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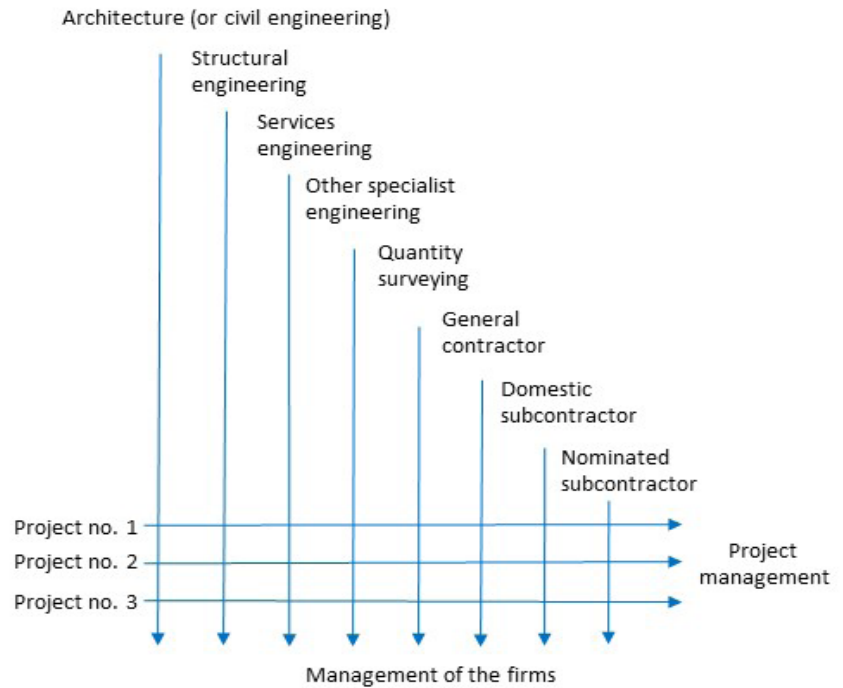
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Core Project Team As a Management Entity for Construction Projects

KEYWORDS: CORE PROJECT TEAM, CORE TEAM, CONSTRUCTION MANAGEMENT, CONSTRUCTION PROJECT, CONSTRUCTION TEAMS

The complexity of constructed facilities and the high degree of specialisation in design and construction generates very fragmented working environment for the construction project. Construction project organisations are built up from the units of organisations and they have arranged rules and procedures about how practicalities are to be done. A current perception of construction management is widely built around power, authority, and task orientation. This is resulting from the traditional focus of the construction industry on the technical and managerial features of construction projects. Organisations of construction projects vary substantially in their structure and this structure has considerable consequences to outcomes. Therefore, project management professionals continuously seek and establish new organisational and management structures and linkages to facilitate imperative cooperation between people and project partners. New understanding and amendments are broadening the content of construction project management and have provided new insights for successful construction operations. This paper is based on research according to this continuum by having focus on the appearances of management entity of a new kind, its significance and roles as a part of construction project management. The paper sought to summarize this literature and the survey study by focusing on the project management entity "core project team", later "core team". Drawing from this inclusive, the phenomenon of core team, the authors approach the field through six attributes, which have been selected to describe the new way for organising project management.





INTRODUCTION

The construction industry is a project-based industry and they have their traditional ways of structuring projects. When the single firm or organisation perform the project, their challenge is to organise participants from different special fields or functions into an effective project team (Fewings, 2005). When the size of project grows, it is common, that projects are undertaken by an amalgam of independent firms or organisations (Fewings, 2005). According to Walker (2015) the work of company in the construction industry and its specialists present two types of management issues: the problem of managing company and managing projects. The result can be a rather complex management structure. Simplified matrix management structure has been shown in Figure 1. The matrix is greatly simplified and in practice, this is rarely the case, but this gives a picture on how complex environment building projects are for management. The diagram shows that the same professional practices,

general contractor and subcontractors have performed three projects. Usually each project has a different compound of professional practices. This kind of inconsistency makes the improvement the effectiveness of the project management process extremely difficult (Walker, 2015). Traditionally construction project organisations were determined by the arrangements of separated companies selected in competitions. Wide range of organisational arrangements has arisen through the progress of interdisciplinary group professional practices. (Walker, 2015) In addition to this, most activities in the construction industry are organised through temporary organisations, which are designed to provide benefit for a permanent organization or stakeholders through complex problem-solving processes (Söderlund, 2011). Traditionally different stakeholders are solving the challenges of their own field. The experts have been worked independently acting only from their own perspectives, which has caused a

fragmented approach to project delivery and reduced project delivery efficiency (Egan, 1998; 2002; Evbuomwan and Anumba, 1998). Complex environment and different goals of stakeholders has placed challenges for management, which have been attempt to solve with different management patters. Project management professionals continuously seek to establish new structures and linkages to facilitate imperative cooperation between people and project partners.

This research focuses on an organisational entity of construction management entitled core team. The aim is to find out how known the core team is, who are involved and how many people belong to the core team. In addition, what a core team does and is it inside one company or is it organised from multi company bases, are under study. Accomplish this, the research uses six selected attributes for exploring the entity.

Figure 1. Simplified matrix management structure (adapted from Walker, 2015)

TEAMS IN CONSTRUCTION PROJECTS

Construction projects are largely unique efforts and their operations can be organised in various ways. The approach to the organisation of construction projects, which are still used in many parts of the world, is an architect as a project manager or leader. With the contractor, an architect is responsible for both design and management of the project based on a competitive tender. (Walker, 2015) In construction business, a project manager has been given practically absolute control over their project. Control is given because a head office does not want to interfere with an operating mode of a project and giving a project manager an excuse to accuse head office interference for failure to active cost and schedule goals. (Oakland and Maraszeky, 2017)

Construction project team as a concept has widely acknowledge practical significance. A simple example of a such team formation can represent the official organization in construction project meaning co-operation between an architect, structural engineer, electric engineer and building system (HVAC) engineer (Kähkönen et al., 2013). Co-operation of these different disciplines is demanded but to reach top quality solutions, smoothly operating team work is required. Informal networks encourage open communication and provide contact both across the function within the team as well outside the team to ancillary functions. According to such an understanding, teams can be formed officially or unofficially and therefore they can be operated officially or unofficially in the organisation.

Moreover we can recognize the presence of various construction project delivery teams and workgroups that can be present during the certain phases of the project. These are usually established formally or informally to serve specific needs such as architectural design, structural engineering, HVAC design, main supplies, site operations etc. Organisational boundaries can create some limits for integrative work but there is aspiration to work in collaborative manner between different teams and

workgroups (Baiden et al, 2006). High level integration in construction projects is seen as a key driver of change needed for the industry to be more successful (Fischer et al, 2017). The team design is understood as a core task for integrated project deliveries, which as a whole is highlighting the significance of project teams and team thinking in construction projects (Ashcraft, 2012).

The concept of core team has been interest of authors of this paper. Its presence can be recognized in some text books and articles of practice proposing that there can be some industrial significance around it which also can have impact on the management practices around construction projects. (Kähkönen et al., 2013).

The research behind this paper is on the management of a construction project with the aid of core teams. The research framework is built around six attributes, which present characteristics of core teams (Figure 2). The question behind the research was, does a core team exists? If it does, who are involved and what they do? Therefore, the attributes have

been selected to explain awareness of the core team, people involved and how they are organised including their assignments.

'Existence of the core team' scans understanding of construction business professionals over the awareness of core teams. Do they have knowledge that this kind of management entity has been used? 'Formality' determines the position of core team's relation to the official organisation. 'Professionals involved' relates people involved and 'team size' number of people involved. 'Organising' is related number of companies. Is the core team formed inside a company or are several companies involved? 'Tasks' represent the main assignments of core team.

CURRENT UNDERSTANDING OF CORE TEAM

It has been recognised that project experts tend to use term core team in significance a small group of project executives or experts with a mandate.

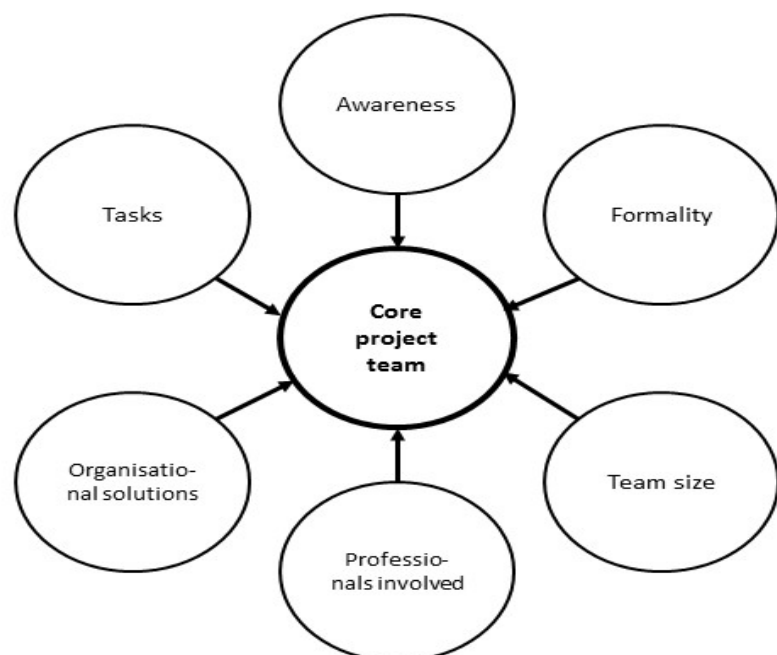


Figure 2. The attributes of the research framework

Despite of being intuitive ad-hoc solutions one should acknowledge them. (Kähkönen et al., 2013) Core team has been mentioned in the project management literature in the context of the construction industry, although only seldom. As a central unit of a project organisation, core team has been mentioned in the project management literature.

Core team is an effective approach to project team organisation developed by PRTM (Pittiglio Rabin Todd & McGrath (management consulting firm)) in mid-1980s in the context of product development (McGrath and Arrow, 2000). Since then the core team has been mentioned in the literature on several fields as a central unit of an organisation e.g. software projects (Carmel, 1995), team knowledge management (Eppler and Sokowski, 2000), organisational approach to technology strategy (Bone and Saxon, 2000), medicine (Haugen et al., 2010), innovation process of the construction sector (Koukkari, 2010), regenerative design and development (Svec, 2012),

product realisation (Rihar et al., 2012), new product development (Marion et al., 2012), project management (Wysocki, 2014) and several other fields. Even though the core team has been mentioned in several fields, only a few defines in more details what the core team is.

Hartman (2000) introduces the target organization model in which centre is the core team. These, a small group of people, are involved in a project from inception to completion for its steering and coordination. These people comprise the core team, a subset of the project team. The core team members know the projects and its objectives. They have developed the ideas, set the primary targets for the project and outline the execution plan. Anthony (1992) describes the core team as the circle in the context of product development. It implies equality of the members of the core team. Structure of the core team which Anthony described is shown in figure 3.

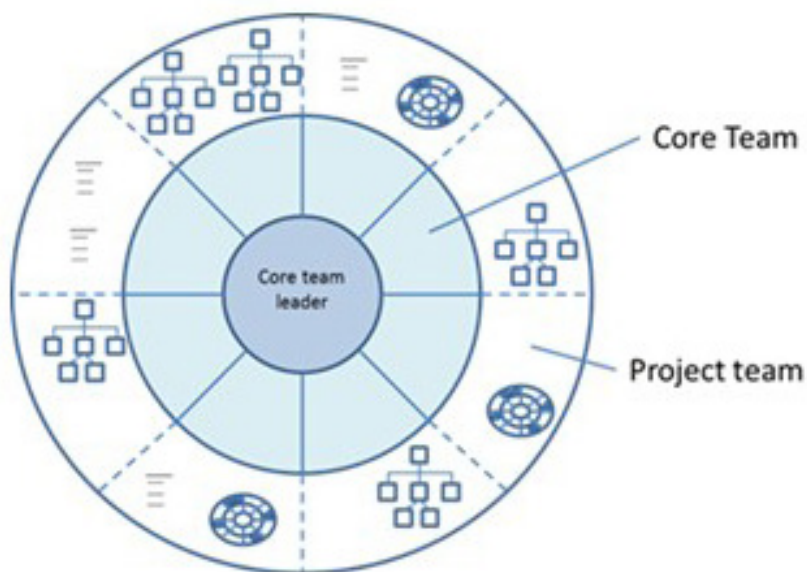


Figure 3. Structure of core team (adaption of picture; Anthony, 1992)

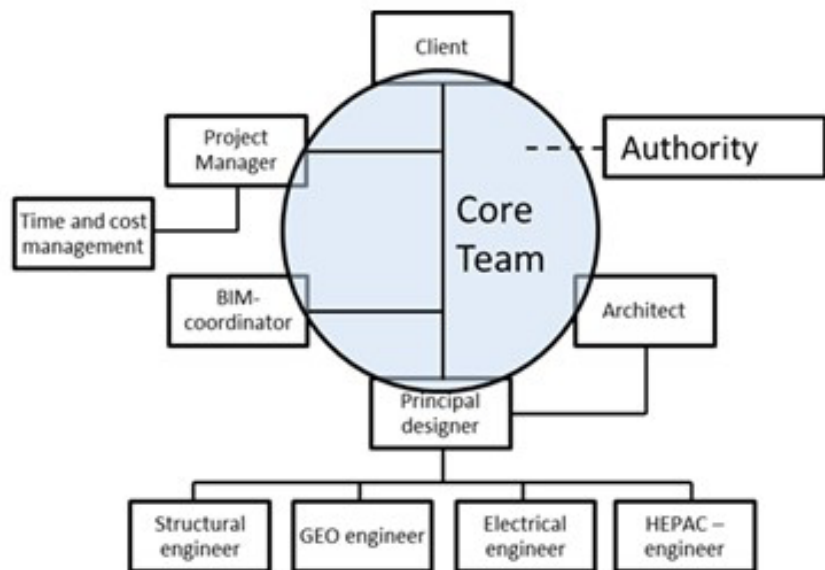
According to Anthony (1992) the core team consists of a core team leader and members of the core team. The role of project team is support and contributes the core team members for their fields. Project teams join in to the project when needed and exit as their work is completed. According to Kaushik (et al. 2014), "The core team governs the project delivery decisions."

Kähkönen (et al. 2013) have recognized that project managers and other project experts tend to use the term core team to mean a special small group of project executives or project experts with a specific mandate and introduced a core projects Team approach in the environment of building construction.

A core team can form in a different way in unequal contexts. Figure 4 presents an example of core team structure where the project manager, the client, the principal engineer, the architect and the BIM-coordinator have formed the core team.

Madusanka and Jayasena (2013) have mentioned core team in the context of integrated project delivery where the owner, the architect and the contractor create the core team. Moore (2002) also acknowledged that large projects may require a hierarchy of integrate project teams where core team is at the top of the hierarchy. According to Kähkönen (et al., 2013), companies generate their own core teams and the strategy of team formulation varies. The core team should be formulated from the professionals so that they would be able to serve the project in the best way. However, it is common that team members in a collaborative construction project should, "be equally committed to a common purpose, goals and a working approach for which they hold themselves mutually accountable" but also "deeply committed to one another's personal growth and success" (Katzenbach and Smith, 1993).

Research methodology and approach
An exploratory research approach was used in order to understand the practical appearances of core teams.



Empirical data was obtained by a survey study amongst professionals in the construction sector. The study explores the research topic with different levels of depth starting from the existence of the concept itself and finally looking for the evidence of core teams in real projects. Therefore, first, the research sought to confirm that the core team as a concept could be identified in construction business context.

The survey reached 682 selected manager and director level professionals of construction sector. They were selected from the list of Confederation of Finnish Construction Industries leaving outside small, one-man companies. After data collection period 140 useable responses were obtained. All respondents were over 26 years of age and they were mostly men (92 %). The women's share of the respondents was 8%. The respondents represent the following educational background: grammar school or vocational school (3%), high school

(0%), technical college (74 %), and university (22 %). According to this, the vast majority of the respondents, 97%, had third level educational background. In the survey quantitative and qualitative type of elements of questions were used. Data of qualitative open questions were subjected to a process of which answers were broken into lines, each representing an item that can be captured with a keyword. From this were extracted factors that summarize the data. Summarized data was further grouped into clusters, which were built into categories that form the basis for the theory emerging from the study. Thus, data was treated through several successive reductive phases, it was verified by an independent third party. Independent third party was used to ensure that the data was not being forced into categories, but that the categories represent the data.

Figure 4. Example of a core team structure

FINDINGS

THE EXISTENCE OF CORE TEAMS

The authors recognized that project managers and experts tend to use the term core team to mean a special small group of project executives or project experts with a specific mandate. In the research, the authors studied the existence of the core team among construction professionals and how widely it is known. Among the respondents, half of them (50 %) have recognized the core team as an organisational arrangement in their construction businesses. They have used or they have known used the core team as an official or unofficial arrangements in their organization.

Question, "did the core team belong to an official or unofficial organization?" measuring a formality. Organization has been defined as an official organization if it has been officially established for the project or it belongs to the official organization chart. Sample items for formality include, "belong official" and "belong unofficial" organization. The total number of respondents was 71. 65 % of the respondents answered

that the core team was an official arrangement in their organisation. The rest of respondents (35 %) described that the core team was an unofficial arrangement.

TEAM SIZE

The team size affects the processes of the team. In the study, the authors were interested in the number of the participants forming a core team. For measuring team size, a group of five questions was used. The first question, "did the number of people of the core team vary during the project?" Sample items for the question include, "number of people of the core team stays the same" and "number of people of the core team varies during the project". The question divided respondents into two sections.

The first section, the core team was the same size during the whole project, the number of people of the core team were also asked. The amount of respondents to the section was 46 % and the distribution of answers have been presented in Figure 5.

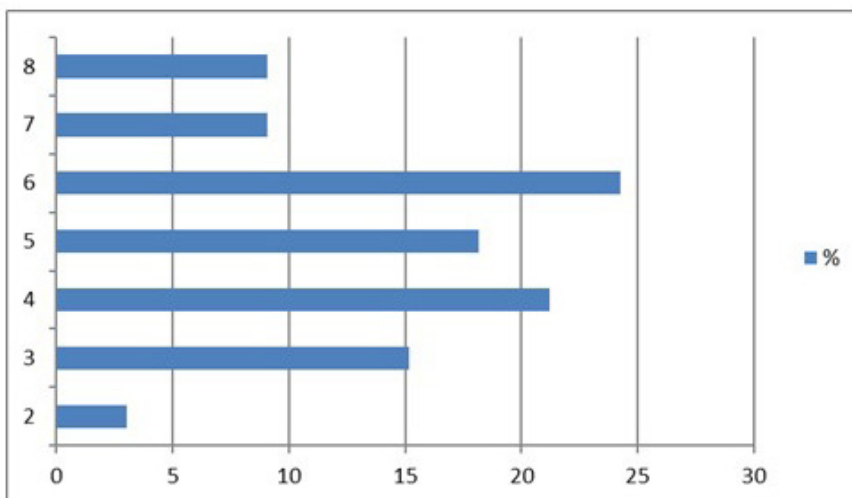


Figure 5. Team size of core team

According to respondents, there were seven different sizes of core teams mentioned. The smallest contained two people and the largest number of people was eight. Most common team sizes seemed to be six, four and five. The median of the answers was {5}.

In section two, where the sizes of the core team vary during the project, the minimum and maximum sizes of the core teams were asked. The amount of respondents to the section was 54 %. The minimum number of people vary between three and twelve. The maximum number of people in the core team vary between three and fifteen.

Organisational solutions

The gained results propose that it is possible to recognize internal core teams or multi-company ones (interorganisational). Most of the respondents have participated the work of core team which was formulated relation with other companies. Based on the survey, 58 % of all core teams are interorganisational and 42 % are internal core teams.

Based on the survey, 66 core teams with different assemblages of

members answered and 321 profession were mentioned as participants in the core teams. Professions were grouped into clusters, treated through several successive reductive phase and then verified by a third party. The third party was used to ensure that the professions were not being forced into clusters. The relevant trade clusters that were recognised are construction management, site operations, design, procurement and accounting, supervision and others. Professions such as; safety manager, apartment seller or logistic manager, which were only mentioned a couple of times, were all grouped in the trade cluster 'others'. The grouping of professions was made so that more representatives of the same profession in the same core team were calculated only one. This way distribution of professions in the core teams was determined. Figure 6 shows the occurrence of different trade clusters in relation to the core teams. Based on the survey at least one member with background in construction management has participated in 85 % of the core teams. At least one member

from site operation has been in 76 % of the core teams. The corresponding figure for the members with design background was 23 %. Members from procurement and accounting in the core team were present 30 % from all and the members from supervision 11 %. Individual from other professions has been collected into the trade cluster 'others'. They have at least one representative in the core team in 21 % of all core teams.

TASKS

One of the key interests of the research was to understand the mission of a core team. This was studied with a particular open question. The respondents named the three most important tasks, which have been assigned to the core team in question. The total number of respondents was 65 and each of them named three tasks. The tasks were grouped into clusters, which were treated through several successive reductive phase and then verified by a third party. The independent third party was used to ensure that the data was not being forced into categories, but the categories represent the data. The clusters of task and their share of the total is been presented in Figure 7.

Construction projects are consistently complex maneuvers where multiplicity of duties exist related to the construction processes.

The main attention of management personnel involved is primary on the orchestration of different parties and their activities throughout preparative work, cooperative actions and daily problem solving. Thus, when it was asked what leader or the leaders of a construction project do, the typical answers were: planning, organising, directing and controlling. Concerning a core team, the respondents answered differently. According to the respondents, the main assignment was to take care of the finance of the building project. The schedule control came close to this followed by decision making.

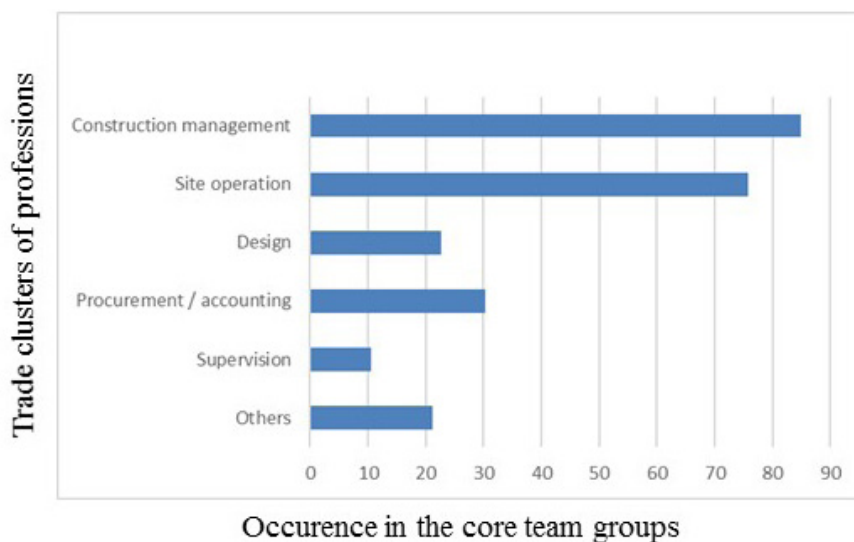
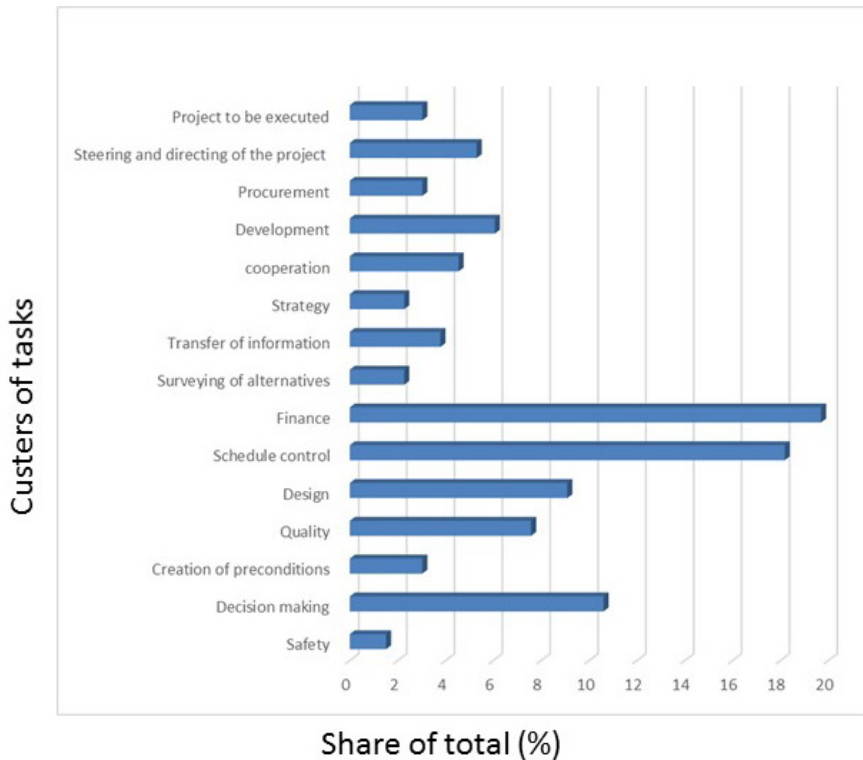


Figure 6. Occurrence of trade clusters in the core teams



DISCUSSION

The construction industry can be characterized as a complex project-based industry where the operations are frequently structured in traditional ways. Too often, vital decision making is drowned by a hierarchical manner where part optimisation procedures are hindering the achievement of high-value results (Kähkönen et al., 2013). In construction business, a project manager has almost full control over their project (Oakland and Maraszeky, 2017). Albeit, in construction projects the high-level integration is seen as a key driver of change needed the industry to be more successful (Fischer et al, 2017). Fragmentation is the consequence of two major factors (Mitropoulos and Tatum, 2000): the high specialisation in design and construction and the intricacy of the constructed facilities. Specialisation is the consequences of distribution of work between organizations as well as between organizational positions. Specialisation permits an organization

gain greater degrees of know-how among members but consequences might be the fragmentation of knowledge and different objectives. The danger is that experts do not understand the consequences of their decisions from the point of view of other stakeholders of the production system. The result is part-optimum decision which is it is not the best for the whole project. Likely, conflicts will exist among participants. A core team is an optional organisational settlement for managing construction project teams.

Often construction project organisations were settled by the arrangements of independent companies selected in competitions. A wide range of organisational arrangements has arisen through the progress of interdisciplinary group professional practices. (Walker, 2015) Traditionally, stakeholders are solving the challenges of their own field and the experts have been acted only with their own perspectives, which has

reduced project delivery efficiency (Egan, 1998; 2002; Egbuomwan and Anumba, 1998). Therefore, new organisational structures and linkages are sought to facilitate imperative cooperation between stakeholders.

The team design is understood as a core task for integrated project deliveries, which as a whole is highlighting the significance of project teams and team thinking in construction projects (Ashcraft, 2012). Design and production strategies and partnering arrangements have been used to attempt to integrate the construction project delivery team (Love, 1998; Anunba et. al, 2002). However, many of these well intentioned attempts have not fully achieved to anticipated success probably because they are frequently superimposed onto environments where adversarial cultures and attitudes still exist (Moore and Dainty, 1999, 2001).

Perhaps the organisational approach, where management of separated teams of stakeholder is integrated more closely, provides more value adding collaboration between project partners.

The core team is an interesting management arrangement in construction business. It seems that core teams as an approach are particularly used in complex major projects where the core team can bring together the key players with a sufficient mandate to steer the project further. Among the core team members the responsibilities are shared and the team can be responsible for the overall success of the project.

In decision-making, part optimisation is avoided and decisions are made based on what is the best from the point of view of the whole project. Companies selected their own core teams and there are several possible way to formulate the core team. Construction projects have all their own unique features and each core team seems to be formed according to a project.

The core team is established for the project, thus tackle the management issue presented by Walker (2015): the problem of managing company and of managing a project.

Figure 7. Main tasks of a core team

CONCLUSIONS

A typical construction project is an effort that involves a number of different organisations brought together. The challenge is to organise the participants of different organisations, special fields and functions into a form of an effective project team. This paper focused on describing the role of core team. To do this, the research used six attributes for exploring the entity.

The research findings show that the concept core team has been recognised in several fields, whereas only a few examples were found with a detailed definition of core team. Additionally it was found that the core teams could exist both in an official or unofficial organisational arrangements in construction projects. It seems that the official arrangements are a somewhat more frequently used approach. The number of members in a core team can be fixed during the project. Based on research almost the half of teams reported being like this. Usually a project core team is composed of six members. Based on what types of skills are needed in the different stages of projects, the number of members can vary during the project. The core team can be

organised inside one company, but it seems, that organizing the core team interorganisational are a somewhat more frequently used approach. Over 300 professions were mentioned belonging to the core team. It was found that construction management and site operations were the most represented clusters of professions that had at least one member in the core team. During a construction project, the tasks of the core team are multifarious. The research findings show us that three main tasks of the core team are taking care of the finance, schedule control and make decisions.

We see the core team as an important development of project structuring that does not hold a fully developed position as a part of formal project structures it can have. In the future, the manning, mandates, contractual recognitions, established approached and decision-making practices are the dimensions where developments should take place. This kind of new team concept can be useful for taking the full benefits of project teams as project structuring approaches.

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