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# Firm's Capabilities in Project Business

*A Systematic Literature Review and Syntesis*

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# ABSTRACT

This literature review examines the concept of capabilities in project business. In business context, a concept of capability means a firm's ability to do something. The capabilities result from available resources and skills. In many industries, production is executed in project-based environment. Project business is defined as part of business that relates to projects, where a firm (or firms) strives for achieving objectives. This study identifies the main themes and research streams in scientific literature on capabilities in project business. Also, the study suggests a tentative framework of firm capabilities in project business, which stresses the important aspects of capabilities for a firm operating in project-based environment.

The review applies a systematic literature review method in data collection and inclusions. Web of Science database is the used in data searches, which were conducted in January 2020. In this study, bibliometric analyses (document co-citation analysis, bibliographic coupling) were used in finding themes and research streams in the literature on capabilities in project business. The framework is generated based on the articles that have a focus suitable for the framework purpose.

The literature on capabilities in project business has increased considerably from year 2010 onwards. The analyses identify the eight document clusters, which represented the themes or topics. Based on number of articles, three biggest themes were: 1) capabilities development in innovation and knowledge management, 2) Dynamic capabilities and project management, and 3) organizational capabilities and IT-systems. Other topics related to capabilities were in connection with purchasing, sustainability and digitalization.

This study identified seven document clusters in research stream examination. The three largest streams in terms of number of documents were 1) absorptive capacity and identification and developing needed capabilities, 2) dynamic capabilities and competitive advantage, and 3) firm's resources and capabilities and competitive advantage. Other research streams were scientific research methodologies and capabilities in connection with firm growth, development and resources.

The tentative framework for project business capabilities consisted of the capabilities emerging on different phases of project process, exploiting the capabilities of supplier network, the importance of learning capability and dynamic capabilities.

# TIIVISTELMÄ

Tämä kirjallisuuskatsaus keskittyy kyvykkyyden käsitteeseen projektiliiketoiminnassa. Liike-elämän viitekehyksessä kyvykkyydellä tarkoitetaan yritysten kykyä tehdä tai suorittaa asioita. Yrityksen kyvykkyyks muodostuu käytettävissä olevista resursseista ja niiden hyödyntämisen osaamisesta. Monella teollisuudenalalla (esim. telakkateollisuus) tuotanto tapahtuu projektimaisesti. Projektiliiketoiminta tarkoittaa sitä osaa liiketoiminnoista, jossa yksi tai useat yritykset pyrkivät saavuttamaan asetettuja tavoitteita projektimaisella toiminnalla. Kirjallisuuskatsauksen tavoitteena on muodostaa kokonaiskuva siitä tieteellisestä kirjallisuudesta, joka käsittelee kyvykkyyttä projektiliiketoiminnan yhteydessä. Kiinnostuksen kohteena on selvittää, mitä teemoja tai aiheita ja tutkimussuuntauksia tässä kirjallisuudessa esiintyy. Lisäksi tavoitteena on muodostaa teoreettinen kehys, joka sisältää ne kyvykkyyden osa-alueet, jotka kirjallisuudessa nähdään tärkeiksi nimenomaan projektiliiketoiminnassa.

Tutkimuksessa sovelletaan systemaattisen kirjallisuuskatsauksen menetelmää aineiston etsimisessä ja valinnassa. Kirjallisuuskatsauksen aineiston lähteenä käytetään Web of Science -viitetietokantaa, josta suoritettiin kirjallisuushaku tammi-kuussa 2020. Tutkimuksessa käytetään bibliometrisiä analyysejä (dokumenttien yhteisviittausanalyysi ja bibliografinen kytkentä) aineistossa esiintyvien aiheiden ja tutkimussuuntausten tunnistamiseksi.

Kyvykkyyksiä projektiliiketoiminnassa käsittelevät tieteelliset julkaisut ovat lisääntyneet 2010-luvusta alkaen runsaasti. Aineistosta tunnistettiin analyysien perusteella kahdeksan dokumenttiklusteria, jotka edustivat aihealueita tai teemoja. Näistä kolme suurinta artikkelimäärien perusteella olivat 1) kyvykkyyksien kehittäminen innovaatio- ja tietojohdamisen yhteydessä, 2) dynaamiset kyvykkyydet ja projektijohtaminen sekä 3) organisatoriset kyvykkyydet ja IT-järjestelmät. Muita tunnistettuja aihealueita olivat mm. ostotoimintaan, kestävään kehitykseen ja digitalisaatioon liittyvät kyvykkyystarkastelut. Tutkimussuuntauksien osalta tunnistettiin seitsemän dokumenttiklusteria, joista dokumenttien lukumäärän perusteella kolme suurinta edustavat 1) absorptiivisen kapasiteetin ja kyvykkyyksien tunnistamista ja hyödyntämistä, 2) dynaamisten kyvykkyyksiä ja kilpailukykyä sekä 3) yritysten resursseja ja kyvykkyyksiä ja kilpailukykyä. Muita suuntauksia olivat mm. tieteellisen tutkimuksen metodologiat ja kyvykkyydet yritysten kasvuun, kehitykseen ja resursseihin liittyen. Projektiliiketoiminnan liittyvien kyvykkyyksien kehitykseen valikoituvat projektiprosessin eri vaiheissa esiin nousevat kyvykkyydet, toimittajaverkoston

kyvykkyyksien hyödyntäminen, kokemusperäisen oppimisen kyvykkyyden merkitys ja dynaamiset kyvykkyydet.

# EXECUTIVE SUMMARY

Capabilities are an important source of competitive advantage. The notion of knowing how --instead of knowing what-- describes the capability concept succinctly. Firm resources are turned into valuable market offering with capabilities. In many industries business is conducted project-based. This calls for attention to the capabilities that should be considered and developed by a firm that operates in project business.

This study proposes a tentative framework of capabilities in project business, which offers three practical propositions when developing a firm's strategy. First, a firm should pay attention to learning capability, which means that the lessons learned in the past project executions should be exploited in the future project executions. This is especially important for firms that aim at repeatable project executions and therefore standardize or modularize the project functions. The effective learning helps avoiding repeating same mistakes in the future. Second, a supplier network should be held as a pool of capabilities. The ability to identify the needed capabilities in different stages of a project gives guidelines to supplier selection criteria and highlights importance of managing the supplier relationships. Third, dynamic capabilities are important in project business. The concept of dynamic capabilities refers to higher level capability, divided into sense, seize and reconfigure capacities. Sensing stands for the firms' ability to sense the changes in markets and customer needs. These changes may open new opportunities and seizing the identified opportunities and the ability to reconfigure the resource base can offer competitive advantage.

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# 1 INTRODUCTION

## 1.1 The outline of the study

The research field on capability concept is extensive. The capabilities are closely linked to firm resources, competitive advantage and performance, which are focal concepts in e.g. strategic, organization and marketing management. This literature review concentrates on the central concepts related to firm capabilities and attempts to discover how capabilities in research literature are treated in project business context. In many industry sectors (e.g. shipbuilding, construction industry, information technology) business is conducted project-based, thus highlighting the importance of characteristics of the project business. The target of this review is to identify the main themes in the literature that discusses capabilities in project business context. Also, this review tries to recognize the theoretical origins or research streams in literature of the capability concept.

This study follows the systematic literature review method and applies bibliometrics tools and analysis in visualizing the structure of scientific literature that focuses on capabilities in project business. Bibliometrics analyses are deepened by examining the literature structure also from temporal point of view, which gives insight on how the research has developed over time. The following research questions are set for the study and they partly summarize that targets of this review.

**RQ1: What is the thematical structure of scientific literature discussing capabilities in project business?**

**RQ2: What research streams can be identified in the scientific literature of the capabilities in project business?**

This study also attempts to generate a tentative framework of firm capabilities in a project business context. Based on the research literature, the framework should highlight the aspects of capabilities that are important for a firm that operates in project business. Next section focuses briefly on the central concepts of this study including firm capabilities and project business. Then, the used research methodology and data is addressed. The next section summarizes results of the study. Finally, the review discusses the findings of the study and draws the conclusions.

## 2 THE CENTRAL CONCEPTS OF THE STUDY

### 2.1 Direct and indirect capabilities

Firms need capabilities to create and maintain competitive advantage in markets. Competitive advantage ensures firm's success in markets and fosters the income and growth of the firm. The competitive advantage has been studied for decades in management research (e.g. Porter, 1980). According to Prahalad and Hamel (1990) the source of competitive advantage derives from firm's management abilities and capabilities to utilize the technological and production skills and to turn these into competencies that markets demand at a given time. Valuable, scarce and inimitable resources that firm possesses are a source of sustainable competitive advantage (Barney, 1991). This notion is central to the resource-based view (RBV) of the firm which connects the resources and firm capabilities together.

Research on capabilities roots mainly from RBV. Edith Penrose's (1959) research and seminal book *Theory of growth of the firm* introduced the resources and capabilities and their significance on firm's competitive advantage. The capability is defined in Cambridge Dictionary as "the ability to do something" (<https://dictionary.cambridge.org/dictionary/english/capability>). The ability to do something distinguishes the capability concept of the pure resource concept, at least when the resources are defined as assets a company owns. According to Day (1994) resources are assets that firm has generated through investments and activities and capabilities are the ability to exploit these assets.

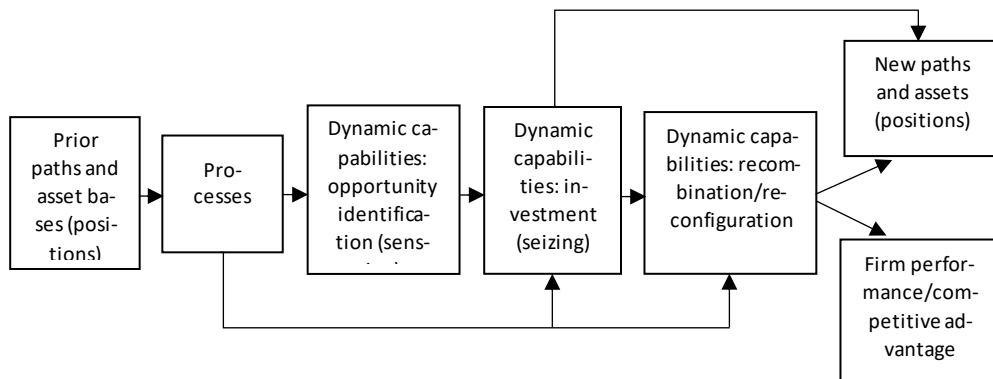
Concept of capabilities is complex. Loasby (1998) discusses capabilities from a firm's perspective as "know how" and distinguishes this from "know what". Knowing how leads to development of needed skills and executing these skills in practice. Loasby (1998) identifies firm's direct capabilities and indirect capabilities. Whereas direct capabilities are connected to firm assets and skills to manage these in a productive way, indirect capabilities refer to the notion of the ability of obtaining access to the needed capabilities outside of the firm (Araujo, Dubois, & Gadde, 2003; Loasby, 1998; Spring & Araujo, 2014). Accessing the external capabilities do not exclusively mean controlling these capabilities. Instead, accessing the outside capabilities can manifest also in an inter-firm relationship. The transaction efficiency between two firms depends on indirect capabilities (Loasby, 1998). Spring and Araujo (2014) suggests four elements that compose the indirect capabilities: interface

artefacts (e.g. IT applications helping interaction between firms), contracting (ability to conclude efficient agreements and establish subcontracting relationships), boundary management practices (e.g. ability to identify needed capabilities in recruiting) and IT infrastructure (e.g. applications enabling data and information exchange between firms). The connection of firm capabilities and inter-firm relationships adds the complexity of the capability concept. According to Araujo et al. (2003) the capabilities are “embedded” in nature. This means that the capabilities are not in isolation but develop through relationships with customers and suppliers. Uzzi and Gillespie (2002) emphasizes also the embeddedness of the capabilities and that the benefits of the capabilities actually emerges in the inter-firm relationships. The usefulness of the capabilities depends on circumstances. A specific capability may bring fruitful results in certain situation, but the same capability doesn’t necessary work as well in all situations although the circumstances may appear fitting (Loasby, 1998).

## 2.2 Dynamic capabilities

The concept of dynamic capabilities forms a significant area in the capability research. According to an established definition by Teece et al. (1997, p. 515) the dynamic capabilities are firm’s ability *“appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional competences to match the requirements of a changing environment”*. According to Witcher et al. (2008) the dynamic capabilities are higher-level concept that affect lower-level capabilities and competences. The dynamic capabilities are divided into three enterprise-level capacities: sensing, seizing and reconfiguring (Teece, 2007). The framework of these capacities has been adopted in research in different contexts, e.g. firm’s digital transformation (Warner & Wäger, 2019) and project-based organization (Choi, Cho, Han, Kwak, & Chih, 2018).

The dynamic capabilities’ connections to resources and competitive advantage is presented in figure 1. The process model is based on Teece’s (2007) work.



**Figure 1.** Process of resources to competitive advantage (adapted from Helfat & Peteraf, 2009, p. 96).

The figure 1. suggests that capabilities root from processes or routines which are developed from path-dependent resources. This implies that dynamic capabilities do not suddenly appear but are formed by business choices firm has made in past. The dynamic capabilities consist of identifying opportunities (sensing), investing (seizing the opportunity) and recombining skills and resources (reconfiguring). The dynamic capabilities affect the firm performance and competitive advantage and lead firm to its new position.

The concept of dynamic capabilities is connected to organizations' absorptive capacity. The absorptive capacity of an organization refers to the ability to identify external, valuable information, adapt to it internally and exploit the outcome commercially (Cohen & Levinthal, 1990). The organization's absorptive capacity is accumulative, which means that it develops during organization's lifecycle.

## 2.3 Project business

A project is a way to organize and manage a target-oriented work (product, service etc.) that has a starting point and ultimately a finish. The notion of project is rather common in research literature and the conceptualization of the project in different context is blurred (Sydow, Lindkvist, & Defillippi, 2004). In many industries manufacturing is organized as projects, when products are customized to meet specific customer requirements. This practice refers to project manufacturing or engineer-to-order (ETO) manufacturing, in which products are the outcome of a project (Yang, 2013).

The term “project” is a general contextual term including intra- and inter-organizational settings e.g. business process re-engineering project, ERP-implementation project and delivery project (related to high-value capital goods). Artto and Wikström (2005, p. 351) has defined project business as “*Project business is the part of business that relates directly or indirectly to projects, with a purpose to achieve objectives of a firm or several firms*”. This general level definition is a result of a bibliometrics and conceptual study which analyzed the thematic structure on project related scientific literature.

## 3 RESEARCH METHOD AND DATA

### 3.1 Systematic literature review

A review of past literature and knowledge is part of every scientific study. A systematic literature review method has originally been applied in medical science but its use in social sciences has increased. Compared to a traditional narrative literature review where the researcher's study selections could be implicit, the systematic literature review method is set for example to minimize the biased view of the researcher by systematic literature searches and explicit inclusion and exclusion criterion of the literature (Cook, Mulrow, & Haynes, 1997). The replicability of the study and transparency of the made choices are important features of the systematic literature review (Tranfield, Denyer, & Smart, 2003).

### 3.2 Bibliometric analyses

Bibliometrics is a quantitative method which uses published works as data and its analyses are used for many different purposes (Forsman, 2016). For example, universities can measure their employees'/researches publishing activity or funding authorities may want to follow which universities count for most published works in certain fields when assessing the future funding. Bibliometrics is also used by researchers in more detailed analyses related to literature substance or content. Different analyses (e.g. co-citation analysis and bibliographic coupling) have been developed for example to identify research streams or researcher networks within areas of interest. Document co-citation analysis has been performed to group documents that share similarities in subject (Small, 1980). Bibliographic coupling analysis has been used to reveal in the document data similarities in research focus (Jarneving, 2007).

### 3.3 Data search and article inclusions

Data search in Web of Science (WoS) Core collection was conducted on the 28th January 2020. The used search string was capability\* AND Project AND Business. The target was to capture the documents that discussed the capabilities in business and especially in project context. The search was limited to articles and English language

with no time limitation regarding publish year. Preliminary dataset consisted of 119 articles. The dataset was exported from WoS to Excel where each article was in its own row in a list. The list included following information of the articles: authors, article title, source/journal, publish year, volume, issue and page numbers. In addition, key words, abstract and DOI-link was added to the list.

Next, an inclusion/exclusion process for the dataset was done. The inclusion or exclusion was conducted based on evaluation of articles' title, keywords and abstract. The criterion for inclusion was that the article included capability term in a context of a) project or business, b) interfirm relationships or c) theoretical concept discussion. The exclusion or inclusion was marked in the list for each article. This process resulted in 26 article exclusions, which made up 93 articles to be included in the final dataset.

## 4 RESULTS

### 4.1 Descriptive statistics of literature dataset

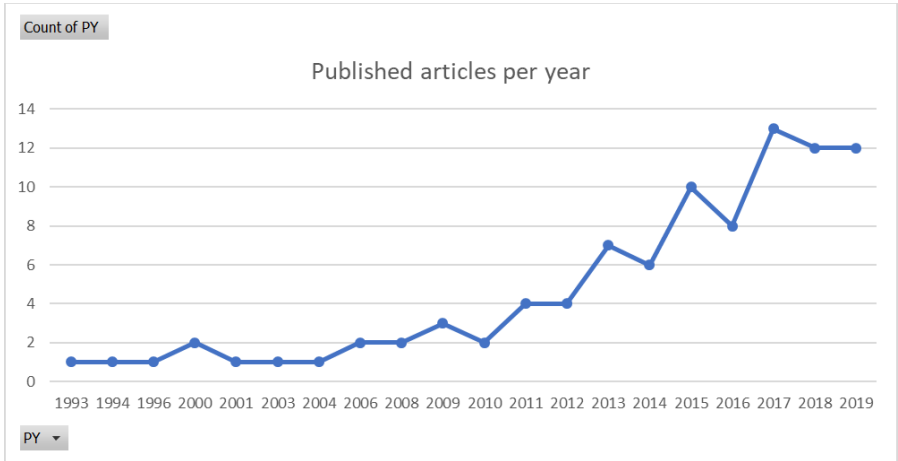
This section reports the descriptive statistics of the 93 articles dataset. Altogether the dataset contained articles from 69 different journals. Table 1. shows the journals which count for two or more articles in the dataset.

**Table 1.** Two or more articles per journal in the dataset.

| Journal                                                | Number of articles in dataset |
|--------------------------------------------------------|-------------------------------|
| Industrial Marketing Management                        | 6                             |
| Sustainability                                         | 5                             |
| International Journal of Project Management            | 4                             |
| Business Process Management Journal                    | 3                             |
| International Journal of Production Research           | 3                             |
| Decision Support Systems                               | 2                             |
| Industrial and Corporate Change                        | 2                             |
| Industrial Management & Data Systems                   | 2                             |
| International Journal of Construction Management       | 2                             |
| International Journal of Managing Projects in Business | 2                             |
| Journal of Business & Industrial Marketing             | 2                             |
| Journal of Cleaner Production                          | 2                             |
| Service Industries Journal                             | 2                             |

The top journals represent the research fields of marketing, project and business management, environment management, production management and service management. From the context point of view, business and industry sectors typify the dataset's journals.

The publishing years of the articles is reported in figure 1. The figure shows how research on capabilities in project business context has developed in terms of number of publications.



**Figure 2.** Number of published articles per year in dataset

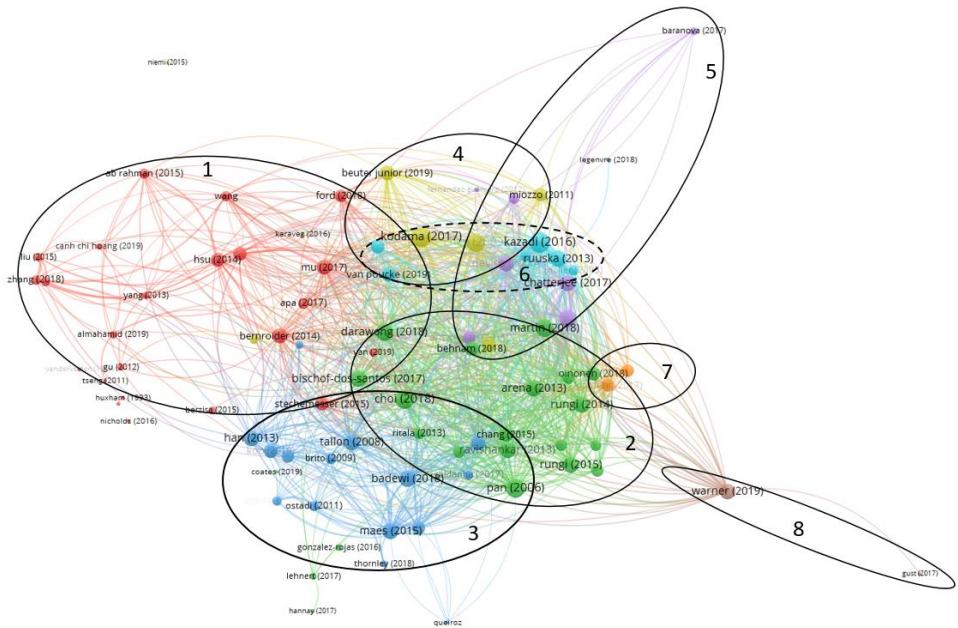
The publishing years of articles in the dataset range from 1993 to 2019. The research activity has increased from year 2010 and peaks in 2017 with 13 published articles. This clearly indicates that the research interest in the capability in project business has grown during the last ten years.

## 4.2 Structure and roots of literature on capabilities in project business

### 4.2.1 Bibliographic coupling

Bibliographic coupling bases on the notion that the coupling between two published documents are stronger the more references they share. The bibliographic coupling analysis create a network of documents. In the network, there is formed document clusters, which are argued to share similarities in terms of research topic or method. The target is to create a division of the themes and topics related to the literature combining the capabilities and project business.

Figure 3 depicts the bibliographic coupling analysis of the datasets. The illustration is made with VOSviewer program (version 1.6.13).



**Figure 3.** Visualization of bibliographic coupling, document clusters circled

The nodes in the figure stands for articles and the color of the nodes represent a cluster the articles belong to. The VOSviewer visualization included 88 articles (of total n=93) in the analysis. The bibliographic coupling analysis reveals eight clusters in the dataset. The clusters are roughly circled and numbered in the figure. The articles within the clusters were analyzed and searched for a theme that represented the articles in the clusters. The thematic analysis was conducted in synthesis of qualitative and quantitative methods. The qualitative method included reviewing the clusters' articles and making a summary based on the titles and abstracts. This review gave an overview of the contents and subjects of the articles in the clusters. The quantitative method contained applying statistics on the occurred words in the clusters' documents. The data included the titles and abstracts of each clusters' articles. As an example, figure 4 illustrates word clouds of clusters 1 and 6. The word



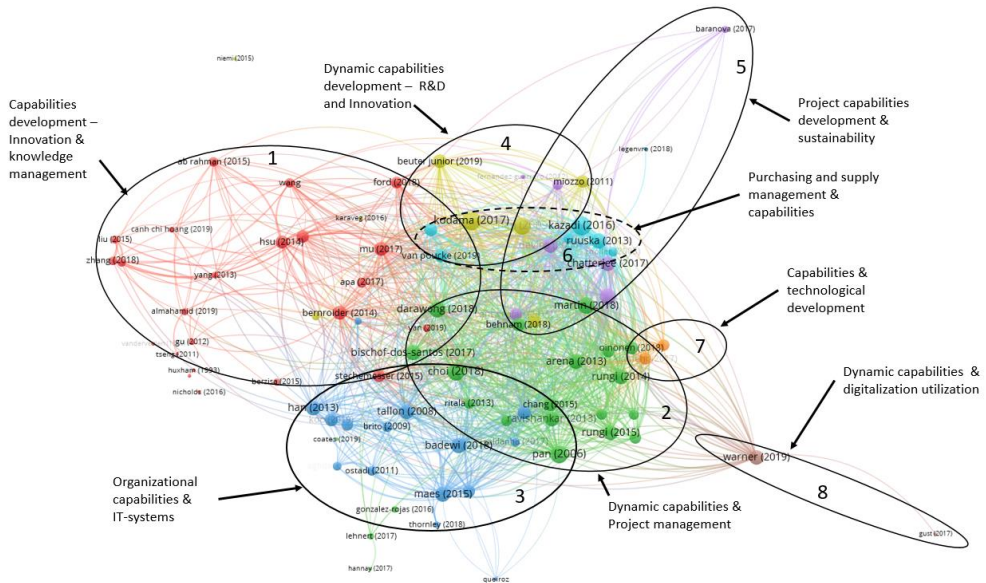
| Terms           | CLUSTER 1 | CLUSTER 2 | CLUSTER 3 | CLUSTER 4 | CLUSTER 5 | CLUSTER 6 | CLUSTER 7 | CLUSTER 8 | sum x |
|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------|
| capabilities    | x         | x         | x         | x         | x         | x         | x         |           | 8     |
| business        | x         | x         | x         | x         | x         | x         |           | x         | 7     |
| capability      | x         | x         | x         | x         | x         | x         | x         |           | 7     |
| study           | x         | x         | x         | x         | x         | x         | x         |           | 7     |
| projects        |           | x         | x         |           | x         | x         | x         |           | 5     |
| case            |           | x         |           | x         |           | x         | x         |           | 4     |
| innovation      | x         | x         |           | x         |           | x         |           |           | 4     |
| results         |           |           | x         |           |           | x         |           |           | 2     |
| value           |           |           | x         |           |           | x         |           |           | 2     |
| chain           |           |           |           |           |           | x         |           |           | 1     |
| co-creation     |           |           |           |           |           | x         |           |           | 1     |
| creation        |           |           |           |           |           | x         |           |           | 1     |
| purchasing      |           |           |           |           |           | x         |           |           | 1     |
| sourcing        |           |           |           |           |           | x         |           |           | 1     |
| stakeholder     |           |           |           |           |           | x         |           |           | 1     |
| subcontractors' |           |           |           |           |           | x         |           |           | 1     |
| supplier        |           |           |           |           |           | x         |           |           | 1     |
| suppliers       |           |           |           |           |           | x         |           |           | 1     |
| supplier's      |           |           |           |           |           | x         |           |           | 1     |
| supply          |           |           |           |           |           | x         |           |           | 1     |

**Figure 5.** Snapshot of terms list with cluster 6's terms filtered.

Based on the qualitative and quantitative methods, the clusters were given a name. The idea was to develop a name that represents the topic(s) or theme(s) that cluster's articles are discussing. The term frequencies and uniqueness compared to other clusters' terms affected the cluster naming. The cluster sizes in terms of number of articles and the found topic is presented in table 2. Figure 6 draws the bibliographic coupling visualization with identified themes added.

**Table 2.** Number of articles and thematic content per bibliographic coupling clusters.

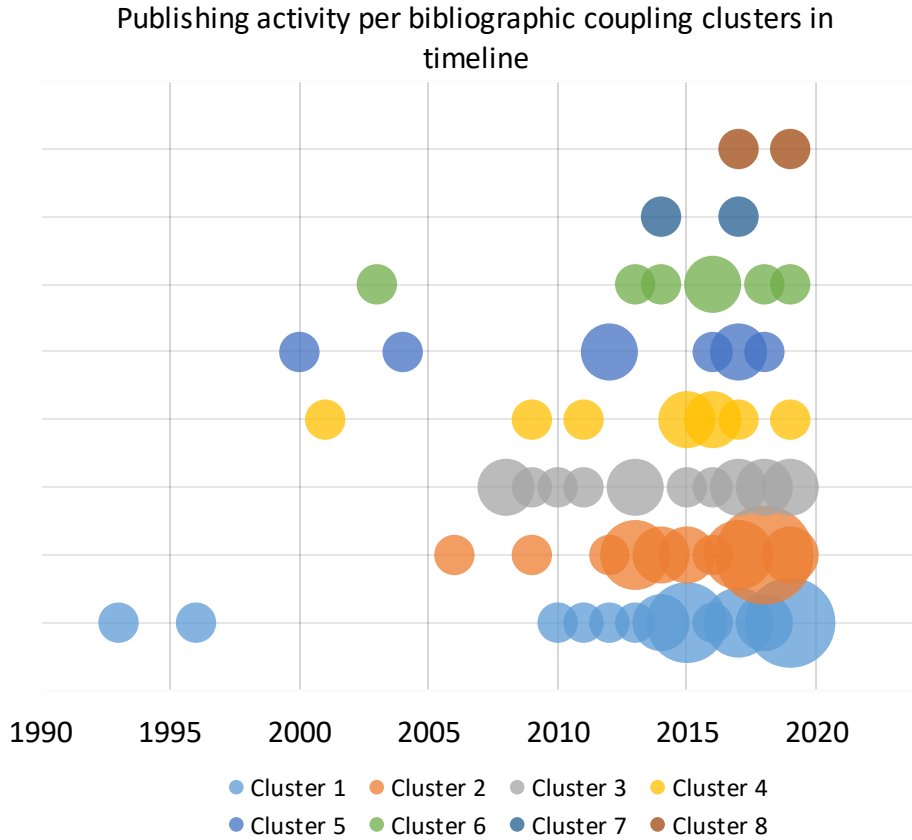
| Cluster | No of articles | Theme                                                        |
|---------|----------------|--------------------------------------------------------------|
| 1       | 23             | Capabilities development – Innovation & knowledge management |
| 2       | 22             | Dynamic capabilities & Project management                    |
| 3       | 15             | Organizational capabilities & IT-systems                     |
| 4       | 9              | Dynamic capabilities development – R&D and Innovation        |
| 5       | 8              | Project capabilities development & sustainability            |
| 6       | 7              | Purchasing and supply management & capabilities              |
| 7       | 2              | Capabilities & technological development                     |
| 8       | 2              | Dynamic capabilities & digitalization utilization            |



**Figure 6.** Visualization of bibliographic coupling, document clusters circled

The clusters 1-3 cover 75 % of articles in the analysis dataset. The themes in the tree biggest clusters are related to organizational capabilities, dynamic capabilities, capability development, knowledge and project management and innovation. The smaller clusters themes cover perhaps more specific focus areas namely sustainability, purchasing and supply management, technology development and digitalization.

Based on the article clusters, also an analysis from the timeline perspective was made. Analyzing the clusters from the timeline perspective gives insights on which themes have become more active during the years. Figure 7 depicts this analysis. The bubbles represent articles and the bigger the bubble is the more articles have been published during that year.



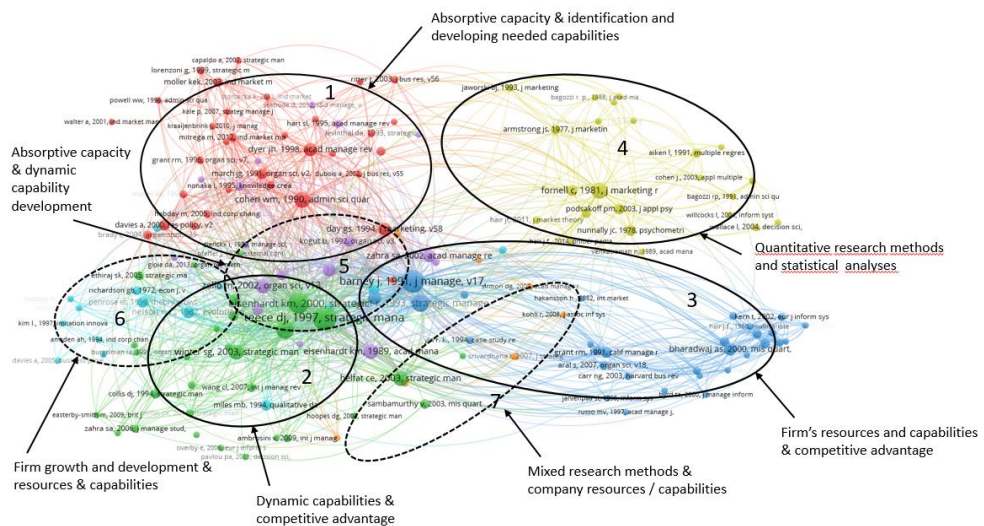
**Figure 7.** Bibliographic coupling document clusters on timeline. The size of the bubble represents the publishing activity per year.

Cluster 1 articles are on the bottom and cluster 8 articles are on the highest line. As shown earlier in figure 1, the overall publishing activity has increased from year 2010 onwards. This is also visible in figure 7. IT, technology and digitalization related themes (clusters 3, 7 and 8) have emerged 2008 and especially the digitalization utilization during last years, which is rational since this theme has gained lot of attention during the last years.

#### 4.2.2 Document co-citation analysis

Document co-citation analysis reveals the research streams within the literature data (small 19xx). The document co-citation by notion means that two documents are co-cited when these two documents are cited together by other documents. The

more the two documents are co-cited by other documents, the higher is the co-citation strength between these two documents. The document co-citation analysis reveals 155 documents, and they comprise seven clusters. The content or thematic analysis of the clusters was conducted basically similar than in bibliographic coupling data. However, contrary to the case of bibliographic coupling, text data was not as easily available of the cluster documents. From each cluster, documents with the strongest total link strengths was identified and the thematic analysis was conducted based on them. The text data analysis based on the document titles and abstracts. Table 3 list these documents. In table 4, there are the clusters and their sizes in terms of number of documents and interpretation of the clusters' thematic content. The document co-citation analysis based on the used dataset is visualized in figure 9. The visualization is made with VOSviewer-program. The analysis includes the references that has received three or more citations, which limits the results leaving to weaker co-citation documents out. In the figure, there is roughly circled the nodes belonging to one cluster.



**Figure 8.** Visualization of document co-citation analysis, document clusters circled and named.

**Table 3.** The strongest total links strength documents per clusters of the document co-citation analysis.

| Cluster | Document                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Cohen, W.M., Levinthal, D.A., 1990, Absorptive Capacity: A New Perspective on Learning and Innovation, <i>Administrative Science Quarterly</i>, 35(1), pp. 128-152</p> <p>Day, George S., 1994, The capabilities of market-driven organizations, <i>Journal of Marketing</i>, 58 (4), 37-52</p> <p>Dyer, J.H., Singh, H., 1998, The relational view: Cooperative strategy and sources of interorganizational competitive advantage, <i>Academy of Management Review</i>, 23 (4), 660-679</p> |
| 2       | <p>Eisenhardt, K.M., Martin, J.A., 2000, Dynamic capabilities: What are they? <i>Strategic Management Journal</i>, 21 (10/11), 1105-1121</p> <p>Teece, D.J., Pisano, G., Shuen, A., 1997, Dynamic capabilities and strategic management, <i>Strategic Management Journal</i>, 18 (7), 509-533</p> <p>Teece, D.J., 2007, Explicating dynamic capabilities: the nature and micro-foundations of (sustainable) enterprise performance, <i>Strategic Management Journal</i>, 28 (13), 1319-1350</p> |
| 3       | <p>Amit, R., Schoemaker, P.J.H., 1993, Strategic assets and organizational rent, <i>Strategic Management Journal</i>, 14 (1), 33-46</p> <p>Barney, J., 1991, Firm Resources and Sustained Competitive Advantage, <i>Journal of Management</i>, 17 (1), 99-120</p> <p>Bharadwaj, A.S., 2000, A resource-based perspective on information technology capability and firm performance: An empirical investigation, <i>MIS Quarterly</i>, 24 (1), 169-196</p>                                       |
| 4       | <p>Fornell, C., Larcker, D.F., 1981, Evaluating structural equation models with unobservable variables and measurement error, <i>Journal of Marketing Research</i>, 18 (1), 39-50</p> <p>Nunnally, J.C., 1978, <i>Psychometric theory</i>, McGraw-Hill</p>                                                                                                                                                                                                                                      |

Podsakoff, P.M., MacKenzie, S.B., Jeong-Yeon L., Podsakoff, N.P. 2003, Common method biases in behavioral research: A critical review of the literature and recommended remedies, *Journal of Applied Psychology*, 88 (5), 879-903

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**5** Eisenhardt, K.M., 1989, Building theories from case study research, *The Academy of Management Review*, 14 (4), 532-550

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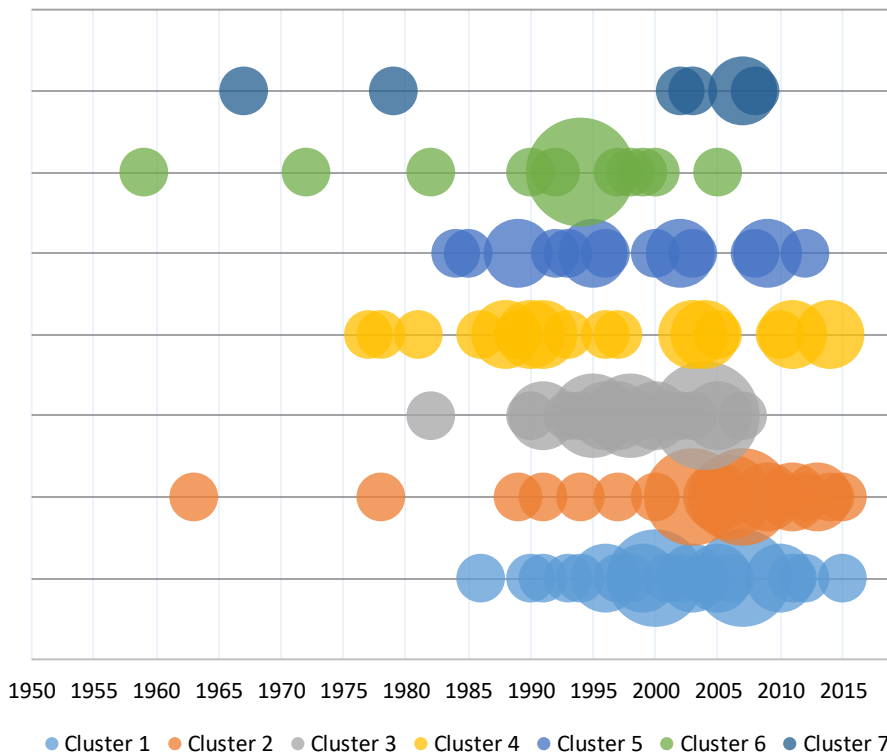
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**Table 4.** Number of documents and thematic content per document co-citation clusters.

| Cluster | No of documents | Description of themes in documents                                          |
|---------|-----------------|-----------------------------------------------------------------------------|
| 1       | 32              | Absorptive capacity & identification and developing the needed capabilities |
| 2       | 30              | Dynamic capabilities & competitive advantage                                |
| 3       | 30              | Firm's resources and capabilities & competitive advantage                   |
| 4       | 24              | Quantitative research methods and statistical analyses                      |
| 5       | 17              | Absorptive capacity & dynamic capability development                        |
| 6       | 15              | Firm growth and development & resources & capabilities                      |
| 7       | 7               | Mixed research methods & company resources / capabilities                   |

The document co-citation analysis could indicate the origins of the combination of capabilities and project business research according to the dataset. Table 3 contains highly cited articles and books that have affected research on capabilities. Interesting finding in the document co-citation analysis is the clusters 4 and 7 which do not have a direct thematic link to capabilities research. These clusters represent methodological viewpoints, whereas the other clusters contain more capabilities related documents. Timeline analysis per document co-citation clusters is illustrated in figure 7.

## Publishing activity per document co-citation clusters in timeline



**Figure 9.** Document co-citation clusters on timeline. The size of the bubble represents the publishing activity per year.

Most of the cited works have been published between 1990 and 2010 (77 %). The first three clusters (1. Absorptive capacity & identification and developing the needed capabilities, 2. Dynamic capabilities & competitive advantage, 3. Firm's resources and capabilities & competitive advantage) condense in the early years of 2000. The earliest document in the analysis belongs to cluster 6 (Firm growth and development & resources & capabilities), which is the Penrose's "*Theory of growth of the firm*" from 1959.

### 4.3 Firm capabilities in project business

The research focusing especially on project business capabilities is scarce compared to capabilities studies in general. In this literature review, an additional target was

to create a tentative framework of the capabilities in project business context. For this purpose, the articles in the original dataset (n=93) was viewed more in detail and searched for the articles that had a project-point of view in the capability examination. In this process, 11 articles were selected (table 5).

**Table 5.** Articles on firm capabilities with project context perspective.

| No | Article                                                                                                                                                                                                                                      | Content / Contribution                                                                                                                                                                                |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Pan et al. (2006). A Dual-Level Analysis of the Capability Development Process: A Case Study of TT&T. <i>Journal of the American Society for Information Science and Technology</i> , 57(13), 1814–1829.                                     | Identification of resources supporting capability development. Analyses made from organization and project perspectives                                                                               |
| 2  | Ostadi et al. (2011). An examination of the influences of desired organisational capabilities in the preparation stage of business process re-engineering projects. <i>International Journal of Production Research</i> , 49(17), 5333–5354. | Identification and assessment of the most important firm capabilities in business process re-engineering project.                                                                                     |
| 3  | Brady, T., & Davies, A. (2004). Building project capabilities: From exploratory to exploitative learning. <i>Organization Studies</i> , 25(9), 1601–1621.                                                                                    | Development of a project capability-building model. The model describes the process of firm developing its capabilities to reach an efficient repeatable project execution from learning perspective. |
| 4  | Portillo-Tarragona et al. (2018). Classification and Measurement of the Firms' Resources and Capabilities Applied to Eco-Innovation Projects from a Resource-Based View Perspective. <i>Sustainability</i> , 10.                             | The assessment and analysis of firms' resources and capabilities from eco-innovation project success point of view.                                                                                   |
| 5  | Choi et al. (2018). Dynamic Capabilities of Project-Based Organization in Global Operations. <i>Journal of Management in Engineering</i> , 34(5), 1–12.                                                                                      | Study of strategies supporting the dynamic capabilities development of project-based organizations.                                                                                                   |

|    |                                                                                                                                                                                                                                     |                                                                                                                                                               |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6  | Arena et al. (2013). Integrated Risk Management through dynamic capabilities within project-based organizations: The Company Dynamic Response Map. <i>Risk Management</i> , 15(1), 50–77.                                           | Development of a tool for assessing risk response strategies from a project-based organization point of view. The tool utilizes dynamic capability framework. |
| 7  | Ritala et al. (2013). Key capabilities in knowledge-intensive service business. <i>Service Industries Journal</i> , 33(5), 486–500.                                                                                                 | Developing a framework for identifying key capabilities of knowledge-intensive service project offerings.                                                     |
| 8  | Yang, L. R. (2013). Key practices, manufacturing capability and attainment of manufacturing goals: The perspective of project/engineer-to-order manufacturing. <i>International Journal of Project Management</i> , 31(1), 109–125. | Development and assessment of a model for enhancing project manufacturing (engineering-to-order) capabilities.                                                |
| 9  | Davies, A., & Brady, T. (2000). Organisational capabilities and learning in complex product systems: Towards repeatable solutions. <i>Research Policy</i> , 29(7–8), 931–953.                                                       | Introduction of project capabilities concept in relation with supplier core capability development in project (/ complex product systems) delivery context.   |
| 10 | Ruuska et al. (2013). Supplier capabilities in large shipbuilding projects. <i>International Journal of Project Management</i> , 31(4), 542–553.                                                                                    | Supplier capability assessment in delivery project context from the buyer's perspective.                                                                      |
| 11 | Rungi, M. (2014). The impact of capabilities on performance. <i>Industrial Management and Data Systems</i> , 114(2), 241–257.                                                                                                       | Identification of important capabilities affecting the financial and project performance.                                                                     |

Project capabilities were introduced as a separate capability by Davies and Brady (2000). They assess the capabilities in “complex product systems” context. The complex product systems are “high-technology and high-value capital goods”, which are of low volume and subject to highly tailoring according to business customer's needs. The production of the complex product systems is organized project-based, involving number of suppliers. Davies and Brady (2000) stress the importance of

project capabilities in complex product systems business. The project capabilities include capabilities related to bid preparation and project execution. The bid preparation capabilities include gathering needed information, conceptual design, intelligent cost estimation, service level definition and risk management. The project execution capabilities include integration of organizational functions, ability to purchase inside and outside of the organization, managing and reallocation of resources through the project life cycle, team based working, ability to use project management tools (Davies & Brady, 2000, p. 938).

Project capabilities are dynamic in a sense that must be developed through experience and learning (Brady & Davies, 2004; Pan, Pan, & Hsieh, 2006). Projects are often unique, but the good practices should be transferable to new project executions. This underlines the importance of learning capability within organizations, in order to avoid repeating same mistakes in new project executions (Arena et al., 2013; Brady & Davies, 2004). Choi et al. (2018) have studied the dynamic capabilities development in project-based organizations in engineering-construction industry. The dynamic capabilities concern firm's capacity to sense, seize and reconfigure the resource and competence base to adapt to dynamic environment including changes in customer needs and markets (Teece, 2007). Choi et al. (2018) study gives managerial strategy proposals how to sense the changes in markets, seize the opportunities and reconfigure companies' resources. The dynamic capabilities as a concept relates to high level decisions that firms should make in order to maintain and increase to competitive advantage. These decisions guide the development of firms' lower level operational capabilities (Witcher et al., 2008).

Project-based business calls for risk management capabilities. The risks are related to uncertainties that characterize one-off and complicated project execution (Arena et al., 2013). Arena et al. (2013) introduce in their study a managerial tool for assessing the risk response strategies in project business context. They have identified an extensive list of firm capabilities that relate to projects and different stages of the process (table 7).

**Table 6.** Processes and the related project capabilities (adapted from Arena et al. (2013, pp. 59–60).

| Process                                       | Project capability                                                                                                                           |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Commercial and bid management                 | Proposal organization establishment<br>Competencies required for the bid planning                                                            |
| Project management                            | Projects team and organization definition<br>Contract and proposal close out analysis                                                        |
| Engineering                                   | Methods and codes planning<br>Process and technology selection                                                                               |
| Procurement                                   | Project vendor list analysis and qualification plan<br>Procurement organization and estimated man-hours                                      |
| Material management                           | Interfaces with engineering and construction management<br>Change order identification                                                       |
| Operational activities                        | Operational activities organization and estimated man-hours<br>Prefabrication activities management                                          |
| Administration and project control activities | Internal/external interface management (i.e. information supporting administration and project control)<br>Administrative matters monitoring |
| Financial services & insurance                | Control the cash profile and monetary profile, setting up the exchange rate hedging operation<br>Time-deposit management                     |

Arena et al. (2013, p. 53) also discuss in their study of four macro-capabilities, which derive from dynamic capability concept: delivery, integration & coordination, learning and reconfiguring. These include in project business context e.g. project planning and controlling, human resources management, generation of new knowledge,

feedback and consolidating lessons learned and re -designing operational competencies.

Project business extends to services sector. The intangibility and other features related to services (compared to tangible products) calls for capabilities which have been studied by Ritala et al. (2013). They found four distinctive capability categories that are important in knowledge intensive service business: knowledge management, service productization, process management and relationship orchestration. More specific, these include e.g. acquiring the customer knowledge, service offering modularization and visualization, process coordination and problems solving skills and understanding the customer relationship value and contribution to customer's knowledge network (Ritala et al., 2013).

Project business models are also applied in manufacturing branch. This refers to project manufacturing or engineer-to-order (ETO) manufacturing, where the specific customer requirements or product customization is handled with project management tools. Firm's manufacturing project capability could be improved by implementation of manufacturing practices such as production planning, quality management, human resource management and capacity management. The manufacturing practices means for manufacturing project managers a variety of needed skills, which eventually support the project targets and success. (Yang, 2013)

Project based business is dominant practice in many industry sectors, e.g. shipbuilding. The shipyards manage the building process as a project which includes a high number of stakeholders. Ruuska et al. (2013) have studied the supplier capabilities and how they are valued by the buyers in large shipbuilding project context. The magnitude and complexity of these projects requires a network of suppliers that perform specified jobs, e.g. product deliveries and services. From buyers' perspective the most important or valued supplier capabilities are the technical/operational capabilities and business capabilities. These two sets of supplier capabilities include schedule management, cost effectiveness, high quality management, financial soundness and supplier employees' individual skills and capabilities (Ruuska et al., 2013).

The question of the capabilities impact on financial and project performance is appealing since the answer has significance in practice business life. However, complexity of the capability concept and high number of variables affecting financial and project performance makes the questions very difficult. Rungi (2014) has approached these questions in project-based business context. In this quantitative

study capabilities were divided into business, project and project portfolio categories. The most beneficial capabilities for financial performance were the project time/scope/&cost management, project portfolio maximization and logistics management.

## 5 Conclusion

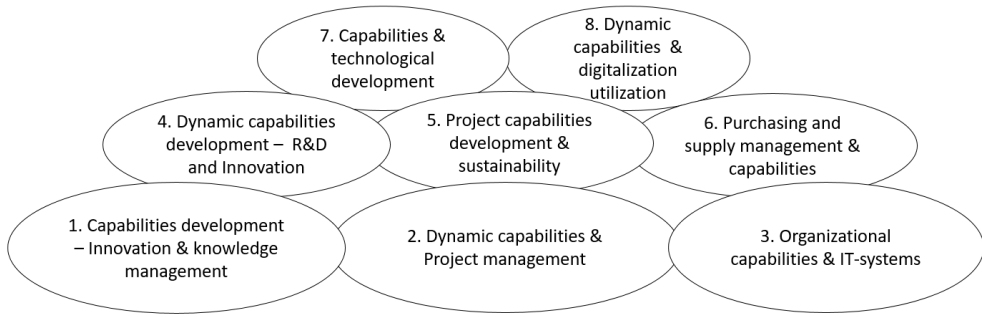
### 5.1 Summary on key findings

This review focused on scientific literature of firm capabilities in project business context. In particular, the thematic structure of the literature was of interest. The applied methodology included systematic review method and bibliometrics analyses (bibliographic coupling and document co-citation analysis). The systematic literature review method is designed to minimize the bias by systematic searching for the data and making the data selection transparent. Bibliographic coupling and document co-citation analyses are established bibliometric tools that has been used to structure literature datasets by their references or citations.

The literature searches that were conducted at the end of January 2020 resulted in 93 journal articles with the inclusion criterion of English language of publication and the article including capability term in a context of a) project or business, b) interfirm relationships or c) theoretical concept discussion. The articles were published between 1993 and 2019. Publishing activity has been increasing considerable during last ten years, which may indicate of growth in research interest on capabilities in project business (or increased publication activity or opportunities in the field). The top journals cover marketing, project and business management and sustainability from environmental and economic perspectives. Journals dedicated to business and industrial sectors are strongly presented.

The bibliographic coupling analyses reveal the eight document clusters. The documents in these clusters were examined with qualitative and quantitative text data tools to find the thematic content of these clusters. The synthesis of these results is shown in figure 10.

The most attention received themes according to our data were capability development, dynamic capabilities and organizational developments in innovation & knowledge management, project management and IT-systems contexts (clusters 1-3). The smaller clusters' (4-6) themes were more specific in focus area such as purchasing, project capabilities, sustainability and R&D. From temporal perspective all clusters' article publishing activity was most dense during the last ten years. The smallest clusters' (7-8) articles had been published during last 6 years.



**Figure 10.** Identified topics of the document cluster in the bibliographic coupling analysis.

By using the document co-citation analysis, the review identified the research streams in the literature on capabilities and project business. The analysis resulted in 155 documents (articles and books), which were distributed to seven document clusters. The documents with strongest total link strengths per cluster were subjected to text data analysis. The identified research streams are shown in figure 11.

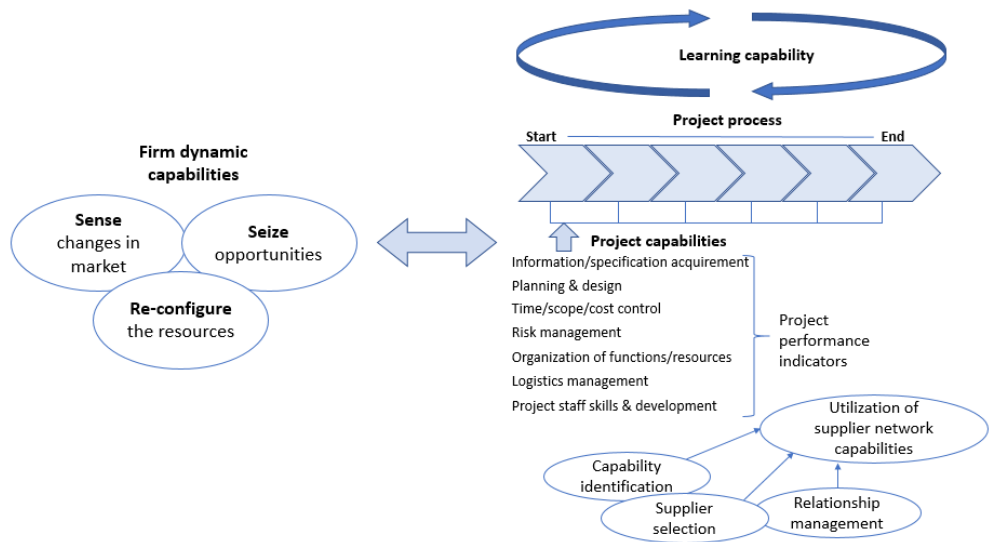


**Figure 11.** Research streams based on the document co-citation analysis

The first three cluster were the biggest in terms of number of documents. Concepts of absorptive capacity, dynamic capability and firm resources along with the competitive advantage is stressed in the analysis. Interesting finding was that clusters 4 and 7 basically included methodological works. Cluster 6, which related to firm economics and resources is the oldest cluster including the first published work in the data.

## 5.2 Tentative framework for project capabilities

Project business capabilities were studied in this review. The literature focusing in capability aspects in project business context was scarce. This cautious conclusion was made although the used data gathering was not designed for making a comparison of overall capabilities concept research domains. The review attempted to create a tentative framework of firm capabilities in project business context. Set of journal articles (n=11) contributing to this target was identified in the dataset and studied more in detail. The represented journals in this set was diverse. Two articles had been published in *International Journal of Project Management*, and the rest in individual journals including variety of domains e.g. services, engineering, sustainability and organizational management. Figure 12 suggests a tentative framework for project business capabilities.



**Figure 12.** Capabilities in project business -framework

The framework consists of four connected sections. Successful management of project process requires, during the project lifetime, different kinds of capabilities, particularly project capabilities. Davies and Brady (2000) separate these capabilities to bid preparation and project execution capabilities. Typically, financial indicators are set to measure a project's performance. Thus, the project capabilities ultimately influence these indicators and demonstrates the level of firm's capabilities. Many studies (e.g. Davies & Brady, 2000; Ritala et al., 2013; Rungi, 2014; Yang, 2013) have identified capabilities and examined their influences in project-based business. In

above figure, there is a non-exhaustive list of capabilities which have had positive impact on project in these studies.

Firm's capability to learn from earlier experience is important in project business (Arena et al., 2013; Brady & Davies, 2004; Pan et al., 2006). The learning and possible corrective actions help firms avoid repeating mistakes in future project executions. The experience and learning also leads to development of needed capabilities. In the figure learning is depicted on top of the project process surrounded by curved arrows, which illustrates idea of gaining information through experience and utilizing this information in future project.

The project business involves in many cases suppliers and business partners. In these cases, project execution requires products and services that are purchased from suppliers. A large and/or complex project may include a network of suppliers, and managing this network requires particular capabilities from focal firm. These capabilities relate for example to ability to identify the suppliers that possess the needed capabilities to perform the delivery. Selecting the right suppliers and managing these relationships may help focal firm to exploit the supplier network capabilities successfully.

A firm's dynamic capabilities are part of the framework in figure 12. The concept of dynamic capabilities is divided to firm capacities to sense, seize and reconfigure (Teece, 2007). The dynamic capabilities are important especially in rapidly changing business environment. Firms operating in project business need to have capacity to sense the e.g. changes in customer demands and effects of technological innovations to their business. Thus, the ability to grasp opportunities and reconfigure own resources flexible may lead to competitive advantage in markets.

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