quality measurement can be raised. Subjective quality ratings were used, which may suffer from biases such as the halo effect; professionals' general impressions of the process biasing their assessment of specific features of the buildings' quality. Although professionals' subjective ratings may be based on professional considerations, they may not be purposeful in regard to the functions of the building. It was tried to use the client's and users' evaluations of the quality, but as the response rate was too low from these groups such an approach was discarded. One way to overcome this subjective rating problem in the future is to conduct separate data collection of client's and users' evaluations of the quality after the building has been in use for a while.

A general objection that can be raised to several of the measurements is that I have mainly used one measure to capture phenomena, both professional values, identity, work involvement, cohesiveness and groupthink. Construct validity would have been heightened if I had used several and different measures of the same 'concept'. This would have opened up for a better understanding of the variables as it would have been possible to test for both convergent and divergent validity. I preferred the inclusion of more variables rather than to broaden the measurement of a few, given that there was a limit regarding questionnaire size. However, for most of the measures, several items that captured different aspects of the variables, were used.

Regarding specific measures, one can especially criticize the way work involvement, professional values and identity were measured. As I lacked purposeful and valid measures for these theoretical constructs, I tried to develop new measurement methods. Regarding professional values I feel that the chosen approach managed to capture different orientations to professional work, but one may ask whether these are attitudes rather than values. Measuring values quantitatively is a difficult task that requires more effort than was available here. What I especially will raise doubt about is the method used, making people range different alternatives according to first, second and third priority. The method was selected because the experience gained through the interview revealed that professionals had a tendency to perceive everything equally important. However, for studies in the future I would recommend to combine the Likert scale with the 'priority-scale'. The same can also be said for the measuring of identities where the same approach was used. Although the questions seemed to function well and made people define which group they identified mostly with, one could have improved validity by combining this new measurement-method with more traditional Likert-scales.

It is also necessary to give some comments to the measurement of conflict. Following previous studies (Pelled, 1995; Jehn, 1995), I distinguished between task-related and interpersonally related conflict. It appeared that these two measures did not correlate and had different impacts on performance. While interpersonally conflict had severe negative impact on productivity, task related conflict had a negative impact on quality. The reason may be that while task-related conflict captures diversity of attitudes towards important decision areas and is a measure of an antecedent condition of conflict, the interpersonally conflict measure captures manifest conflict. It is understandable that such different aspects of conflict can have different consequences for performance. What one may question, however, is to what degree the measure of interpersonally related conflict also captures task related conflict. According to the impressions gained through interviews and observation, it seemed to me that people had severe problems distinguishing the person from professional task issues. I would argue that the above distinction is not purposeful and that one instead of focusing at different aspects of conflict, rather should focus at the different stages or expressions of conflict.

The measurement can also be criticized for being reductionistic in that the major approach in this study is based on aggregating individual-level data to measure group-level phenomena. Rather than studying core groups as a whole I have mostly studied the individuals within these groups. All the variables regarding both composition and process are based on individual members' data or perceptions by aggregating these responses to estimate overall group measures. Such an approach follows the general line of research within small-group research although it is debated and criticized within the group research field itself. A special symposium called 'To learn about groups, study groups' was set up at the 1995 Academy of Management meeting in Vancouver, where these issues were discussed broadly.

Groups are not simply aggregates of individuals. Groups redefine individual realities by changing individual perceptions and beliefs (Hackman, 1993) and creating new realities for group members over time. In addition, groups in real organizational settings are both more varied, complex and dynamic than individual level aggregates are able to convey. Relating to what was said at the referred symposium, I want to add that individual level data may be useful for understanding some aspects of group performance, but that they are not sufficient. Only exploring individual-level data can lead to poor and even misleading interpretations and conclusions of the phenomenon. In order to understand groups properly researchers should study groups as entities. It is therefore highly recommendable to combine qualitative interview or observant methods with quantitative methods such as surveys. Although this study is largely based on measuring groups through individual-level data, I have attempted to balance out this narrow and reductionistic approach using both interviews, interacting with professionals and observations of core groups in meetings. The different levels of data provided different, complementary insights for understanding the core group phenomena. In retrospect I acknowledge that the insight gained through observing groups broadened the understanding substantially. For future studies I would therefore recommend to put as much effort in gathering qualitative group-level data as quantitative individual-level data.

Another related issue regarding aggregating individual-level data to group level is the problem of the varying response-rate across groups. For some reason, this problem is

rarely reported or discussed in the research articles I have found. I raised this issue talking to Susan Jackson who has conducted several studies on small groups. The lack of full data sets on people's backgrounds reduces for instance the validity of composition aggregates. However, one can assume that the variance is similar for the group units with high response rate and those with low response rate. This problem was accounted for here by doing regression analyses with different responses of data sets. The main analysis did not show considerable differences of results across data-sets. However, it is worth paying attention to this problem and evaluating results from similar studies more critically when they do not report response sets across project units.

7.3.2 External validity

External validity considerations have to do with the generalization of results to particular target projects, settings and times and generalizing across projects, settings and times. As the project units lost during data collection do not seem to vary systematically from the project units included in the study, I will conclude that the result can be generalized to hold for the entire population, which consists of Norwegian and Swedish construction projects over 5.000 m2 directed towards the construction of buildings for educational and office purposes. Another aspect is whether the results can be generalized across time. This is a highly relevant question as there was a recession in the construction industry when the study was conducted. Answering this question correctly would require a replication of the study during more regular times. To this I can only say that I would assume that group processes created in projects, are more subdued to internal project events than the wider external environment.

The other question one may raise is whether the results can be generalized across projects within construction and across industries. The fact that the effect of task (office and educational building) did not produce significant different results opens up for generalizing the results across different construction projects. However, given that the chosen projects were not very different regarding the task and technology, a definite conclusion regarding this cannot be given here.

Regarding the generalization of the results across industries, the issue becomes even more vague. I would expect that the results could be valid for projects very similar to construction projects such as projects within technically related areas. The planning and construction of oil platforms and refineries have a certain resemblance to construction, but it is risky to make any firm conclusions. Instead I would encourage other researchers to pursue these issues in different project industries.

7.4 Theoretical and methodical contributions

One of the most important theoretical contributions is having empirically shown that theories originally developed for small-group behavior in stable, large organizations do not hold for temporary organizations, such as construction projects. In addition to having shown that group composition does not seem to matter at all for performance, process seems to take other forms and has completely opposite effects for projects than what is found for stable organizations. Even though the results can not automatically be generalized to all kind of projects, the findings open up for acknowledging the study of temporary organizations as a research field of its own, requiring new theory development for organizational processes and performance.

Theoretically, another important contribution from the present study regards the development of the core group concept for projects, which is based on applying theories developed for stable organizations to temporary organizations. The invention of the concept is new and may inspire other researchers to make it an issue of research, in the same way Bourgeois (1980) and Hambrick and Mason (1984) created the research field focusing on top-management groups. Using a group-level perspective on projects is also quite new, but launching the 'human' perspective within project management by establishing a theoretical platform is maybe an even larger contribution. This is truly an understudied aspect as most studies and theories within the project field are technically or structurally focused. I hope that my study is a step further in the direction of

demystifying the 'rational' orientation and myth within the field of project management by having shown that process plays such an important role. By testing out theories developed for small groups on a relatively unexplored setting; i.e. construction projects, I have also enlarged the scope of general social-psychological theories.

I have also introduced some new elements to the study of groups and projects by introducing sociology-of-profession theories and developing the concepts of professional values and locals-cosmopolitan based identities. These are new and relatively unexplored issues that would have deserved more time to study in depth. With the proliferation of 'knowledge' organizations and more temporary professional work modes such as networks, groups and projects, the professional norms, values and identities may be important issues for the understanding of organizational behavior both on an individual and organizational level.

Methodically, the measurement of professional values, identities and group-think is a contribution, as these were all developed for the purposes of this study. I would also point to the triangulation of methods that strengthened the study as a whole and contributed in giving a fuller and better picture of both theoretical concepts and empirical findings. Such an approach is highly recommended although I would encourage other researchers to put more effort than I did into qualitative field observation where groups can be studied for what they are.

7.5 Managerial implications

The study and its results violate a wide-spread belief amongst many project managers and professionals, the idea that in order to secure an efficient process and good quality, the most important issues to take care of are mainly concerned with project method, contracts and organizational structures. This study shows that the good projects are shaped through the managing of process and not only by the right contracts, contracting modes and project method. By having focused at the role of the core group and human issues, this study offers an alternative explanation to why certain construction projects are more efficient than others.

As discussed in the chapter on project performance, there is a great belief in rationality within the project management field. Even though not all the premises for rationality have been discarded, the strong impact shown for the role of process makes it necessary to reorient both the study and practice of projects in technically oriented industries more towards social processes and management issues. It seems like it is difficult to plan process instrumentally through for instance paying careful attention to group composition. The study opens up for a more developmental and prosess understanding of construction projects. There is apparently much to gain by understanding and managing human group processes better. I will therefore conclude by saying that the major challenge for managing construction projects and probably other technically oriented projects, is to manage professionals and handle group processes. However, most important of all, the ability to handle conflicts and negotiations should become a basic requirement of all project managers. Experienced project managers should be able to distinguish between constructive and less constructive conflicts and be able to suppress and handle the less constructive conflicts in a purposeful way.

7.6 Suggested topics for future research

Finally, I will pay some attention to challenges for research in the future. Having argued for the need of developing 'the organization of temporary organizations' as a research field of its own, I will try to frame some ideas that can be pursued further by other researchers.

As professionals seem to be driven as much by professional norms, values and identities as economic incentives, formal goals and obligations, this issue would be interesting to explore further. Understanding the role professional orientation has for performance is as important as understanding what motivates the 'core people' in the project.

Secondly, understanding better the role of process also ranks high on the priority list of future research projects. More than studying different aspects of process I would recommend research that would give deeper insight into the dynamic and changing

nature of process such as to have a better basis for developing theories for project management. The managers' role and the way process shifts during different stages are issues that deserve more attention.

During the pilot study and the participant-observation study I became aware that the construction industry uses practices and methods not necessarily functional for today's challenges. Especially communication modes seemed very unproductive. Here I will highlight the role of formal meetings. They tend to last for hours and use a lot of time and effort because all core group members have to participate. Usually the meetings are held at the site, which can be at a long distance from general offices. The meetings also seem to be very concerned with bureaucratic details and less with the actual work produced. In my view construction could benefit from having communication and meeting practices evaluated and researched in more depth.

Another issue worth studying further is the closure of large projects. Usually little attention is paid to this last stage when the actual work is being done. This stage has several aspects. First there is the issue of learning or knowledge exchange. How could one increase the learning of project work both individually and organizationally? The second issue concerns professionals' life after the project is done. Since many may not have future plans or engagements, distress and anxiety may be created during the closing stages of the project. Related to this is the fact that project work is very demanding and stressful. With the shorter time limits and work pressure, there is a growing danger for burn-out among project professionals. This issue does not only concern the project world, but may also be seen to have a social dimension. In the world of increasing demands for efficiency and performance, I will stress the need of the social costs of such a development. So although having focused on instrumental concerns here, I would like to encourage other researchers to include more social and human performance indicators in future studies of projects.

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APPENDIX 1

Project - definitions

A project is a complex effort to achieve a specific objective within a schedule and budget target, which typically cuts across organization lines, is unique, and is usually net repetitive.
(Cleland and King, 1983)

A project leads to specific result, is unique, involves a variety of resources and is limited in time and scope.
(Andersen, Grude and Haug, 1987)

A project can be defined as posessing the following characteristics:
- *A defined beginning and end*
- *A specific, preordinated goal or set of goals*
- *A series of complex or interrelated activities*
- *A limited budget*

(Pinto and Slevin, 1988)

A project organization is established for a limited period of time to accomplish a well defined and specified set of objectives.
(Adams and Brandt, 1988)

A project can be considered to be any series of activities and tasks that;
- *Have a specific objective to be completed within certain specifications*
- *Have defined start and end dates*
- *Have founding limits (if applicable)*
- *Consume resources (i.e. money, people, equipment)*

(Kerzner,1989)

APPENDIX 2

Group - definitions

Conceiving of a group as a dynamic whole should include a definition of group based on interdependence of the members.
(Lewin,1951)

A small group is defined as an number of persons engaged in interacting with one another in a single face to face meeting or series of such meetings, in which each other member receives some impression or perception of each other member distinct enough so that he can, either at the time or in later questioning, give some reaction to each of the others as an individual person, even though it be only to recall that the other was present.
(Bales, 1950)

A human group is a collection of individuals (1) who have significantly interdependent relations with each other, (2) who perceive themselves as a group by reliably distinguishing members from non-members, (3) whose group by identity is recognized by non-members, (4) who, as a group member acting alone or in concert, have significantly interdependence relations with other groups, and (5) whose roles in the group are therefore a function of expectations from themselves, from other group members, and from non-group members.
(Alderfer,1977)

A group is defined as two or more persons who are interacting with one and another in such a manner that each person influence and is influenced by each other person.
(Shaw, 1981)

Groups can be defined as two or more persons who posses the following criteria; group members must be conscious of their membership in the group; must have an emotional identification with the group; must carry out the groups interests; and finally, the external relationship must be that other see you as belonging in a group.
(Taifel,1981)

A group exists when two or more individuals .... Perceive themselves to be members of the same social category.
(Turner,1982)

A small group often have from three to eight members, up to twenty, and have frequent, face-to-face interaction and mutual influence. They usually exist over a relatively long period of time and have goals that bind them together.
(Mitchell & Larson, 1987)

Work groups are defined by the following three attributes;
-They are real groups. That is, they are intact social systems, complete with boundaries, interdependence among members and differentiated member roles.
- They have one or more tasks to perform.
- They operate in an organizational context.
(Hackman, 1990, p.4)

Team - definitions

Teams are collections of individuals who must rely on group collaboration if each member is to experience the optimum of success and goal achievement.
(Dyer, 1977, p. 4)

Interdisciplinary teams is defined as a process which involves multidisciplinary participation, collaborative sharing of information, case coordination and goal-setting through group input in the decision-making process.
(Fiorelli, 1988)

A team is one or more people - it has a specific performance objective or recognizable goal to be attained - and coordination activities among member of the team is required for the attainment of the goal or objective.
(Larson and LaFesto, 1989)

DEL A: BYGGEPROSJEKTET APPENDIX 4

Ta utgangspunkt i byggeprosjektet som ble nevnt på første side. Du var en sentral deltager. Her følger en del spørsmål som er relatert til resultatet og prosjektprosessen (både prosjektering og bygging);

1. Når startet ditt engasjement i prosjektet? Mnd.....År.....

2. Når sluttet ditt engasjement i prosjektet? Mnd.....År.....

3. Hvordan ble kvaliteten på det ferdige bygget i henhold til de spesifikasjoner og krav som ble utviklet tidlig i prosjektet?
Sett en sirkel rundt tallet som angir ditt svar for hver egenskap:

	Svært dårlig kvalitet	Dårlig kvalitet	Bra kvalitet	Utmerket kvalitet
1. Utvendig design	1	2	3	4
2. Interiør-design	1	2	3	4
3. Funksjonsløsning(er)	1	2	3	4
4. Luft, lys -og lydkvalitet	1	2	3	4
5. Fleksibel etterbruk	1	2	3	4
6. Sikkerhet	1	2	3	4
7. Vedlikehold	1	2	3	4
8. Bygningsmaterialer	1	2	3	4

4. Hvordan ble ressursbruken i dette prosjektet for ditt firma i forhold til det som var planlagt? Med ressursbruk tenker vi på arbeidstimer og materialbruk.
Sett en sirkel rundt tallet som angir ditt svar:

	Høyere ressursbruk enn planlagt	Som planlagt	Lavere ressursbruk enn planlagt
Ressursbruk i dette prosjektet	1	2	3

5. Nedenfor følger en liste med ulike beslutningsområder som kan være aktuelle i et byggeprosjekt. Hvor viktig synes du hver og en av disse beslutningsområdene var for at prosjektet ble fullført med godt resultat?
Sett en sirkel rundt tallet som angir ditt svar for hvert beslutningsområde:

	Ikke viktig	Litt viktig	Viktig	Svært viktig
1. Romprogram	1	2	3	4
2. Byggeprogram	1	2	3	4
3. Økonomiske rammer	1	2	3	4
4. Forprosjekt	1	2	3	4
5. Anbudsdokumenter	1	2	3	4
6. Entrepriseform	1	2	3	4
7. Kontraktsform	1	2	3	4
8. Valg av prosjekt- og byggeleder	1	2	3	4
9. Sammensetning av fagpersoner	1	2	3	4
10. Annet (spesifisèr)	1	2	3	4

6. Hvor ofte i løpet av din deltagelse i prosjektet, har du vært åpenlyst uenig i faglige forslag og meninger som har blitt fremført av følgende prosjektdeltagere:
Sett en sirkel rundt tallet som angir ditt svar for hver person:

	Svært uenig	Ofte uenig	Av og til uenig	Nesten aldri eller aldri uenig
1. Byggherre	1	2	3	4
2. Prosjektleder	1	2	3	4
3. Brukerrepresentant(er)	1	2	3	4
4. Prosjekteringsgruppeleder	1	2	3	4
5. Arkitekt	1	2	3	4
6. Rådgivende ing. Bygg	1	2	3	4
7. Rådgivende ing. VVS	1	2	3	4
8. Rådgivende ing. Elektro	1	2	3	4
9. Byggeleder	1	2	3	4
10. Hovedentrepenør	1	2	3	4

7. Har du arbeidet sammen med noen av de andre deltagerne i prosjektet tidligere? *Sett en sirkel rundt tallet som angir ditt svar:*

1. Ja 2. Nei

8. Dersom du svarte ja på spm. 7,
hvilke av disse personene i prosjektet har du arbeidet med tidligere?
Sett en sirkel rundt tallet (ene) som angir ditt svar:

1. Byggherrerepresentanter
2. Prosjektlederen
3. Brukerrepresentant(er)
4. Prosjekteringsgr.lederen
5. Arkitekten
6. Rådgivende ing. Bygg
7. Rådgivende ing. VVS
8. Rådgivende ing. Elektro
9. Byggelederen
10. Hovedentrepenør (representant)

9. Hvis du hadde hatt mulighet til å fullføre prosjektet med andre deltagere, hvordan ville du reagert på utskiftning av hele prosjekteringsgruppen?
For hver påstand skal du angi ditt svar ved å sette en sirkel rundt det tallet som du mener passer best.

	Helt uenig	Uenig	Enig	Helt enig
1. Jeg ville mislikt det sterkt.....	1	2	3	4
2. Jeg vile savnet samarbeidet.....	1	2	3	4
3. Jeg ville vært likegyldig.....	1	2	3	4
4. Jeg ville vært glad for det.....	1	2	3	4

10. Sammenlignet med andre prosjekt du har deltatt i, hvordan kommer dette prosjektet ut med hensyn til samarbeidet mellom deltagerne?
Sett en sirkel rundt tallet som angir ditt svar:

	Svært dårlig	Dårlig	Ganske bra	Utmerket
1. Måten vi kommer overens på.....	1	2	3	4
2. Måten vi samarbeider på.....	1	2	3	4
3. Måten vi hjelper hverandre på.....	1	2	3	4

11. Hvilke av disse gruppene følte du sterkest tilhørighet til i løpet av arbeidet med dette byggeprosjektet? Plukk ut tre grupper.
Sett en 1 ved siden av den gruppen som du følte sterkest tilhørighet til; en 2 ved siden av gruppen som du følte nest mest tilhørighet til; og en 3 ved gruppen som du følte tredje mest tilhørighet til.
MERK! Kun 3 grupper skal avmerkes.

RANGÈR

1. Byggherren....._____
2. Brukerne....._____
3. Prosjekteringsgruppen....._____
4. Arkitektene....._____
5. Rådgivende ingeniører (Bygg, VVS eller Elektro)....._____
6. Firmaet jeg jobber i....._____
7. Andre(vennligst spesifisèr)....._____

12. Vi ber deg om å sette deg inn i følgende situasjon. Du deltar i et typisk prosjekteringsmøte for dette prosjektet.
Nedenfor finner du en del påstander som beskriver atmosfæren i prosjekteringsgruppen. Hvor enig er du i hver og èn av disse beskrivelsene av situasjonen; *Du skal angi ditt svar ved å sette en sirkel rundt det tallet som du mener passer best.*

	Helt uenig	Uenig	Enig	Helt enig
1. Jeg følte press på å komme fram til enighet med de andre i gruppen.....	1	2	3	4
2. Jeg ble oppfordret til å komme med forslag og kommentarer.....	1	2	3	4
3. Jeg opplevde at mine forslag ble konstruktivt diskutert i gruppen.....	1	2	3	4
4. Jeg følte det var aksept for å være uenig med de andre i gruppen.....	1	2	3	4
5. Jeg opplevde at enhver sak ble diskutert grundig når det var behov for det.....	1	2	3	4
6. Jeg holdt synspunktene for meg selv når jeg var uenig med de andre deltagerne.....	1	2	3	4

DEL B: HOLDNINGER TIL ARBEIDET DITT

Her følger en del generelle spørsmål som ikke er relatert til byggeprosjektet.

13. Under følger en del påstander om hvilket forhold du kan ha til arbeidet ditt. *For hver påstand skal du angi ditt svar ved å sette en sirkel rundt det tallet som du mener passer best.*

	Helt uenig	Uenig	Enig	Helt enig
1. Hvis jeg måtte begynne å arbeide i en annen bransje enn jeg gjør i dag ville jeg bli veldig frustrert og misfornøyd	1	2	3	4
2. Jeg liker å tenke på arbeidet mitt, selv når jeg ikke er på jobb	1	2	3	4
3. Det viktigste med jobben er å tjene nok penger til å gjøre de andre tingene jeg ønsker å gjøre	1	2	3	4
4. Jeg ønsker jeg var i et annet fagområde og yrke	1	2	3	4
5. Min hovedinteresse i livet kommer fra arbeidet mitt	1	2	3	4

14. Sett at du skulle presentere deg for et nytt menneske du møter hos noen venner, hvilke **tre** forhold ville du spesielt trekke fram;
Sett en 1 ved siden av det forholdet som du først ville komme til å nevne; en 2 ved siden av den neste , en 3 ved siden av det tredje forholdet du ville nevne. MERK! Kun 3 egenskaper

RANGÈR

1. Prosjektet du er engasjert i ....._____
2. Profesjonen eller yrket ditt....._____
3. Firma du er ansatt i....._____
4. Bosted eller oppvekststed....._____
5. Nasjonalitet....._____
6. Politisk tilhørighet eller livssyn....._____
7. Familiesituasjon....._____
8. Hobby og fritidsinteresser....._____

15. Ta stilling til følgende spørsmål.
Sett en sirkel rundt tallet som angir ditt svar:

	Ja	Nei
Tilhører du en fag-eller yrkesorganisasjon nå?	1	2
Leser du faglitteratur eller fagtidsskrifter regelmessig	1	2

16. Ta stilling til følgende påstander.
Sett en sirkel rundt tallet som angir ditt svar:

	Svært sjeldent	Sjeldent	Ofte	Svært ofte
1. Jeg legger vanligvis mer vekt på hva mine kollegaer mener om arbeidet mitt enn hva ledelsen sier	1	2	3	4
2. Hvis det forekommer uenigheter mellom profesjonelle, faglige standarder og min oppdragsgivers interesser, pleier jeg å løse dem til fordel for min oppdragsgiver	1	2	3	4

17. Nedenfor er listet opp en del egenskaper ved et byggeprosjekt. Hvilke er viktige for at du skal føle deg faglig stolt over din prestasjon i byggeprosjekt?
Se på den følgende listen av forhold, sett en 1 ved siden av det som gjør deg mest stolt en 2 ved siden av det som gjør deg nest mest stolt ; og en 3 ved siden av det du er tredje nest stolt av.
MERK! Kun 3 egenskaper skal merkes.

RANGÈR

1. Bygg leveres uten feil og mangler....._____
2. God oversikt over framdrift og økonomi....._____
3. Leverer bygg som skaper fornøyde brukere....._____
4. Skaper tekniske og/eller designmessige gode bygg....._____
5. Fullføre prosjekt i henhold til mål og krav som ble satt....._____
6. Evne til å sette seg fort inn i nye problemstillinger....._____
7. Utvikle nye tekniske og/eller designmessige løsninger....._____
8. Flink til å spille på lag med de andre i prosjektet....._____
9. Utvikle miljøvennlige bygg....._____
10. Levere bygg som ligger godt plassert i forhold til omgivelsene....._____
11. Skaper motivasjon og oppslutning i prosjektet....._____

18. Hvilke oppfatninger tror du andre yrkesgrupper har om din faggruppe?
Se på den følgende listen av karakteristikker, sett en 1 ved siden av det du synes er mest treffende; en 2 ved siden av det som er nest mest treffende; og en 3 ved siden av det tredje mest treffende karakteristikk.
MERK! Kun 3 skal avmerkes.

RANGÈR

1. Brukerorienterte....._____
2. Teknisk fikserte....._____
3. Fleksible....._____
4. Omstendelige....._____
5. Fordyrende mellomledd....._____
6. Samarbeidsvillige....._____
7. Kreative rotehoder....._____
8. Fagorienterte....._____
9. Pragmatiske....._____
10. Annet (spesifisèr).....

....._____

DEL C: GENERELLE OPPLYSNINGER

19. Hvor gammel ble du på din siste fødselsdag? _____År

20. Kjønn *Sett en sirkel rundt tallet som angir ditt svar:*

1. Mann 2. Kvinne

21. Stilling i dette prosjektet
Sett en sirkel rundt tallet som angir ditt svar:

1. Byggherre
2. Prosjektleder
3. Brukerrepresentant
4. Prosjekteringsgr.leder
5. Arkitekt
6. Rådgivende ing. Bygg
7. Rådgivende ing. VVS
8. Rådgivende ing. Elektro
9. Byggeleder
10. Hovedentrepenør
11. Annet (spesifisèr).....

Utdanning og erfaring

22. Antall studieår på heltid etter videregående skole?
Sett en sirkel rundt tallet som angir ditt svar:

0 1 2 3 4 5 6 7 8 9 10 eller flere

23. Hvor lenge har du arbeidet i din nåværende stilling?_____År

24. Hvor lenge har du arbeidet i bygningsbransjen, enten i ditt nåværende firma eller i andre? _____År

25. Hva er det mest sentrale fagområdet i utdannelsen din?
Sett en sirkel rundt tallet som angir ditt svar.
MERK! Sett kun èn sirkel.

1. Arkitektur
2. Tekniske ingeniør fag
3. Håndverksfag
4. Realfag
5. Økonomi
6. Statsvit./sosiologi
7. Jus
8. Humanistiske fag
9. Prosjektledelse og- administrasjon
10. Annet (spesifisèr).....

26. Har du utdannelse, opplæring eller arbeidserfaring innenfor andre fagområder? Nevn kun utdannelse, opplæring og arbeidserfaring som strekker seg utover seminarer, interne kurs og enkeltoppdrag.
Sett en sirkel rundt tallet som angir ditt svar:

1. Ja
2. Nei

27. Dersom du svarte ja på spm.26, innen for hvilket fagområde?
Sett en sirkel rundt tallet eller tallene som angir ditt svar :

1. Arkitektur
2. Tekniske ingeniør fag
3. Håndverksfag
4. Realfag
5. Økonomi
6. Statsvit./sosiologi
7. Humanistiske fag
8. Jus
9. Prosjektledelse og- administrasjon
10. Annet, spesifisèr.....

APPENDIX 5

GENERELL INFORMASJON OM BYGGEPROSJEKT

Ta utgangspunkt i byggeprosjektet som ble nevnt på første side. Du var prosjektleder for dette prosjektet. Her følger en del generelle spørsmål om selve gjennomføringen.

Prosjektlengde (i tid)

1. Når ble prosjektering (skisseprosjekt) startet opp? Mnd.....År.....

2. Når ble bygging startet opp? Mnd.....År.....

3. Når ble bygget ferdigstillt? Mnd.....År.....

Paralell prosjektering og bygging

4. Foregikk prosjektering og bygging parallellt (overlapping) i løpet av prosjektperioden ?*Sett en sirkel rundt tallet som angir ditt svar:*

   1. Ja 2. Nei

5. Dersom ja; I hvor mange måneder foregikk prosjektering og bygging parallellt?
   Det taes her utgangspunkt i når hovedtyngden av prosjektering skjer, det vil si prosjektering fram til anbudsdokumentene er ferdige.

   Antall mnd.....

Prosjektstyringsverktøy

6. I hvor stor grad har du brukt disse hjelpemidlene og verktøy i styringen av dette prosjektet?
   Sett en sirkel rundt tallet som angir ditt svar for hvert alternativ:

	Ikke i bruk	Lite	Middels	Mye
EDB-basert prosjektstyringsverktøy.....	1	2	3	4
PA- bok.....	1	2	3	4
Prosjektplan -eller tidsplan.....	1	2	3	4
KS-manual eller system.....	1	2	3	4
Annet (spesifisèr).....	1	2	3	4

Møtevirksomhet prosjektering

7. Hvor mange prosjekteringsmøter ble holdt før bygging startet?

   Antall.....

8. Hvor mange prosjekteringsmøter ble holdt etter bygging startet?

   Antall.....

9. Hvor lenge varte prosjekteringsmøtene i gjennomsnitt?

   Ca. tid.....Minutter

Møtevirksomhet byggefasen

10. Hvor mange byggemøter ble holdt i dette prosjektet?

    Antall.....

11. Hvor lenge varte byggemøtene i gjennomsnitt?

    Ca. tid.....Minutter

Entrepriseform

12. Hvilken entrepriseform ble brukt i dette prosjektet?
    Sett en sirkel rundt tallet som angir ditt svar:

    1. Hovedentreprise
    2. Generalentreprise
    3. Delt entreprise
    4. Totalentreprise
    5. Construction Management modell
    6. Annet (spesifisèr).....

Kontraheringsform

13. Hvordan ble **arkitekt, rådg. ing. og andre konsulenter** kontrahert?
Sett ett kryss i den ruten som angir ditt svar for hver aktør.
La det stå åpent hvis en eller flere av disse ikke ble kontrahert:

	Ark.	Rådg. ing.	Andre konsul.
1. Direkte forhandling			
2. Begrenset tilbudskonkurranse			
3. Åpen tilbudskonkurranse			
4. Begrenset anbudskonkurranse			
5. Åpen anbudskonkurranse			
6. Egen regi			
7. Annet.....			

14. Hvordan ble flertallet av **entrepenørene** kontrahert?
Sett et kryss i ruten som angir ditt svar. Totalt tre kryss:

	Entrepenører
1. Direkte forhandling	
2. Begrenset tilbudskonkurranse	
3. Åpen tilbudskonkurranse	
4. Begrenset anbudskonkurranse	
5. Åpen anbudskonkurranse	
6. Egen regi	
7. Annet.....	

15. Hvordan ble **byggelederen** kontrahert?
(Ikke relevant for Construction Management prosjekter o.l.)
Sett et kryss i ruten som angir ditt svar:

	Byggeleder
1. Direkte forhandling	
2. Begrenset tilbudskonkurranse	
3. Åpen tilbudskonkurranse	
4. Begrenset anbudskonkurranse	
5. Åpen anbudskonkurranse	
6. Egen regi	
7. Annet.....	

Kontrakter

16. Hvor mange entreprisekontrakter har byggherren eller prosjektledelsen inngått i dette prosjektet?

Antall.....

17. Hvor mange kontrakter har hovedentrepenøren inngått i dette prosjektet?
(Se bort i fra dette spørsmålet hvis du ikke har grunnlag for å besvare)

Antall.....

18. Ble det inngått gruppekontrakt med solidaransvar med deltagerne i prosjekteringsgruppen?
Sett en sirkel rundt tallet som angir ditt svar:

1. Ja 2. Nei

19. Hva slags type kontrakt(er) ble inngått med **arkitekt,rådg.ing. og andre konsulenter** som deltok i prosjekteringsgruppen?
Sett et kryss i ruten som angir ditt svar for hver aktør, totalt tre kryss:

	Ark.	Rådg. ing.	Andre konsul.
1. Timehonorar			
2. Incitamentsavtale			
3. Fast pris kontrakt			
4. Annet.....			

20. Hva slags type kontrakt(er) ble inngått med **hovedentrepenør og øvrige entrepenører** i prosjektet?
(Ikke relevant for Construction Management prosjekter o.l.)
Sett et kryss i ruten som angir ditt svar for hver aktør, totalt to kryss:

	Hoved-Entr.	Øvrige Entr.
1. Timehonorar		
2. Incitamentsavtale		
3. Fast pris kontrakt		
4. Annet.....		

Kostnader (inkl. egeninnsats)

21. Vi ønsker her en oversikt over byggherrens ressursinnsats til prosjektering og oppføring av bygget. Kostnadene skal inneholde både egeninnsats og innkjøp av tjenester. Dersom egeninnsatsen ikke er registrert, forsøk å angi det timetallet som er benyttet på prosjektet.
Vennligst angi totale beløp i 1000 kr eks. MVA.
Tomtekjøp , finansiering. og gebyrer/avgifter holdes utenfor.

	Innkjøpt i kr.	Egeninnsats kr. .	timer
1. Prosjektering (inkl. prosjekteringsledelse)			
2. Byggeledelse			
3. Prosjektledelse			
4. Entrepenørytelser (inkl. materialer)			
5. Egen administrasjon			
6. SUM prosjektkostnad			

22. Hvor mange m2 brutto er bygget på? Antall m2_____

23. Hvor mange etasjer er bygget på? Antall etasjer_____
(eks. kjeller og evt. innredet loft)

Uforutsette hendelser

24. Skjedde det noe uforutsett i dette prosjektet som du mener fikk store konsekvenser for prosjektets planlegging og/eller gjennomføring (både med hensyn til tid, økonomi og/eller kvalitet)?

1. Ja 2. Nei

25. Dersom du svarte ja på spm. 25, hvilke av følgende hendelser inntraff?
Sett en sirkel rundt tallene som angir ditt svar:

1. Nye politiske vedtak, regler eller lover
2. Kommunale vedtak
3. Endring av priser
4. Vanskelige værforhold
5. Grunnforhold annerledes enn forventet
6. Nye miljøkrav fra samfunnet
7. Endring av rentenivå
8. Endring av brukere / leietagere
9. Annet (spesifisèr).....

APPENDIX 6

Items in group identification scale, Brown et. al. (1986)

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1. I am a person who considers the _____ group important.

2. I am a person who identifies with the _____ group.

3. I am a person who feels strong ties with the _____ group.

4. I am a person who is glad to belong to the _____ group.

5. I am a person who sees myself as belonging to the _____ group.

6. I am a person who makes excuses for belonging to the _____ group.

7. I am a person who tries to hide belonging to the _____ group.

8. I am a person who feels held back by the _____ group.

9. I am a person who is annoyed to say I'm a member of the _____ group.

10. I am a person who criticizes the _____ group.

Notes. Items are presented in random order.
Each item is answered on the following five-point scale:
Never Seldom Sometimes Often Very often
The scores for the last five items are reversed to give a possible range of 10-50 for the whole scale.