EDINBURGH NAPIER UNIVERSITY
THE BUSINESS SCHOOL

Applying Standards, Guidelines and Methods in Construction Project Management

A Phenomenological Examination of Project Management Methods and Practices in the Construction Industry

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List of abbreviations

3K ..... *kaihatsu, kaizen and kakusin*
ACWP ..... *Actual Cost of Work Performed*
BAC ..... *Budget at Completion*
BCWP ..... *Budgeted Cost of Work Performed*
BCWS ..... *Budgeted Cost of Work Scheduled*
BIM ..... *Building Information Modelling*
CBA ..... *Cost benefit analysis*, *Cost benefit analysis*
CCPM ..... *Critical Chain Project Management*
CFA ..... *Cash flow analysis*
CPM ..... *Critical path method*
CSF ..... *Critical success factor*
DA ..... *Decision analysis*
DIN ..... *German Institute for Standardization*, *Deutsches Institut für Normung*
ETA ..... *Event Tree Analysis*
EV ..... *Earned value*
EVA ..... *Earned Value Analysis*
FMEA ..... *Failure Mode and Effects Analysis*
FTA ..... *Fault tree analysis*
GDP ..... *Gross domestic product*
GERT ..... *Graphical evaluation and review technique*
HAZAN ..... *Hazard analysis*
HAZOP ..... *Hazard and operability studies*
ICB ..... *Individual Competence Baseline*
IPMA ..... *International Project Management Association*
ISO ..... *International Standards Organization*
KPI ..... *Key Performance Indicators*
LCC ..... *Life-cycle costs*
LCCA ..... *Life-Cycle Cost Analysis*
P2M ..... *Project and Program Management*
PEM ..... *Project Excellence Models*
PERT ..... *Program evaluation and review technique*
PM ..... *Project Management*
PMB ..... *Performance Measurement Baseline*

PMBOK.....*Project Management Body of Knowledge*
PMBOK® Guide .....*A Guide to the Project Management Body of Knowledge*
PMI .....*Project Management Institute*
PMPA .....*Project Management Assessment Models*
PRINCE.....Projects in Controlled Environments
PSI..... *Project Success Indicators*
RBS .....*Risk Breakdown Structure*
SA..... *Sensitivity analysis*
SAO.....*Standard-Applying Organization*
SGO..... Standard-Giving Organization
SPM..... *Standardized Project Management*
SSADM.....*Structured systems analysis and design methodology*
SWOT.....*Strengths weaknesses, opportunities and threats*
TOC..... *Theory of Constraints*
WBS .....*Work Breakdown Structure*
XPM.....*Extreme Project Management*

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1. Abstract

This dissertation scrutinizes the application of various standards, guidelines and methods in construction project management, and examines the use of such methods, tools and applications. Even though the availability of literature in the context of PM is extensive there has not been an adequate focus on applied project management with a specific interest in the constructing project management. This study describes the experiences gathered by the interviewees who are experienced construction executives and also discusses how they have managed their projects. The reason for the selection of a subjective, descriptive and phenomenal research approach is described and the advantages for this philosophical stance are also mentioned in the thesis.

The question that emerges is in regards with how the construction managers accomplish any given project and how they 'live' their PM. Hence, this study investigated the relevance of PM for managers working on construction projects.

Various techniques, methods and procedures which were not included in the literature were highlight by the participants. There are studies available, mainly empirical, in the context of applied PM methods and the results of these studies do not correspond with the findings of this research. Another finding is that, in general, from the responses received, it is clear that PM certification programmes provide limited value to an experienced construction manager. Further results were summarized in the findings and result chapter of this work.

2. Introduction

The goal of this study is not just to provide the theoretical evaluation of literature or the analysis of the interviews, but to also generate sustainable value for the reader and to combine to the already existing knowledge and gain new insights from the interviews.

The construction industry has established into a crucial factor that determines the development of the global economy. Furthermore, it is asserted that it is a paramount contributor to the sustainable development of the countries considering its socio-economic and environmental impact (Serpell, Jorge and Sergio, 2013). Apart from employing people worldwide, the industry also encompasses a refined supply-and-fabrication network that is inclusive of various suppliers and manufacturers that caters towards different construction products. The building projects are managed by construction project managers. With the expanding internationalisation, building volume and complexity, the everyday adversities that are handled by the construction executives are constantly accumulating. It is imperative that project leaders should employ the use of project management methods and techniques to make the work easier and allow the projects to more targeted, efficient and results-oriented.

This dissertation will examine the various project management (PM) methods for the international construction industry, and also examine the use of such methods, tools and applications. Although the availability of literature in the context of PM is extensive, there has not been an adequate focus on international project management with a specific interest in the international constructing project management. Thus, the question that emerges is in regards with how the construction managers accomplish any given project and how they 'live' their PM. Since, the international construction business is impacted by a range of volatile, varying and influential factors; it can be expected that the international project environment and construction works would place a particular emphasis on adopting a methodical approach towards the projects.

It is apparent that the construction industry is not just a crucial factor that impacts the global economy, but is also subject to the current trend of internationalisation. It is essential that the right PM methods and tools are used while executing construction projects as the international construction projects usually involve immense distances from their respective head offices; thus, there is the prevalence of cultural differences between the project stakeholders along with a different legal system. Thereby, it can be assumed that the importance of responsible decision making to effectively pursue any construction project is paramount.

There is a palpable rising trend towards the global added-value chains, but the modern PM must attest to the distinct nature of projects[1] while aiming for the processual character and striving for transferability and repeatability. Despite the required need, no methods and techniques seems to be available for construction projects, essentially for the international ones. This thesis examines the relevant questions by initiating a

[1] A project is: " a temporary endeavor undertaken to create a unique product, service, or result" Project Management Institution (PMI), *A guide to the Project Management Body of Knowledge (PMBOK guide), fifth edition,* 5th ed. (Newtown Square, Pa.: Project Management Institute, 2013); as well as a "a time and cost constrained operation to realize a set of defined deliverables (the scope to fulfill the project's objectives) up to quality standards and requirements" *Competence Baseline (ICB)* (IPMA), www.gpm-ipma.de.

comprehensive literature review and semi-structured interviews. The phenomenological research approach is best suited to reflect actual experiences from international construction sites.

2.1. Research aim and objectives

The aim of this study is to analyse how project executives in the international construction industry manage their projects and identify which methods and tools they use. The study also draws a comparison between the methods implemented by the interviewees and the theoretical approaches of the academic literature.

- The first objective of this research is to provide a description of PM as well as an understanding of the disciplines of PM.
- The second objective focuses on existing bodies of knowledge (BOKs) and their influence on project management. Existing BOKs and associated literature are reviewed, and the participants' familiarity with the standards of the BOKs is determined. Moreover, the study addresses the question of whether such BOKs have a sustainable benefit to the execution and success of international building projects.
- The third objective is to analyse whether the application of PM is widespread in actuality and to evaluate whether the results of previous, mostly empirical, studies are confirmed by the findings of this dissertation.
- The fourth objective is to examine how German construction project managers manage their international projects. The interview results are presented and structured in line with the structure of the literature review.
- The fifth objective is to provide an overview of key PM tasks and to examine and compare the proposed approaches with the literature and with the recommendations from the interviewees.

The contribution of this study to the academic field is to provide a thorough knowledge about the applied construction project management and also to provide a suitable answer to the question whether the formal and rigid project management guidelines are perceived as valuable tools which prove to be viable in practice. The contribution to professional practice, however, shall be achieved by a thematic analysis of a wide range of literature that identifies differences, similarities and common themes as well as through further development of project management best practices by linking the collective knowledge of the interviewed project management professionals.

This dissertation follows the interpretation and belief that good qualitative research should reflect how practitioners deal with certain situations and consequently should enable the readers to gain awareness and obtain a better understanding of PM mechanisms. Practitioners can gain applicable knowledge about the conceptual approach to international construction PM by referring to the interview results and also by the methods and processes presented in this dissertation, see chapter 6.

Standards and BOKs

Project management is a diverse field of research, particularly without a special inference on construction project management. Any person who studies project management and pursue it as a career option will unavoidably come in contact with the standards of BOKs. There are a variety of international and national 'bodies of knowledge' (BOK) which are concerned with the setting up of guidelines for project management, for instance, the "Guide to the Project Management Body of Knowledge (PMBOK®Guide)" (see section 3.3). Thus, it is fair to assume that the BOKs have a significant influence on the everyday workings of the project leaders. Even though, the

standardised rules are crucial for an optimized work, however, the familiarity with the rules of BOKs remains quite partial, as for example Chou and Yang indicated in their research (Siang and Yih, 2012).

The basic rules highlighted in the "bodies of knowledge" refer to a general and an overall concept of project management. The question that arises is whether the construction project managers are aware of these rules and avail the same; or whether the managers consider the rules to be applicable in the context of construction. The BOKs, however, also offer a large number of certifications, which should allow a uniform training standard among the project participants (see annex A.14).

- Therefore, the first objective of this research is to determine whether the participants of the study are familiar with the standards of the BOKs and whether they are familiar with the relevant certifications and, if possibly, possess them.

Application frequency of PM methods

An imperative question that formulates is whether the theoretical approaches on project management are put to practice. There is a limited number of BOKs that suggest individual methods, but there are different PM programs and standards, also there are a large number of tools, techniques and methods of PM. In addition to the individual methods, techniques and standards of the BOKs and PM programs, there is an extensive range of the expert's literature. For the purpose of this research, ten proficient books have been compared to showcase the additions, differences in various cited and proposed methods (see annex A.6). However, the methods and standards of project management are used in different ways and are dependent on the industry of the user (see annex A.2). Furthermore, various studies deal with the application of PM techniques which showcase that the PM methods are pretty familiar with a variety of PM standards and methods (see section 3.6).

- This leads to the second objective of whether the application of PM is in actuality and to evaluate whether the results of this study resonate with the findings of this study. However, a comparatively small sample group of a phenomenological examination and a statistical assertion cannot be demonstrated, thus, a purposive sample is used to provide an indication of the selection criteria for the participants of the study are similar.
- A phenomenological investigation offers the possibility that the statements and the supposed facts are fathomed more precisely based on the experiences and understandings. Thus, the third objective is to examine how the PM is incorporated in the international construction project environment and how the international project managers manage their projects. The third objective entails the analysis of methods and techniques that are used by the participants and the reason behind their application, and it also aims to analyse the methods and techniques developed by the participants for themselves.

Project Managers

Usually methods and techniques can be only as good as good as their users, thus, a part of this study also deals with project leaders in respect to their skills as project managers.

- Since a group of well-trained and experienced project leaders participated in this study, the fourth objective deals with the rationale of a competent project leader. The study will aim to answer and decipher the skills of the project managers by reviewing the available literature, and by enquiring the participants about the desired skills of a project manager. It will also explore whether the respondents think that the PM skills, techniques and standards mentioned in the literature are applicable in the international context, including the cross-border construction projects.[2]
- In addition, the question arises whether the formal training of civil engineers in Germany is sufficient to prepare young graduates adequately for the task of construction project management

[2] See for instance: An interpretive comparison of Chinese and Western conceptions of relationships in construction project management work Ping Chen and David Partington, "An interpretive comparison of Chinese and Western conceptions of relationships in construction project management work," *International Journal of Project Management* 22, no. 5 (2004).

1.1. Structure of this thesis/ conceptual framework

To better illustrate the approach to and the structure of this research the following diagram has been prepared. Fig. 2-1 visualizes the introduction to this study and the literature review, the considered fields of literature, the decisive studies and which results the analysis of literate produced. One of the most relevant aspects of the literature analysis has been the identification of key themes related to the subject project management. Fig. 2-2 shows the summary of themes and results of the interviews and describes as well the structure of the chapter 6 and how this chapter is connected to the subsequent chapter 7 and 8.

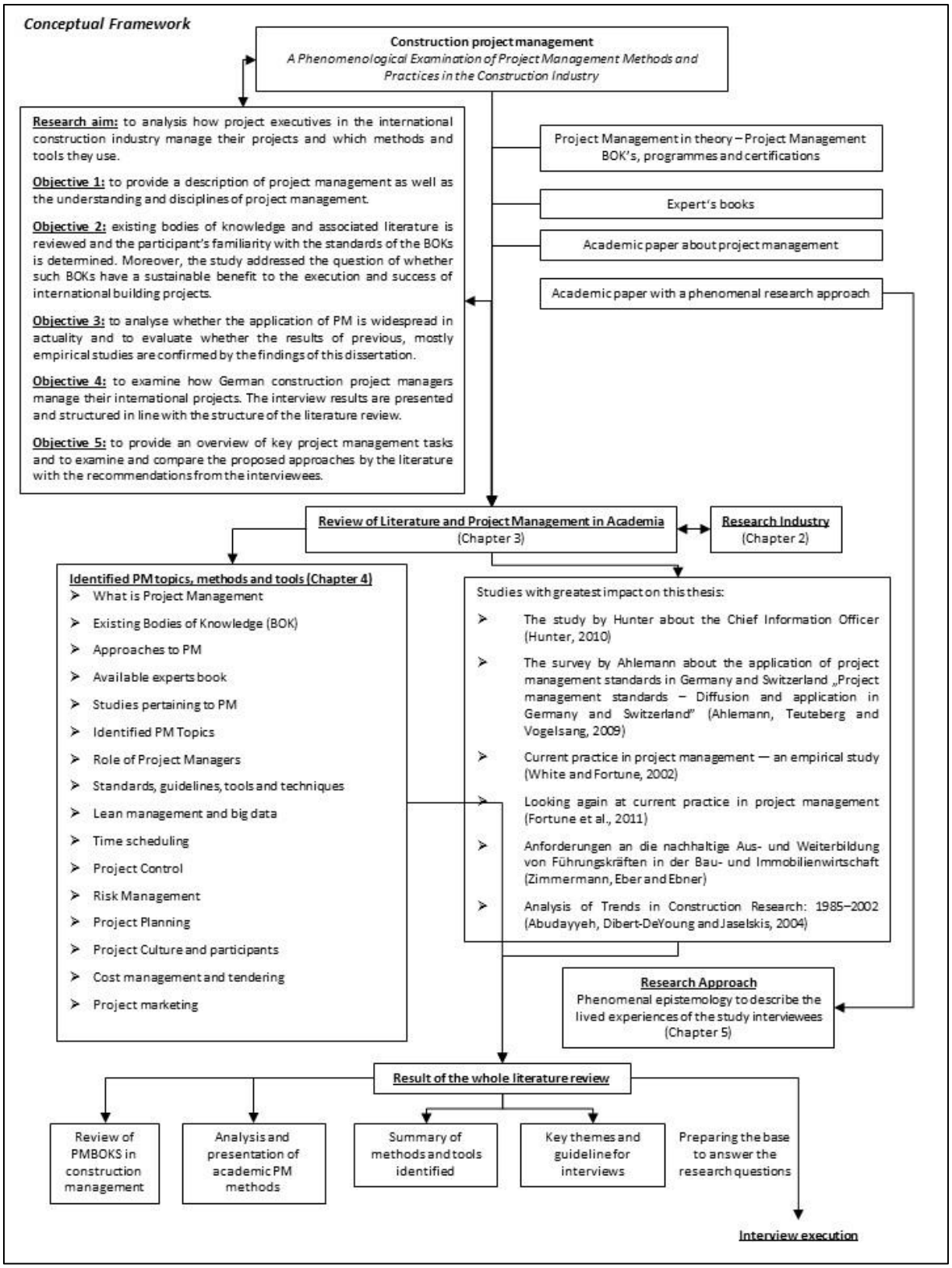

FIG. 2-1 STRUCTURE OF THIS THESIS (1)

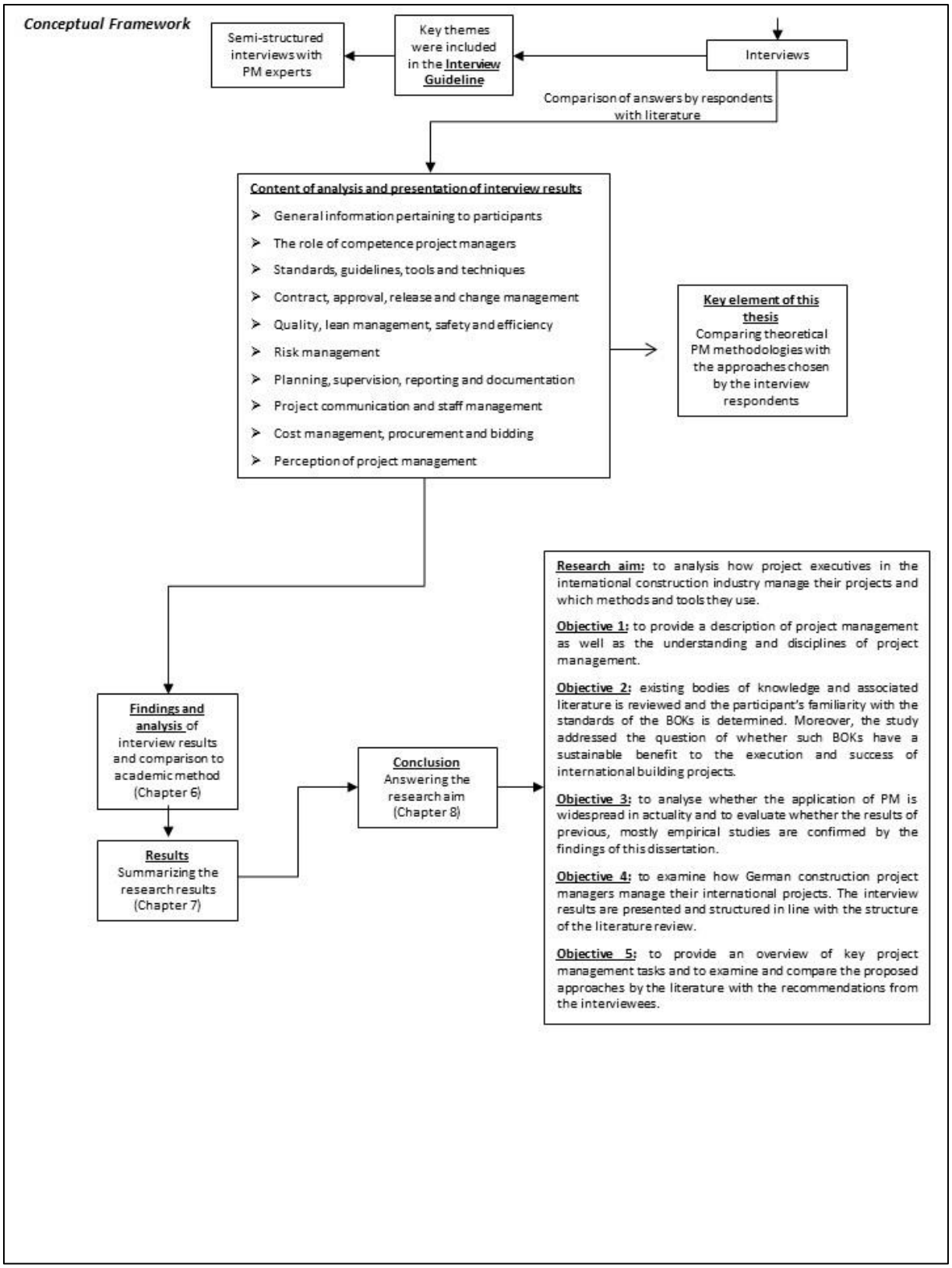

FIG. 2-2 STRUCTURE OF THIS THESIS (2)

1.2. Individual chapters

The presentation of the researched industry is mentioned in Chapter 2. The chapter effectively deals with the industry discussed in the study, particularly about the global construction industry. However, to understand the context of the study, it is crucial to provide a productive insight into the construction industry. Thus, resonating with the thought mentioned above, Section 2.1 deals with the current market trends, the economic conditions of the global construction industry of the recent years, whereas section 2.2 considers the factors for successful project implementation and expected market growth factors.

In Chapter 3 a considerable and thorough literature analysis has been pursued in this study to identify, evaluate and analyse the relevant technical studies. In addition, special attention was paid to BOKs, their added value for projects and their successful implementation. The review also incorporates qualitative and quantitative studies conducted in the direction of the researched topic. Thus, the exhaustive examination of literature and available studies connected to the project and construction management has been presented in that chapter.

The purpose of the literature analysis is to provide an overview of the available qualitative papers, empirical studies and literature pertaining to international project management. The review also aims to point out similarities and inconsistencies in the discussed literature and discuss the standard methods and tools.

Moreover, it has been possible to identify PM topics, methods and tools that are in relevance with the interviews and consecutive analysis in this study. In Chapter 4identified themes are mentioned which were used in interviews and the consequent analysis and the presentation of the findings. The review of literature for the identification of themes and topics encompasses various books and academic materials that focus on the idea of PM (or construction management). ,The identified subjects, topics, methods and themes were gathered, systematized and used for the interview guideline as well as a blueprint for the analysis of responses, see annex A.6 and Chapter 6.

In Chapter 5 the phenomenological research approach is mentioned along with its resulting advantages. The preferred methodology provided an insight into the organisational life of how construction projects abroad are managed. Such an approach begins with the observation of a specific event or phenomena, and further aims to identify the patterns and trends among the selected set of data. The subjective and the descriptive methodologies that are chosen greatly impact the data and its collection and analysis. This influence along with the limitation of the selected research approach and possible alternative methodologies with their advantages and disadvantages has been discussed in Chapter 5. Additionally, the key themes based on the comprehensive review of accessible studies and academic papers were identified. It also describes how the key themes in textbooks, project management guidelines, and other literature were processed. The fifth chapter explains how the key themes from the literature review were incorporated into the data collection to provide a viable initial point for the interviews and to provide suitable assistance to the participants in answering the questions. This chapter also entails how the themes were assimilated into the results and findings. Finally, the conduct of the research and its subject has been discussed to validate its relevance, significance, and worthiness and the research consistency, richness, generalisation and transferability.

Chapter 6 presents and combines the findings of the literature analysis and the conducted interviews. This chapter is structured in the context of the project management topics that were identified in the literature review (see Fig. 2-1 and Fig. 2-2) to present differences and similarities between the literature and the result of the interviews and also to provide a practical PM knowledge to the reader. The goal of this study is not just to provide the theoretical evaluation of literature or the analysis of the interviews, but to also generate sustainable value for the reader and to combine to the already existing knowledge and gain new insights from the interviews. Therefore, the findings from the interviews and the proposed best practices were summarised, examined, compared and evaluated pertaining to emerging key themes together with the theory from previous studies and textbooks. Chapter 6 demonstrates the methods, procedures, and approaches to individual project management-related subjects suggested by the relevant technical literature, examines how the interviewed international project managers deal with individual project management topics in correspondence with the practice-oriented approach and chapter 6 is similarly supposed to be both an academic evaluation of theory and practice as well as a summary and guideline for practice oriented readers to be used for their projects and endeavours.

Chapter 7 is the analysis of the research findings and summarizes the recognized conclusions from the study; whereas Chapter 8 presents the conclusions of this research predominantly related to the initial research aim and objectives.

2. International construction industry

The economic conditions for the international construction business have been influenced by a range of varied crises in the recent years. The building crises in the United States inveigled the demand for building materials all around the globe; also, the financial crises of 2010 and the consequent growth of the crisis in the Eurozone in 2011 persuaded the private and public stakeholders to reduce their spending on investments. Explicitly, the commercial and residential building works suffered from the shortage of funds due to the financial crisis. Due to the sudden deterioration, the governments released stimulus packages to revive the construction market. Despite the shortcomings, the international construction business has entrenched itself as a compelling pillar of the global economy. The anticipated growth rates of various countries in regards to their construction output between 0-1% and 8-9% till 2030 have been highlighted in Fig. 2-1, it is not surprising then that international contractors were able to maintain or even increase their building volumes in the recent years. Nevertheless, growing construction volumes and shifting market demands are crucial variables for the current and future global construction business.

Average annual growth rates								
0-1%	1-2%	2-3%	3-4%	4-5%	5-6%	6-7%	7-8%	8-9%
Germany	Australia	Canada	Algeria	China	Egypt	Indonesia	Myanmar	India
Japan	Belgium	Czech Republic	Argentina	Colombia	Kenya	Nigeria		
	Brazil	Hong Kong	Bulgaria	Peru	Malaysia	Vietnam		
	France	Korea (S)	Chile	Singapore	Philippines			
	Italy	Netherlands	Greece	Saudi Arabia	Qatar			
	Russia	Poland	Hungary	Thailand	US			
	Sweden	Spain	Kuwait	Turkey				
		UK	Mexico					
		Ukraine	Morocco					
			Romania					
			South Africa					
			UAE					

FIG. 2-1 GROWTH IN CONSTRUCTION OUTPUT 2014-30 (48 COUNTRIES) (GLOBAL CONSTRUCTION 2030, P44)

As mentioned earlier, the construction industry is a major pillar of the development of the country. Moreover, Fig. 2-2 provides an indication for opportunities for contracts and projected demand of the market until 2030. The building industry can be credited for the creation of infrastructure, production facilities and housing which are the most substantial factor in any economy. This sector enables the building of an egalitarian society and inculcates an improved standard of living. Construction companies are a major source of employment as many people are directly hired in the building industry. The industry also encompasses a network of various suppliers and manufacturers that cater towards different construction products; this, the industry generate the innovation and development process in the related industries.

The percentage of investments in building and infrastructure depends upon the economic development and the conditions and age of the infrastructure in existence. Public contracts in certain countries (for instance, Germany) include a large fraction of renovation and rectification works in the context of the upgrading and renewal of the buildings in existence. In most developing countries, such as China, public contracts are often the greenfield projects to construct new infrastructure. The contribution of the

building industry to the national gross domestic product can vary from 3.5% to 24% (Walsh, Sawhney and Brown, 2005). European nations tend to invest about 6% to 10% of their GDP in the building sector (Statista.de 2011) which is significantly less than the investments made by Brazil, China, and India.

It has been inferred that the renovation and upgrading of existing structures require less investment as opposed to the building of new infrastructures; this, the contribution of the building industry to the national GDP of developed countries has been receding since the late 1960s until today (Pietroforte and Gregori, 2003). The decline in the sale possibilities of home markets in the developed countries and the increase in the market opportunities in developing countries have been discussed in great detail in the ensuing chapters.

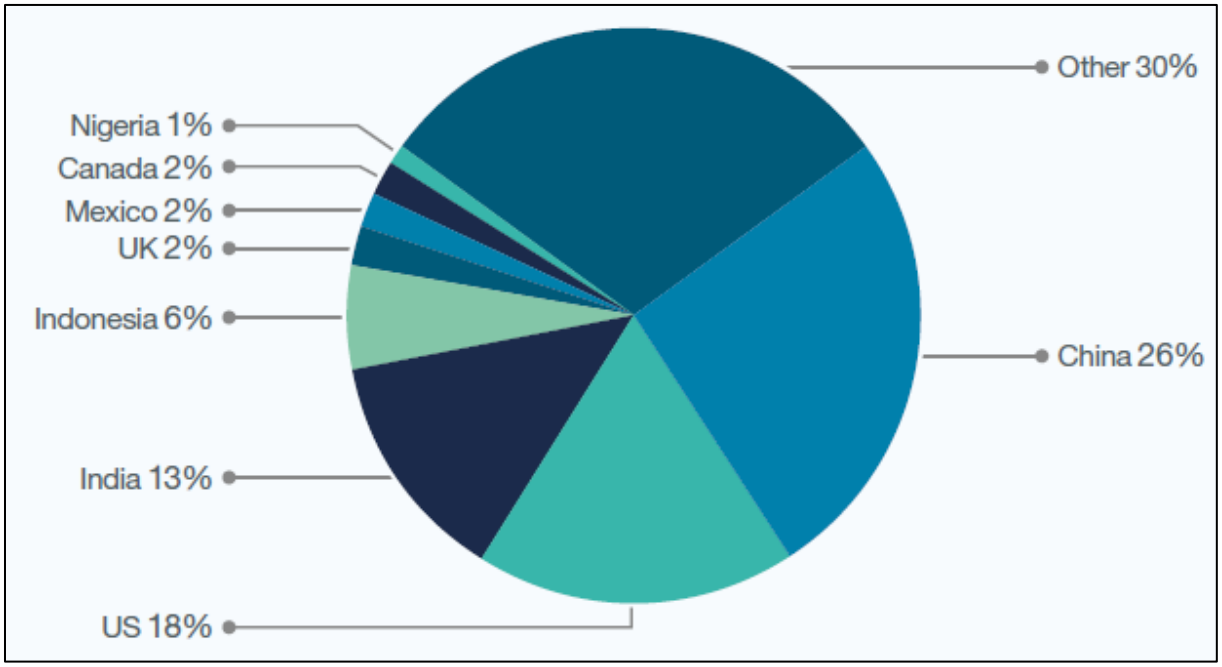

FIG. 2-2 PERCENTAGE CONTRIBUTION TO GROWTH IN GLOBAL CONSTRUCTION OUTPUT 2014-2030 BY COUNTRY (GLOBAL CONSTRUCTION 2030, P46)

2.1. Economic condition of the global construction market

The construction sector is still deemed as an economic promoter as the growth is estimated to remain slow but incessant at around +3.4% in 2016 and +3.5% in 2017 (Eulers, 2017). This global growth is divided into growing emerging markets with around +4.2%; this is a significant decline as compared to previous years and advanced economies with +2.5% (see Fig. 2-3).

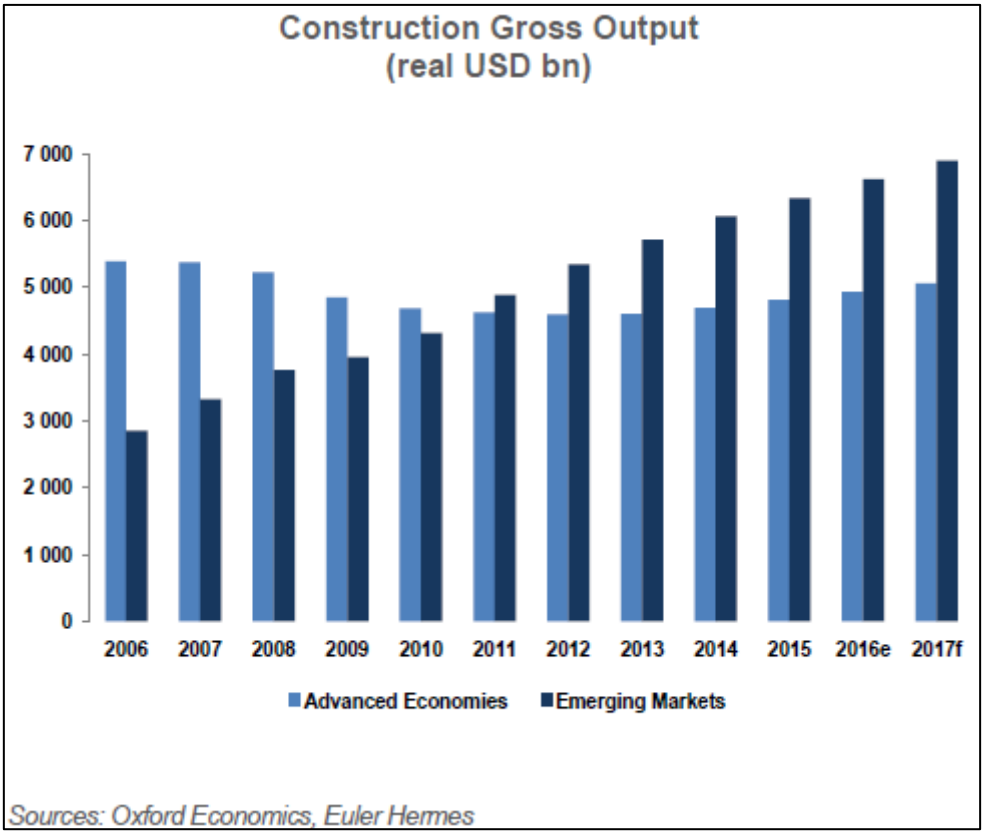

FIG. 2-3 CONSTRUCTION GROSS OUTPUT (2006-2017)

A general recovery of the construction demand in future is expected (see Fig. 2-3[3] and Fig. 2-5). However, it is probable that the regaining will remain below the values ordained in the recent years. In the context of global perspective, as the developed countries are decreasing their contribution to the overall construction productivity, the developing countries are emerging to be the major contributor (see Fig. 2-4).

[3] 2016e stands for expectation, 2017f stands for forecast

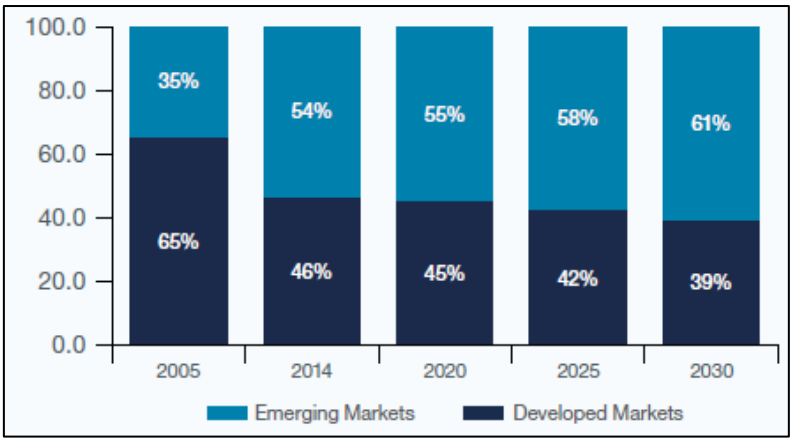

FIG. 2-4 INCREASING IMPORTANCE OF EMERGING MARKETS - % SPLIT (GLOBAL CONSTRUCTION 2030, P44)

Decline ▼ Growth of less than 2% ▲ Growth over 2% ▲

	2005-14	2014-30
Western Europe		
Belgium	▲ **2.6%**	▲ 1.2%
France	▼ *-1.6%*	▲ 1.0%
Germany	▲ 1.2%	▲ 0.6%
Greece	▼ *-11.1%*	▲ **3.4%**
Italy	▼ *-3.8%*	▲ 1.6%
Netherlands	▼ *-1.0%*	▲ **2.0%**
Spain	▼ *-6.4%*	▲ **2.2%**
Sweden	▲ 0.6%	▲ 1.9%
UK	▼ -0.1%	▲ **2.9%**
North America		
Canada	▲ **3.3%**	▲ **2.2%**
US	▼ *-3.4%*	▲ **5.0%**
Asia Pacific Developed		
Australia	▲ **4.6%**	▲ 1.6%
Hong Kong	▲ **4.7%**	▲ **2.3%**
Japan	▼ *-0.3%*	▲ 0.8%
Korea (S)	▼ *-0.4%*	▲ **2.0%**
Singapore	▲ **11.5%**	▲ **4.7%**

FIG. 2-5 REBOUND FORECAST IN DEVELOPED COUNTRIES (GLOBAL CONSTRUCTION 2030, P44)

When the global turnover of construction companies was compared with the total volume of orders received from abroad (see Fig. 2-6), it can be concluded that the international business records for about 10% of the industry performance. The Global Construction Survey'2013 by KPMG concluded that out of the total global construction companies interviewed, 47% of them planned to move into a new geographical location, the most popular of it being Africa (KPMG International). As per the survey, it was found that the companies in Europe and the Middle East are interested in investing in Africa, whereas those in America are focussed primarily in the Middle East. Thus, a majority of contractors intend to continue their global development activities while only a minority of them propose to decline their cross-national activities.

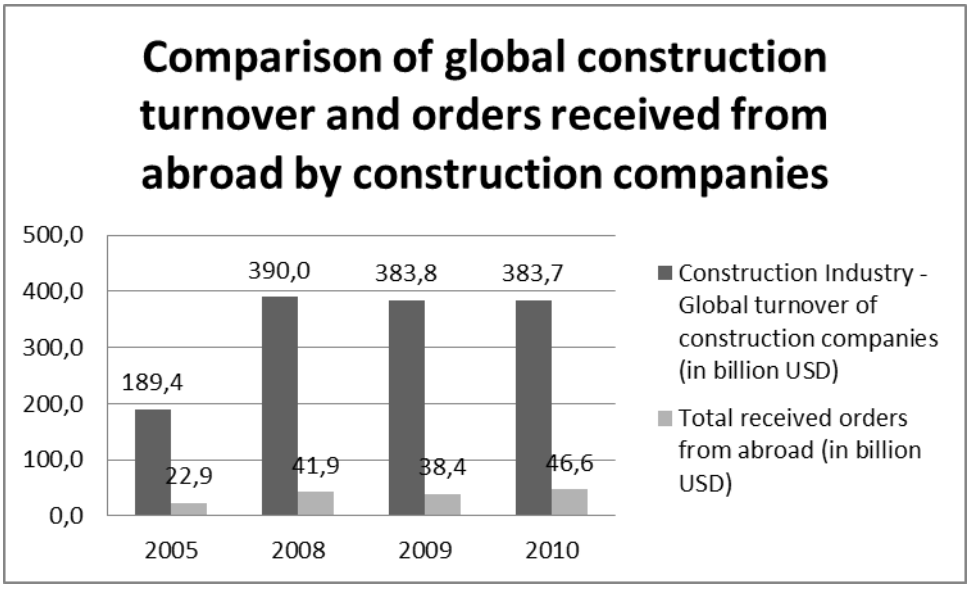

FIG. 2-6 COMPARISON OF GLOBAL CONSTRUCTION TURNOVER AND ORDERS RECEIVED FROM ABROAD BY CONSTRUCTION COMPANIES (ENGINEERING NEWS-RECORD (ENR), 2011)

According to the Global Construction 2030 report from the *Global Construction Perspectives* and *Oxford Economics* for the three main types of building work (infrastructure, housing and non-housing), the four main promoters for the growth of construction output are predicted to be GDP growth rates, population projections, urbanisation trends and budget deficits (Global Construction 2030, p31).

The most important sectors in the construction business are expected to be power and energy, water and wastewater, rail, mining and road and bridge construction. In a survey administered by KPMG, a majority of contractors feel that the stimulus packages ordained by the government can increase their business opportunities (KPMG International).

The increasing global demand for the course of urban development in developed countries (like the United Kingdom[4]) and the large infrastructural projects and industrial and power plant constructions in developing countries (like China, India, or Brazil) require an augmented set of expertise that is available to various small building companies.

[4] See the enormous number of new constructed high-rise buildings in London on skyscraperpage.com

Thus, to compete with the large international contractors, the smaller companies usually seek joint ventures, bidding consortiums, mergers or acquisitions. They offer to indulge in these agreements to extend their technical knowledge, increase the resources, obtain new ways to generate capitals and to meet the dictating requirements of public (especially large-scale) tenders (KPMG International).

Due to the advances made in the technical requirements of buildings and projects, the need to specialise and integrate technical expertise and the constant need for investments to maintain in the competition, there has been a growing interest towards an impetus in the specialisation and integration in the construction industry. Also, the need for permissions, certificates, and project history in the building sector has emerged due to the developing technical requirements for building solutions. These requirements are particularly for the labour-intensive and general work contractors who find it difficult to maintain profitability due to lack of specialisation or integration on a low-wage market.

There are three major reasons that validate the integration of the services provided by sub-contractors: (a) to achieve and maintain a competitive advantage over current and future competitors, (b) to increase the sales volume and contribution margin, and (c) to acquire new technologies and competencies. European building enterprise, Bilfinger SE refocused their business area structure to alter their fundamentally offered services. As a global company with more than 74 thousand employees and with a turnover of 8 billion Euro in 2013, Bilfinger modified its scope due to which nine direct divisions were circulated in the Industrial, Power, Building and Facility, Construction and Concessions sections (FAZ 2014), (Bilfinger SE 2016). The business framework was aggressively altered by 2016 whereby they transformed from being a traditional building company to a service provider for consultancy services, planning, engineering and development. Furthermore, they provide financing, particularly for industrial, power plants and real estate's (see Table 2-1).

Division	Scope
Industrial	Planning, manufacturing and erection of industrial facilities Industrial services (process industry, energy industry)
Power	Planning and construction of power plant engineering

TABLE 2-1 DIVISIONS OF BILFINGER SE

The idea of sustainability often centres on green building and environment-friendly technologies. The contractors, notably from America, are deemed considerably more enthusiastic about sustainability. The projects in developing markets generally involve constructing general infrastructure that supplements the comfort of living, however, in developed markets (America) sustainable technologies and green reputation are given more preference. Such a choice in the developed markets gives an impetus to the contractors among their competition and aids them to bid on a larger range of projects. The client sustainability is associated with cost and energy efficacy of the infrastructure, and this efficiency is linked with environmental-friendly building methods and infrastructure. Thus, most competitors strive for the sustainable approach as it just not provides a competitive advantage but are also required to meet industrial standards and to increase the chances for future projects.

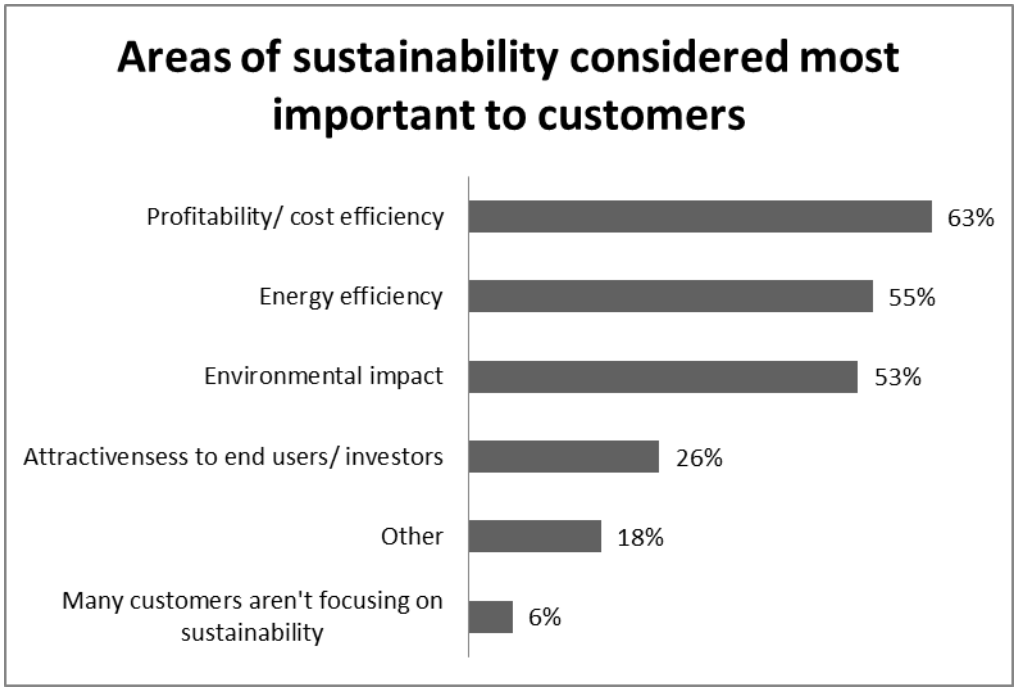

FIG. 2-7 AREAS OF SUSTAINABILITY CONSIDERED MOST IMPORTANT TO CUSTOMERS (KPMG INTERNATIONAL, 2010B)

Thus, due to its added advantages, green technologies and sustainability is another trend in the construction industry. However, this trend might present itself with few challenges such as the reduced production of carbon dioxide, the cautious use of environment-friendly material, and the reduction of building wastes while maintaining the profitability and feasibility.

The construction projects that focus on environmental restoration, energy efficiency and alternative energy sources have to be vigilant about various factors such as, ensuring the economic growth, improving environmental impact, and creating jobs in the green construction industry. In recent years, the green energy market grew significantly which furtherly provides good business opportunities for companies with appropriate technology and proficiency (Jang et al., 2012).

With an increase in the global construction industry, there is an urgent need for more and proficient labour. The data that claims the increasing shortage of skilled people in the construction industry has been provided by the Global Construction Survey of KPMG. However, it can be assumed that this shortage usually occurs in nations that have little or no qualification requirements for the employees. In Germany, for instance, the craftsmen are supposed to undergo a dual training that consists of practical on-the-job training and vocational training for at least three years. Apart from attracting talented and driven people, but also empowers them to negotiate for a higher salary. Such kind of training ensures a balanced level of quality in the industry.

Due to the lack of competent and skilled local labour, various contractors employ foreign labour on their projects. It is also crucial that the work quality resonates with the price charged to the customers. In a high-wage country, the construction results, the quality, and the functionality of the building must be distinguished to rationalise the high purchasing costs. Whereas, in low-wage countries, the quality of the work is often endangered due to the lack of training and competent labour.

The future of the global construction industry

The global construction sector will continue to grow in future with an approximate annual growth rate of two to three percent. Nevertheless, the economic growth rates in the developing markets are currently declining and will remain balanced (European Central Bank, 2015). In developed economies, however, a revival of the construction business is expected.

In the future, the emerging markets will entail market opportunities, as the new environmental and substantial standards will have a positive impetus in the market. The need for housing and infrastructure will escalate due the growing population and urbanisation. Furthermore, the government subsidies and the development projects funded, for instance, by the World Bank (The World Bank Group) or the Asian Development Bank (Asian Development Bank) will prove to be a critical index for the international building market (Euler Hermes, 2017).

The Global Construction Outlook 2030 provides a convincing outline of the forthcoming construction trends and the consequent global economic development (Global Construction Perspectives and Oxford Economics, 2015). Additionally, a report by Global Construction Perspectives and Oxford Economics shows the future market trends and developments in the global construction industry. As per these reports, the total global construction will grow by 85% until 2030 and incorporate the increase to USD 15.5 trillion. Thus, the construction industry would account for 14.7% of the global GDP as compared to 12.4% in 2014. Globally, the construction industry will increase by 3.9% majorly due to the economic development of India, China and the USA. It is estimated that by 2030 China will account for almost a quarter of the worldwide construction activities. The construction market in the US is expected to grow at an average rate of 5.0% annually till 2030, whereas India will contribute to over USD 1 trillion to the turnover of the global construction. It would be possible in 2025 that Europe (except UK) will again reach the sales level of 2006 in the realm of the construction industry. The UK might become the world's sixth largest and Europe's largest contributor to the construction market. The report also states that the infrastructure funding will remain a key driver for growth, especially in the emerging markets (see Fig. 2-8). In addition, Fox and Skitmore (2007) discovered eight key factors that influence the favourable development of the construction industry. These factors have been described by Hardie (2010) as follows:

- Industry-led better practice and culture
- Financial resources and investor confidence
- Human skills and culture of transparency
- Government policies and strategies supporting the construction business
- Research and development (R&D) for construction
- Self-reliant construction culture
- Institutional support
- Supportive attitudes from aid agencies

The anticipation of the future market trends is a challenging task. The empirically driven statistics fail to encompass various factors such as culture, a complex and closely intertwined global economy and regional trends that shape the international business.

Nevertheless, some central drivers for the global construction industry can be identified such as national governments' infrastructure plans, general economic growth and the growth of the population.

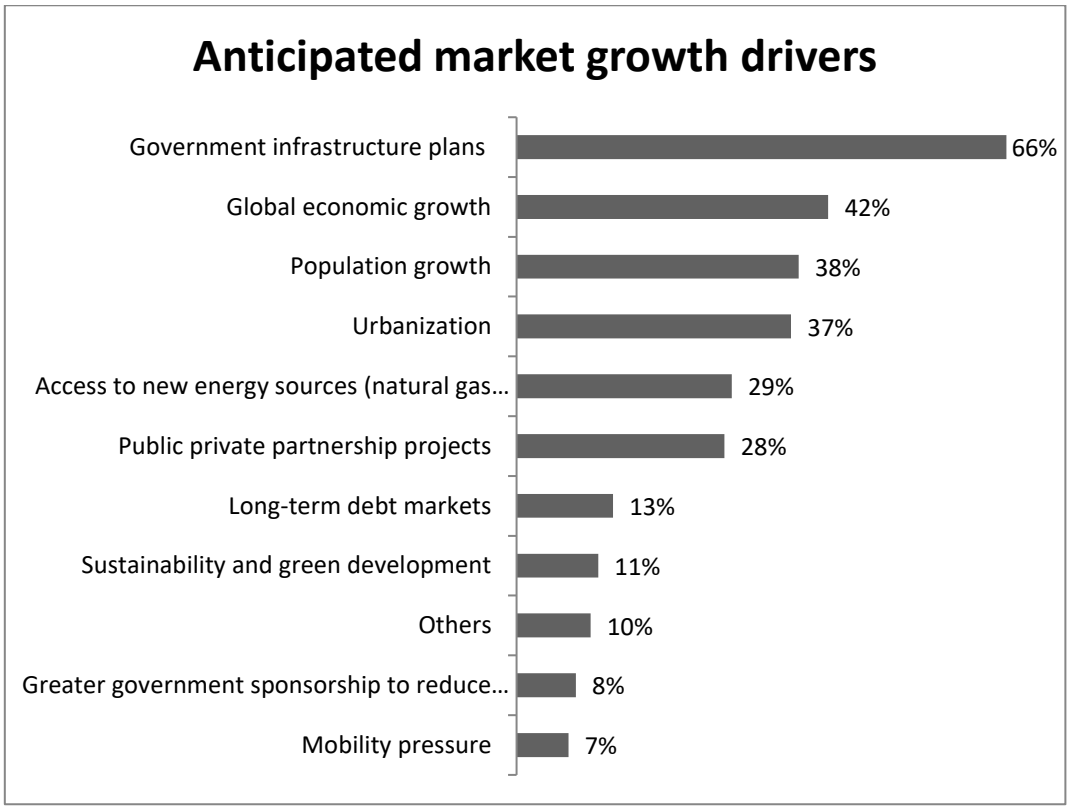

FIG. 2-8 ANTICIPATED MARKET GROWTH DRIVERS (KPMG INTERNATIONAL)

2.2. Factors affecting the success of construction projects

Construction projects are a combination of various anticipated and unanticipated events and interactions. Also, construction projects, essentially the international ones, are evolving to be complex and varied. Thus, as anticipated, a large number of researchers are dealing with the subject of the critical success factors (CSFs) in construction projects and international projects. CSFs are characteristics, conditions, or variables that might influence the project outcome, if managed and maintain accurately (Milosevic and Patanakul, 2005b). The interest in CSFs is not solely academic but also academic that examines the factors that have a positive influence on a project; it can determine the factors that reinforce the perceived success of a project for the participants and the variables that execute the measurement of the performance. (Marques, Gourc and Lauras, 2011). However, the divergent interests of the projects for different parties involved must be considered when determining the success of a project. A project that seems successful to a contractor, for instance, would not necessarily be considered a successful venture for other contractors or customers (Toor and Ogunlana, 2009). There is a varied range of literature that mentions the success factors of construction projects and international construction projects.

Over the years, the conventional factors that were used to evaluate success were along the lines of costs, time and quality and these factors have become correlated with the assessment of project achievements with time. These three factors are combined in the 'Iron Triangle' (Atkinson, 1999), (see Fig. 2-9).

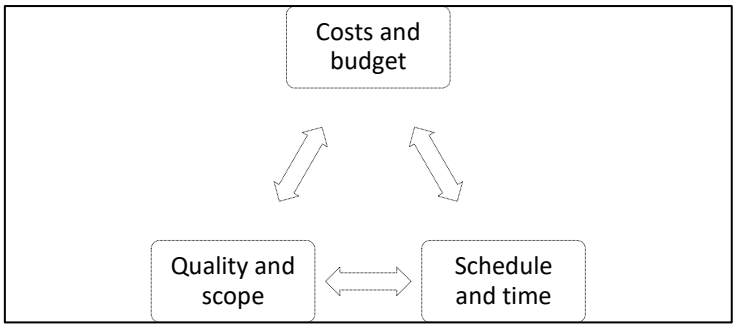

FIG. 2-9 IRON TRIANGLE (ATKINSON, 1999)

The cost, quality and time are the most undisputable assessment criteria that validate for a project's success. However, the question that arises is whether the success factors are pertinent to the project's success, keeping in mind the perceived success of the project by the client and the use of expertise and resources by the contracting companies. Various researchers have aimed to answer whether the traditional assessment of cost, time and quality are still the deemed parameters for modern projects. Babu (2015) examined a variety of factors affecting the success of construction projects. His findings argue that the success factors are more profound than the traditional Iron Triangle. He also mentioned that the significance of a project's success is reliant on whether the respondents were owners, consultants or contractors.

The studies of Babu and Toor provide a better picture of the success criteria for construction projects (Babu, 2015; Toor and Ogunlana, 2010). Toor conducted an investigation with international construction managers and project participants and adjudged that there are three levels of key performance indicators (KPIs) for construction projects. In the first level, the traditional indicators such as budget cost,

time and quality are the criteria for determining success. The second level includes safety, efficacy and effectiveness which are used to measure the accomplishment of the construction projects. The third level of key indicators includes the deficiency-free execution of works, the conformity with stakeholder expectations, and the minimization of construction aggravation, disputes, and conflicts. The various factors obtained by combining the results of the investigations conducted by Babu and Toor are as follows[5]:

On time delivery
Costs and budget as anticipated
Quality
Health & Safety
Productivity and efficient use of resources
Free from defects (high quality of workmanship)
Meets the specifications
Conforms to stakeholders' expectations and client satisfaction
Conforms to stakeholders' expectations
Regular & Community Satisfaction
People
Minimized construction aggravation, disputes
Innovation & Learning
Environment

TABLE 2-2 POSSIBLE PROJECT SUCCESS FACTORS ACCORDING TO (TOOR AND OGUNLANA, 2010) AND (BABU, 2015)

For further consideration that mentions about the factors of project success, the study conducted by Alias can also be contemplated (Alias et al., 2014). However, a clear distinction is made between Alias' study and studies by other researchers as Alias refers to contributing success factors for achieving the project goals as opposed to factors that assess project success. To avoid confusion, the project's success factors should be called success contributors. Thus, the study conducted by Alias aims to define the variables that lead to project success, which ought to be reflected throughout the entire project with the intention of enhancing the success of the project. The variables are shown in annex A.4. The project success contributors according to Alias are given in Table 2-3 (Alias et al., 2014).

[5] Possible project success factors to asses project success

Support from senior management
Skilled designers
Skilled project managers
Troubleshooting
Project team motivation
Commitment of all project participants
Strong/detailed plan effort in design and construction
Adequate communication channels
Effective control, such as monitoring and updating plans
Effective feedback
Adequate financial budget

TABLE 2-3 PROJECT SUCCESS CONTRIBUTORS BY (ALIAS ET AL., 2014)

Thus, by concluding the studies conducted by Chan, Alias and Babu, various researchers have been able to determine KPIs for construction projects which refer to both the objective and subjective measures in the context of KPIs[6] and decipher the success of building projects (Chan and Chan, 2004; Alias et al., 2014; Babu, 2015). Besides identifying the key success factors, projects' success can also be measured by categorising the projects into different phases. It has been assumed that the individual projects' phases possess different success factors; thus the project managers should focus on some important factors before the initiation of the project.

[6] The purpose of the KPIs is to enable measurement of project performance as well as organizational performance. When defining KPIs one shall focus on critical project aspects and not gather too many KPIs as the observing and managing might consume too much time and resources. In order to keep the use of KPIs functional and effective the data acquisition must be easy and quick and the indicators should be established and understood throughout the organization.

3. Review of literature and Project Management in academia

3.1. Introduction

PM can be defined as all the activities that are required to achieve a defined project goal. Such activities comprise of planning and organizing tasks, allocating resources, leading and motivating project teams, controlling the project progress, and executing the project resonating with the desired goals. Projects, usually, have a due date for the supply of a unique product, service, or any other requirement (Tukel and Rom, 1998). Nowadays, the project managers can depend on different standards generated by 'bodies of knowledge' and other project management associations. The following chapters shall provide an insight into the most common PM BOKs, their contents and definitions, as well as their approaches and understandings of project management.

Moreover, this research shall investigate how the practitioners manage their building endeavours abroad. Thus, this literature review serves varied purposes in the context of this dissertation. On the one hand, the evaluation of previous studies serves as a foundation upon which this research is based. A comprehensive review of the literature provides an overview of the accessible qualitative papers, empirical studies and literature that is related to international project management as well as to generate an objective and logical summary of the current knowledge that focuses on the international construction project management.

On the other hand, this literature review also serves the purpose of identifying key themes, topics, methods and techniques that were studied and which provide a framework for the interviews conducted in the course of this study. Hence, the literature review offered key themes and topics for the subsequent study and also served as a basis for semi-structured interviews and their further evaluations.

The literature of the experts, books and academic materials related to PM (or construction management), project organization, PM standards, and international PM have been reviewed and scrutinized in this study. Due to the varied and vast material concerned with project management or construction management, the literature review was quite challenging. Nevertheless, from this literature review, it was possible to narrow down the useful literature and identify some critical study that could be used as a starting point for this dissertation.

The subsequent section 3.4 provides an outlook on technical books that resonate with this research. There are a large number of expert's books and selecting the appropriate literature is quite taxing and often questionable. Nevertheless, section 3.4 provides a brief overview of books used for producing this research work; the extensive enumeration is attached (see annex A.3).

To determine a methodological approach for this literature review, it was reasonable to consider the aspect of project management from a higher level. Such an approach would also aid to examine the concept of construction management and international construction management thoroughly. With the intention to methodologically structure the selection and analysis of the literature, five key questions were asked for this literature review (see Fig. 3-1).

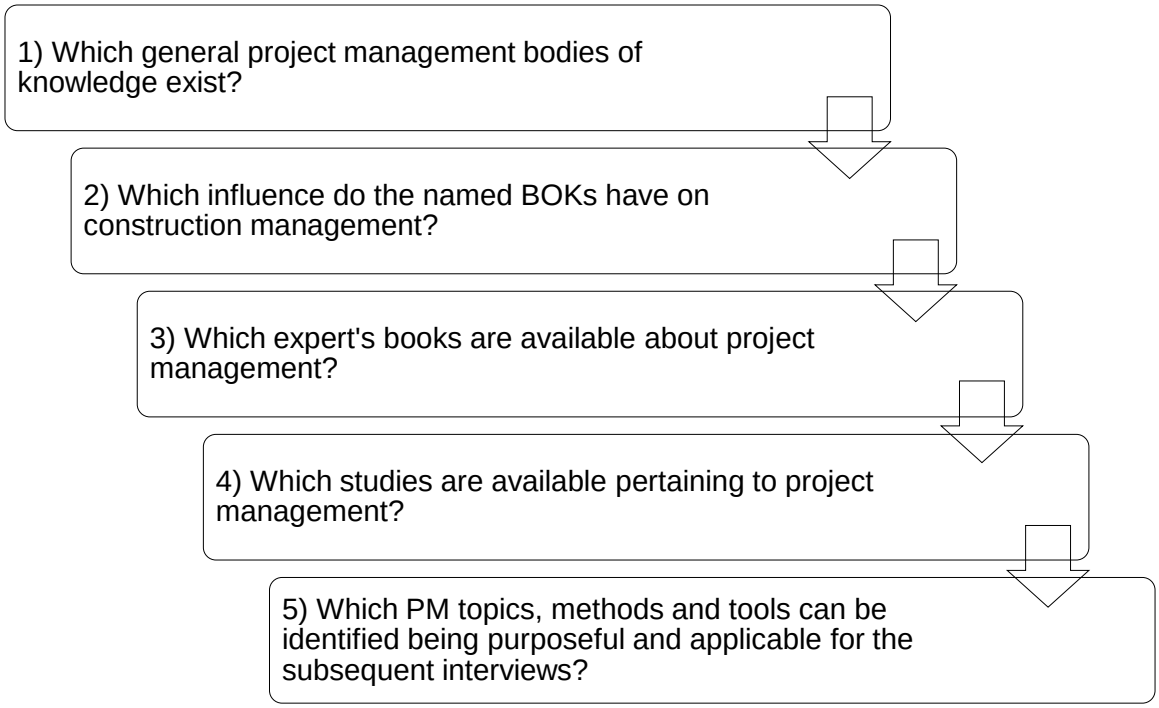

FIG. 3-1 QUESTIONS AS GUIDELINE FOR LITERATURE REVIEW

A variety of key literature pertaining to PM was identified, which has influenced this research and has been presented in the following chapters. However, there is a limited application of these methods, standards, books, and guidelines. The books by experts are the academic medium for practitioners to obtain information and advice about various processes, methods, techniques or tools.

There is a prevalent number of studies pertaining to project management. For this thesis, however, six studies with most relevance for this research are presented, and their contributions are discussed in section 3.5.

An academic paper by Abudayyeh et al. concerned with the topic of project management underlined the need for increased cooperation between the construction industry and academia to improve the construction practices and processes (Abudayyeh, Dibert-DeYoung and Jaselskis, 2004). Abudayyeh et al. found that the topics such as scheduling, productivity, and cost control seemed to have the highest importance to the construction industry and researchers. They also concluded that, nowadays, IT and computer programmers have become crucial to the development of the construction industry.

This research shall investigate how the practitioners manage their building endeavours abroad. Thus, this literature review serves varied purposes in the context of this dissertation. On the one hand, the evaluation of previous studies serve as a foundation upon which this research is based; on the other hand, the key themes, topics, methods and techniques that were studied provided a framework for the interviews conducted in the course of this study.

Section 3.6 summarizes the identified general PM topics which derived from the literature and this section also serves as a starting point for the preparation of the interview and the survey conducted.

3.2. What is project management (PM)?

The Project Management Institute (PMI) describes PM as the application of knowledge, skills, tools, and methods for implementing any given project (Project Management Institution (PMI), 2014). According to the PMI, a project can be divided into five process groups: initiation, planning, execution, monitoring, and controlling (see Fig. 3-2).

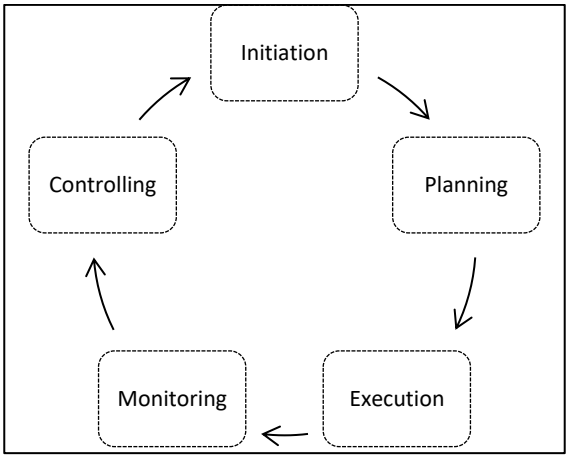

FIG. 3-2 PROCESS GROUPS OF PROJECTS

PM involves delivering of a result within the parameters of period and budget based on the specifications and properties. Generally, the companies tend to implement and establish standardized project management practices to provide their managers with a set of tools and techniques to manage their projects. The project managers lacking expertise and resources also receive an access to tools by using the standardized project management (SPM). The implementation of SPM might carry significant potential for improving the project's performance. There is a considerable relationship between the success of a project and standardized PM tools, standardized project leadership, and standardized PM processes (Milosevic and Patanakul, 2005a).

In recent years, PM associations have invested substantial time and effort to develop PM programmes and certifications. The most common programmes related to the associations and standards are listed Table 3-1 (Ahlemann, Teuteberg and Vogelsang, 2009).

(1) Critical Chain Project Management (CCPM) (Goldratt, 1997), (Morris, Peter W. G, 2013)
(2) DIN 69901-69905 issued by the German Institute for Standardization (Deutsches Institute für Normung (DIN))
(3) International Competence Baseline (ICB) issued by the IPMA (IPMA – International Project Management Association)
(4) ISO 21500:2012, *Guidance on project management* (International Standards Organization (ISO))
(5) Organizational Project Management Maturity Model (OPM3) issued by the PMI (Project Management Institution (PMI))
(6) PMBOK® Guide and associated PM Certifications issued by the PMI (Project Management Institution (PMI), 2013)
(7) PRINCE and PRINCE2 developed by the British OGC (PRINCE)
(8) Standards defined by the Association for Project Management (APM Association for Project Management)
(9) Total Cost Management Framework issued by the AACE International (American Association of Cost Engineering)

TABLE 3-1 PERCEIVED MOST COMMON PM PROGRAMS, ASSOCIATIONS AND STANDARDS

However, the effectiveness of PM is not generally consistent when with the completion of projects on time and within the budget allocated. The causes of failure or poor performance often stem from poor management (Anderson and Merna, 2003). Consequently, when talking about PM, it is crucial to consider both the available PM techniques and the individual who is executing the project. Additionally, the construction or site managers often find that their work is hampered by administrative matters (Styhre, 2006). Hodgson observed that modern PM has been becoming very bureaucratic:

> *"Project management can be seen as an essentially bureaucratic system of control, based on principles of visibility, predictability and accountability, and operationalized through the adherence to formalize procedures and constant written reporting mechanisms. At the same time, however, project management draws upon the central rhetoric of empowerment, autonomy and self-reliance central to post-bureaucratic organizational discourse"* (Hodgson, 2004).

Hodgson believes that the modern PM is a rediscovered, old-fashioned management perception that is preoccupied with excessive planning and a belief that focuses on stern managerial control. Nevertheless, the implementation of PM standards helps to establish and maintain knowledge about different tools and techniques that can manage the construction projects in an efficient manner.

The PM processes, according to DIN[7] (2009a) and ISO[8] 21500:2012 (2009c), can be assigned to the PM phases and associated process subgroups (see annex A.1)); however, the original numbering of the single PM process according to DIN has been omitted.

The initiation, planning, execution, control, and completion of process groups are repeated in every project and its subsequent phases (2009b). It is a possibility that only few processes within a process group are applicable to the individual project phase. The interactions between the individual process groups within a project are illustrated in Fig. 3-3..

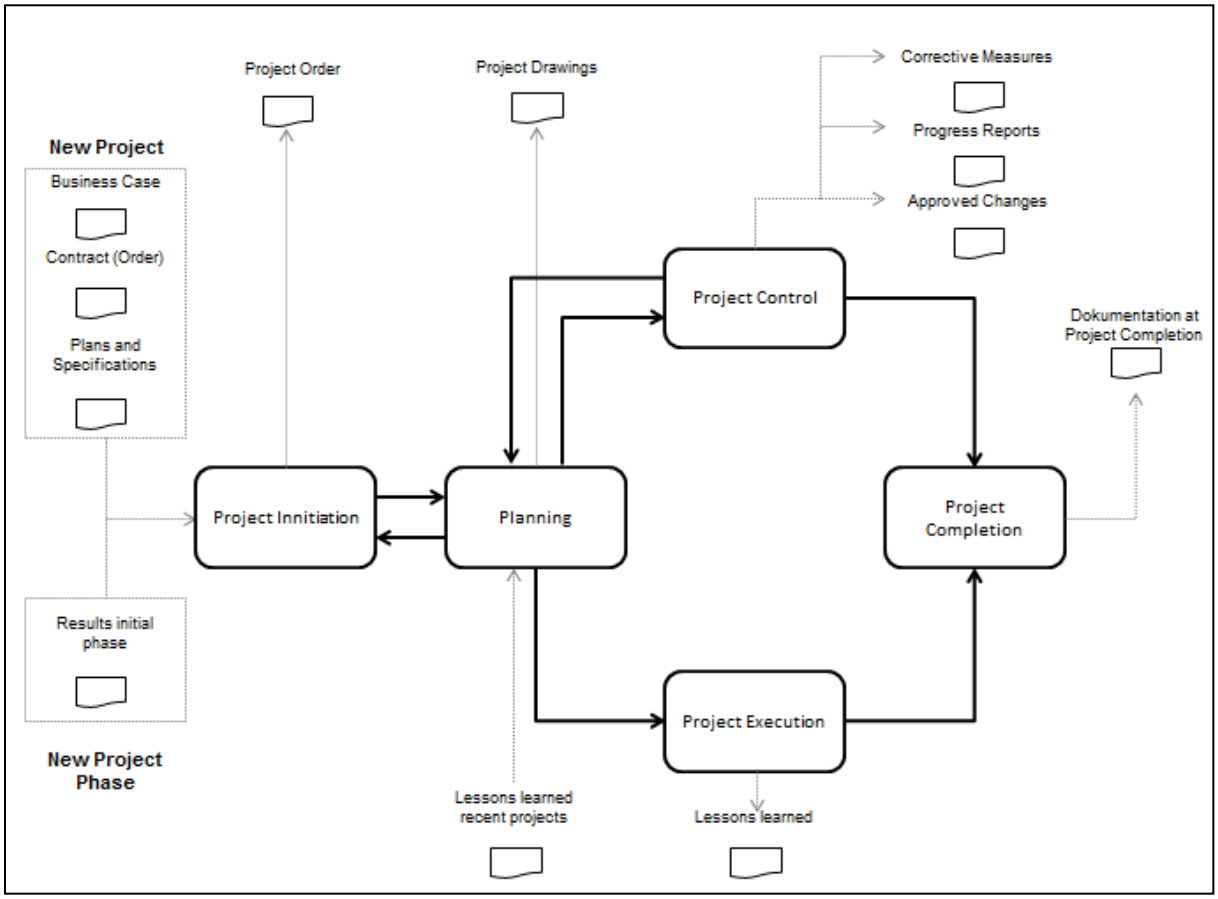

FIG. 3-3 INTERACTIONS BETWEEN PROCESS GROUPS OF PROJECT MANAGEMENT

[7] German Institute for Standardization

[8] International Organization for Standardization

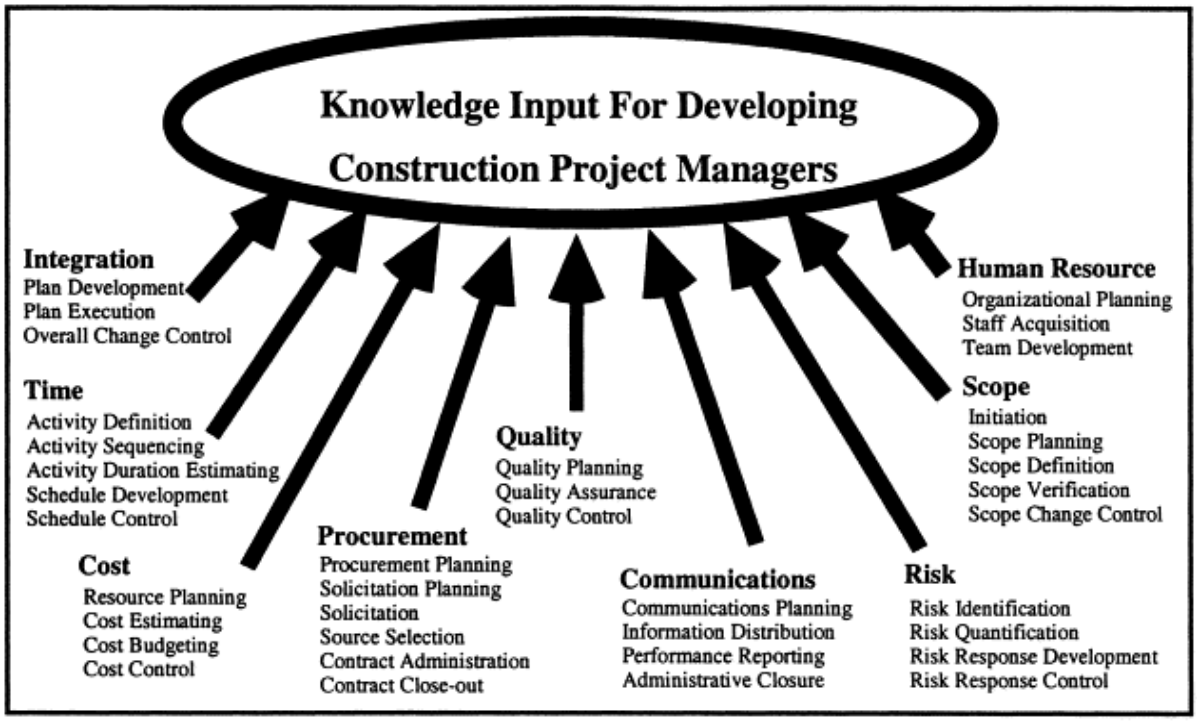

FIG. 3-4 GENERIC KNOWLEDGE AREAS OF PROJECT MANAGEMENT (ADAPTED FROM PMBOK) (EDUM-FOTWE AND MCCAFFER, 2000)

In the context of PM, the terms 'processes' and 'methods' are often used. The PM processes[9] are the whole set of related actions, operations, and measures that are appropriated to attain the project's objective. Nowadays, there are standardized PM processes for each unique project; thus, the project managers must apply suitable processes. Usually, the processes consist of a variety of associated actions and procedures that relate to one another. Thus, PM can be divided into two main categories: PM processes and product-oriented processes. The PM processes relate to the desired purpose of the application, such as scheduling or cost management. Whereas, product-oriented processes relate to the project life cycle which is inclusive of project phases. Thus, these processes can be assigned to individual construction segments (or project phases), such as analysis, design, and production or commissioning. The PM process has varied subgroups, namely initiation, definition, planning, execution/ steering, monitoring and controlling as well as completion.

PM methods[10] are the conceptual basis for structured and planned actions in a project. The method aims to gain knowledge (e.g., the construction progress) and employ distinct tools, such as the critical path analysis to actuate the building's progress. PM methods aim to execute projects in an accomplished manner. They need to be (a) flexible (i.e., the methods have to be adaptable to new project contents and project environments), (b) universally applicable and modular (i.e., the individual modules can be used individually or as a whole), (c) compatible (i.e., the PM methods are compatible with one another), and (d) transparent and preventive (2009b).

[9] lat. procedere= proceed, emerge

[10] Method comes from the ancient Greek and is composed of meta = afterwards and hodos = way; and means to pursue something or to pave the way for something

Understanding and disciplines of Project Management

To further understand the topic of this dissertation, it is imperative to describe the common understanding of the term 'project management'. There are various approaches to PM that are dependent upon the role and position of a project. Kalusche divided the areas of responsibilities of the project as follows: A) organization, information, coordination, and documentation; B) quality and quantity; C) costs and funding; D) due dates, capacities, and logistics; E) contracts and insurance (Kalusche, 2012). Other authors, such as Koskela and Howell, have challenged such a traditional perception of and approach towards PM (Koskela and Howell, 2008); they consider these forms obsolete. Even though they didn't generate any new theories about PM, Koskela and Howell suggested that other factors should be integrated into PM theory. Scrum and comprehensive PM approaches include several factors, such as flow and value generation, management-as-organizing, the language/action standpoint, and the scientific experimentation model (Koskela and Howell, 2002).

Different studies are available that are related to the applicability of certain project management methods. However, shared consent about the various approaches and disciplines of PM, or even the intricacies of project management, does not exist. The conception of and the approach to PM requires the selection and application of certain methods. These methods and topics have been further scrutinised by both the theoretical and empirical academic papers. Thus, it is seemingly difficult to generate a summary of the accessible knowledge and previous academic work due to its humongous quantity. When an initial search for literature in the context of international project management was conducted, the result was more than 4,000 papers, experts' books, surveys and studies. Hence, the number of studies had to be narrowed down to make it impactful for this study; the result is presented in annexKey literature and expert's books.

The reader will be able to identify both experts' books and academic papers mentioned in this study. Although most of the papers were in academic journal articles, the experts' books, like Dörrenberg et al.'s (2014) work, might not have been based on some form of peer review. Although other books, such as the PMI's PMBOK®Guide or the APM BOK, most probably have gone through editorial refereeing to qualify the writing for publication. The experts' books, however, are not considered grey literature, as they provide accumulated experience and practical insights about the real world.

Three more approaches relate to PM. According to Del Pico (2013a), the traditional approach to PM can be divided into five phases: initiation, planning, execution, monitoring and controlling, and completion. The second approach to project management is critical chain project management (CCPM), which is an application of the Theory of Constraints (TOC). The TOC intends to quicken the rate of completion of projects and reduce their failures (Leach). The CCPM mainly consists of the development of the initial project schedule including the durations, dependencies, resources and constraints, and it establishes the project's critical path. The CCPM assumes that all the project tasks are subject to a certain degree of uncertainty, which is reflected by the inclusion of a safety margin to the actual required time of completion. This further asserts that the time necessities are usually fabricated. If a safety margin is not included, the successive tasks will remain idle because of non-availability of resources. Moreover, the task owner would not conclude the project early due to the sufficient availability of time; therefore, delays (or safety margins) are passed on through the project. The

third PM approach (besides the traditional PM and the CCPM approaches) is the extreme PM (XPM), which is generally used for complex and uncertain projects (Del Pico, 2013a). XPM is an agile form of project management and mainly concentrates on managing the project stakeholders rather than complex scheduling techniques and comprehensive planning. However, XPM finds its greatest applicability in the IT and software business rather than the sector of construction management.

The various formal BOKs have mutual terminology, functional decomposition, process description and organizational models in common (Ahlemann, Teuteberg and Vogelsang, 2009), but they often vary according to their conceptual width and scope. Morris et al. identified three formal PM BOKs, which are promoted by PM associations, namely, the PMI's PMBOK®Guide, the APM BOK and the Japanese BOK, P2M (Morris et al., 2006). The particular PM disciplines of the three named BOKs are illustrated in Fig. 3-5 and Fig. 3-6.

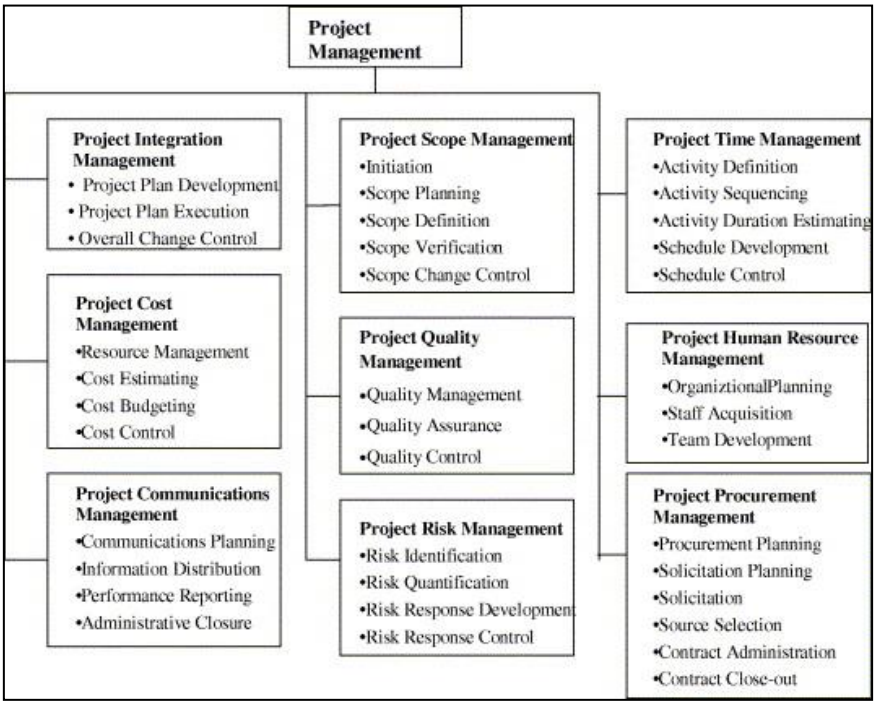

Fig. 3-5 Disciplines of PM by the PMI's PMBOK®Guide

Project Management in context				
Project Management Programme Management Portfolio Management		Project Context Project Sponsorship Project Office		
Planning the strategy				
Project Success Criteria and Benefits Management Stakeholder Management Value Management		Project Management Plan Risk Management Quality Management Health, Safety & Environment		
Executing the strategy	**Techniques**	**Business and Commercial**	**Organisation & Governance**	**People & the profession**
Scope Management Scheduling Resource Management Budgeting & Cost Management Change Control Earned Value Management Information Management and reporting Issue Management	Requirements Management Development Management Estimating Technology Management Value Engineering Modelling & Testing Configuration Management	Business Case Marketing & Sales Financial Management Procurement Legal Awareness	Project Life Cycles Concept Definition Implementation Hand-over and Close-out Project Reviews Organisation Structure Organisational Roles Methods and procedures Governance	Communication Teamwork Leadership Conflict Management Negotiation Human Resource Management Behavioural Characteristics Learning & Development Professionalism & Ethics

Fig. 3-6 PM in its purposive content by the APMBOK (PMI, 2013)

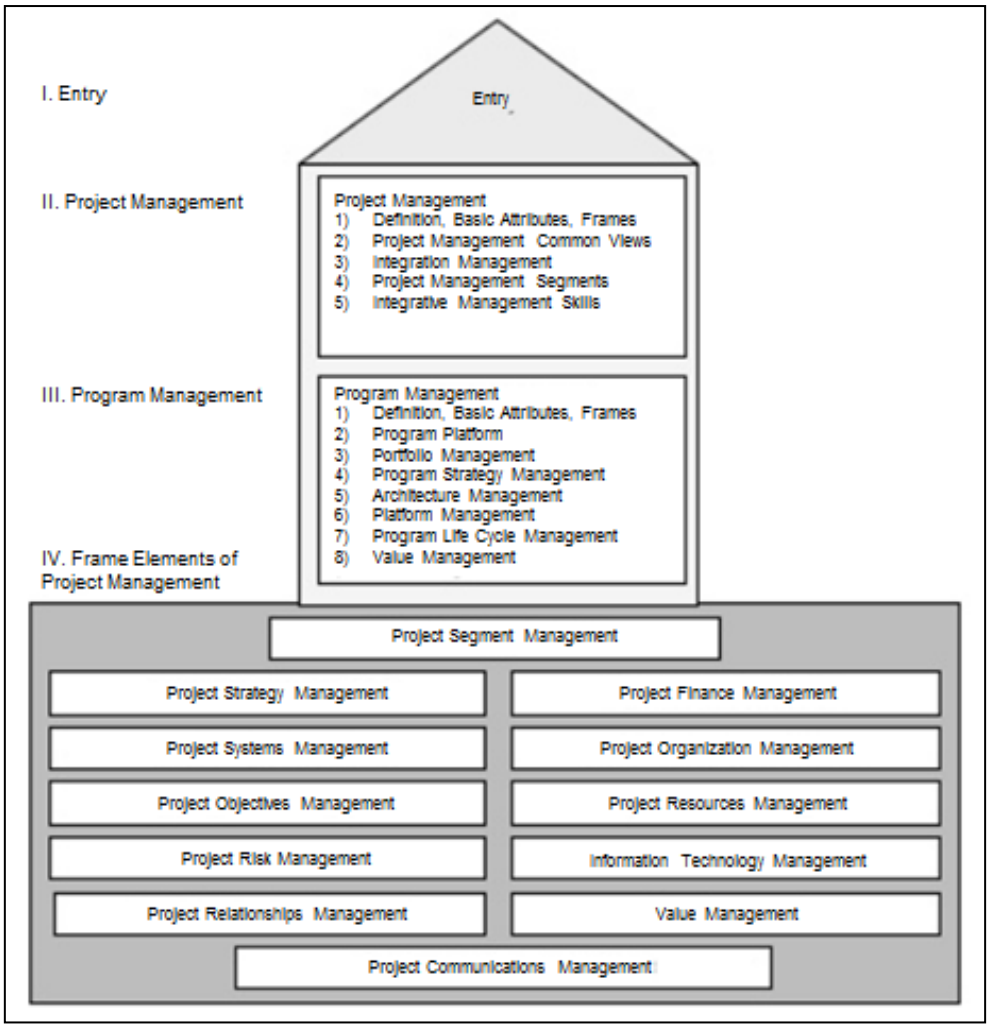

Fig. 3-7 BOK, P2M

3.3. Existing BOKs

Project management is a theme of business research that has been comprehensively studied; thus, adequate literature reflects on different PM techniques, management concepts, soft skills of project managers, and leadership concepts. The continuous development and improvement process that drives people also influences working life. With continuous research, development and practical experience, so-called BOKs emerge that provide established, researched and proven solution patterns and approaches for the methodical management of daily tasks with the goal of ensuring a documented transfer of knowledge and a general understanding of requirements and quality.

A Project Management Body of Knowledge can be understood as an evolving set of terminology, methods and guidelines. The interpretation of the BOK is heavily dependent on the respective business, industry and discipline, and thus, for example, the PMBOK® of comparable literature differs from other disciplines.

The original approach of professional associations for PM was to exchange information and transfer knowledge. However, to prove that the exchange of information and the learning of methods, techniques and knowledge were successful, the business area of PM certification soon developed. Purposely, this refers to a financial business model because although comparable and underlying standards were initially unavailable, the PMI in the United States and later the APM in the United Kingdom developed their own project management standards as the basis for their certifications (Shepherd 2011). One of the most important standards by now is the 1976 standard produced by the PMI “Guide to the Project Management Body of Knowledge”, which was published in 1983. Moreover, apart from the three mentioned ‘Bodies of Knowledge’ below, there are more guidelines that match the description, for instance, the national guidelines and standards. The German ‘Project management - Project management systems’ (Deutsches Institute für Normung (DIN)) of the ‚Guidance on project management’ (International Standards Organization (ISO)), and various other guidelines are also mentioned in Table 3-1. However, as this research is concerned with the international project management, the three most common internationally accepted bodies of knowledge shall be considered.

The most common project management guidelines, or ‘Bodies of Knowledge’, according to Morris et al. (2006) are:

(1) Guide to the Project Management Body of Knowledge (PMBOK®Guide) issued by the Project Management Institute (PMI).[11]

(2) The ‘Body of Knowledge’ by the Association for Project Management[12] (APM BOK)

(3) The Japanese ‘Body of Knowledge’ 2PM (Project and Program Management) of the Project Management Association of Japan[13]

These various formal bodies of knowledge tend to have in common a mutual terminology, functional decomposition, process description, and organizational models (Ahlemann, Teuteberg and Vogelsang, 2009) but they often vary based on their conceptual width and scope. Additionally, the term 'bodies of knowledge' also differentiate the

[11] http://www.pmi.org
[12] https://www.apm.org.uk
[13] http://www.pmaj.or.jp

overall topic of project management in alternative ways. For example, the PMBOK®Guide subdivides project management according to the individual PM disciplines, whereas the APM BOK subdivides the topic by purposive content, and the PMAJ P2M, orderly, divides project management according to the project depth (Fig. 3-8).

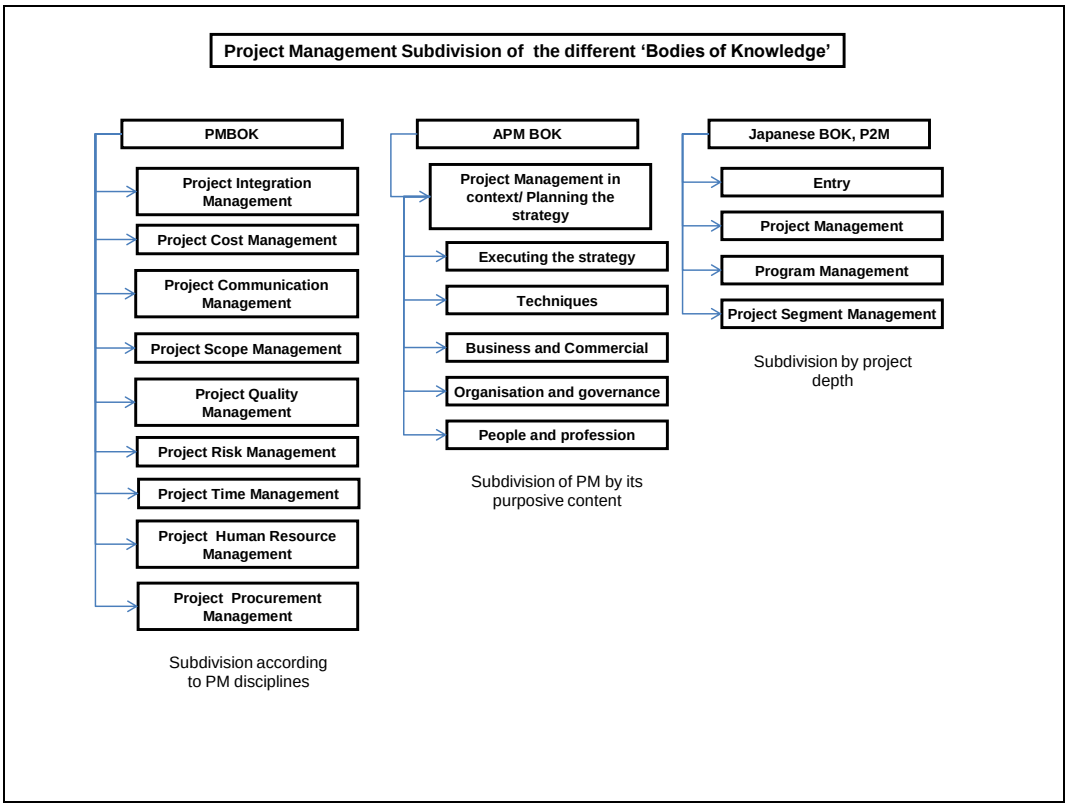

FIG. 3-8 DIFFERENCE BETWEEN BODIES OF KNOWLEDGE

However, Padalkar (2016) states very well that the entire research field ignores two elementary aspects. On the one hand, the actual success and failure factors in projects are not sufficiently researched. An overview of the possible influence and evaluation criteria of project success can be found in annex A.4, as well as further literature from, for example, Ika, 2009, or Müller and Jugdev, 2012. Second, Padalkar states that many authors indicate a weak theoretical foundation of the discipline and emphasize improvement of the practical relevance of the whole research field. Padalkar conducted an examination of thematic progression in the literature between 2000 and 2015 and identified as leading themes project methods, success factors, risk management, performance management and knowledge management. What is more interesting is that empiricism and determinism seem to dominate the research output over 2000–2015 and that despite theoretically rich outcomes, only a few practical, applicable results and recommendations are provided. This is also why Padalkar recommends refraining from overemphasizing determinism or empiricism and consequently renewing the focus on nondeterminism and theory building in PM.

Besner and Hobbs tried to answer the questions about the extent till which various project management tools and techniques can be used. They also tried to decipher the

organisational support and the variances between different types of projects and contexts in use (Besner and Hobbs, 2008).

However, the investigation pursued by Besner and Hobbs (2008) is purely empirical and thus, no individual case evaluation has been conducted. The two researchers distributed web-based questionnaires to receive personal information, and the information related to the type of employment, industry and project characteristics. The last part of the questionnaire aimed to analyse the frequency of use of 70 different project management tools and techniques. By using a 5-point Likert scale, the two researchers also examined the extent of use of the respondent's organisation, and the supported provided by it. This survey, however, is very similar to the surveys conducted by White and Fortune (Current practice in project management — an empirical study White and Fortune, 2002; Looking again at current practice in project management Fortune et al., 2011); (see chapter 3.5).

The number of participants and the extent of the survey is remarkable in the works of Besner and Hobbs. Also, the surveys are based on the three BOKs as mentioned by Morris et al. (2006). In addition, the division of the results into the engineering and construction, information technology and business services is not only relevant for the evaluation of the results but also provides the readers with an interesting insight. Annex Significant differences in usage of PM tools, according PMBOK®Guide, across three types of projects (Besner and Hobbs, 2008) shows the comparison of the application frequency of the individual project management tools which are further divided into the three project types in the study of Besner and Hobbs.

However, this study is similar to the one conducted by White and Fortune; thus, the limitations and applicability of this study are also limited. This research has recognized that the participants use particular tools and techniques without being knowledgeable about them, or have a different idea of technique under a different name. Therefore, a web-based questionnaire entails the risk that the participants can knowingly or unknowingly make false statements as explanation or further inquiries are not probable. Furthermore, a purely empirical collection of used tools does not exhibit the type and the depth of the used tools.

Thus, it is apparent that all the guidelines provide many proposed tools and techniques. However, they also have a general character that encourages the methodological project management related thinking. In addition, although BOKs certainly define the scope of the discipline and also the knowledge areas for practitioners, they also define the certification parameters for professionals (Shepherd 2011).

Influence of BOKs on construction management

The most relevant question with respect to project management is whether all the tools and techniques have a positive impact on the results. Chou and Yang have examined the relationship between the PMBOK®Guide and the project result and customer satisfaction (Chou and Yang, 2012). The main focus was on the efficacy of management tools and techniques when they were being implemented on the construction projects. The survey conducted by Chou and Yang was an empirical study that employed a questionnaire with 127 usable results. The results were then mathematically evaluated to determine the impact of PM tools and techniques on the project results and customer satisfaction.

However, due to the study being an empirical one, they are various problems. The participants' projects may be varied, thus, cannot be compared with one another. Particularly in the case of building projects, there are individual customers, unique project contents and structures, unique project environments, different contractual or legal baselines and the project professionals along with their own subjective expectations, attitudes and training. Furthermore, the comparative statements on the value of tools are troublesome due to the absence of reference projects with identical project properties that did not employ any PM tools or techniques. This problem, however, is common when the subjective influences are empirically represented.

In this dissertation, the participants have been inquired about their PM licences or their knowledge of standards, tools and techniques. However, due to the smaller sample size, the empirical significance and representativeness is reduced. The results, however, are comparable with the interview results presented in Chapter 6.

Table 3-2 shows the responses of the participants of the survey conducted by Chou and Yang (in original paper table 3). As witnessed, only 4% of the participants have a PMP certification, and a total of 64% of the participants have a low or below average familiarity with the PMBOK®Guide.

Level of awareness and certified training program for *PMBOK® Guide*	Low familiarity	51	40.2
	Below average familiarity	30	23.6
	Average familiarity	29	22.8
	Above-average familiarity	11	8.7
	High familiarity	6	4.7
	Total	127	100.0
License	Licensed registered engineer	60	47.2
	PMP	5	3.9
	None	52	40.9
	Others	10	7.9
	Total	127	100.0

TABLE 3-2 SOCIO-ECONOMIC CHARACTERISTICS OF SURVEY RESPONDENTS

Another study, by Siang and Yih (2012), examines the three industries (construction, manufacturing and IT) that apply project management methods according to the P2M. As these researchers mention, the Project and Program Management (P2M) is the first Japanese PM model that aims to develop and improve corporate PM methodologies. This PM model is managed by the Management Professionals Certification Center (PMCC).

Siang and Yih have conducted an exploratory study in which they pursued a secondary research by reviewing the Japanese project management guidebooks along with the journals, articles, books and conference proceedings. This critical review was written on Japanese Project Management (P2M and Kaikaku Project Management) and its influence on the three industries. Thus, the research was qualitative rather than empirical. However, no further qualitative approaches, such as informal discussions with industry representatives or formal approaches through interviews or case studies were preferred by the researchers.

The researchers accurately pointed out the uniqueness of construction projects and the construction industry, which differs from various other industries with recurring

tasks, processes and projects. Siang and Yih explain that the projects, nowadays, require a new management style and that P2M / KPM's 3K (kaihatsu, kaizen and kakusin) are the solution to this problem which can be successfully applied. According to the researchers, this 3K concept depicted in Fig. 3-9 and originally FIG. 2 in the work of Siang and Yih, is the dominant attribute for managing construction projects.

While the 3K approach is interesting and more promising for western industries and companies, also from Fig. 3-9 it is evident that the 3K is more of a methodological approach that can increase value, sustainability and quality in companies, processes and projects.

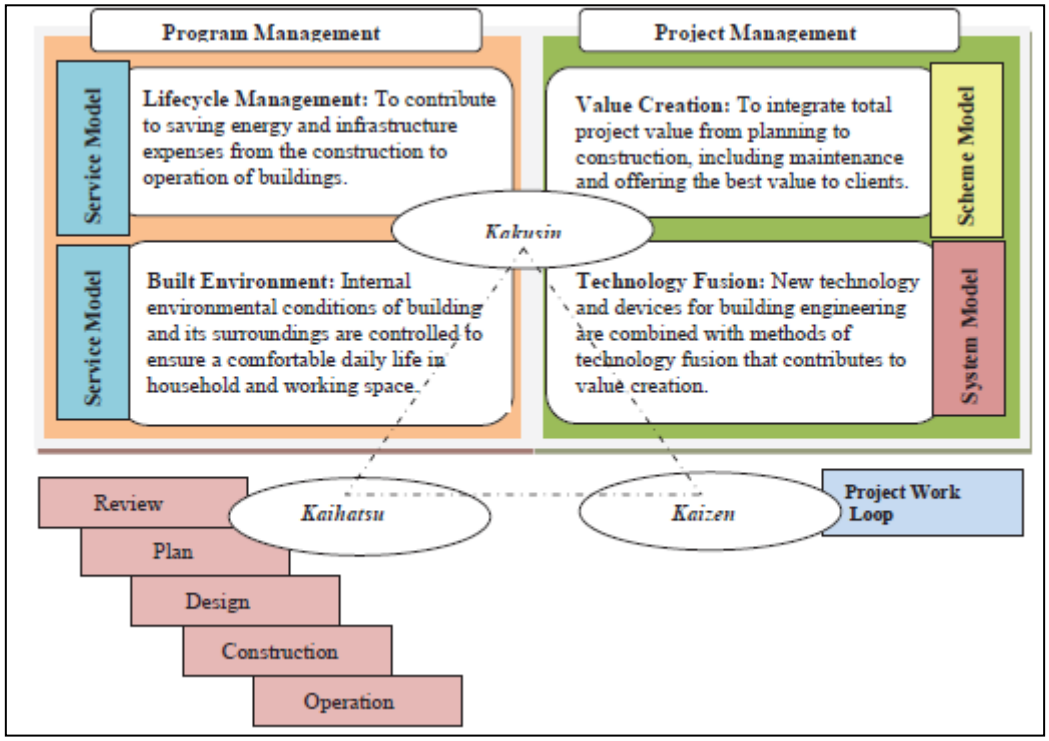

FIG. 3-9 INNOVATION ACTIVITIES IN CONSTRUCTION INDUSTRY WITH 3K IN P2M/KPM ACCORDING SIANG AND YIH (SIANG AND YIH, 2012)

It can be concluded that the identification of topics that project management professionals consider important and disciplines they need to possess profound skills in is a frequently occurring and relevant question. Some while ago, Morris reviewed the UK Association for Project Management's current PM BOK, the APM BOK (Morris, 2000). His review indicated that the BOK lacks a base of empirical data, that significant variations exist between the PMI model and the broader APM/IPMA, and that reviewing and simplifying the APM BOK, which was the main research subject, seems needed. Admittedly, the study by Morris was another empirically based review and, therefore, actual first-hand experiences and reflections were less regarded. However, the general statement that BOKs often lack general or partial applicability and contribution was expressed by Morris in another review: "The PMBoK Guide did not, and still does not, represent the knowledge that is necessary for managing projects successfully but only that which is considered truly unique for project management" (Morris, 2013: p. 54), which is also supported by the findings of this study. Furthermore, a foremost shortcoming of major standards such as APM's BOKs or the PMBOK® is that they are not developed by academic institutions, thus they do not serve the development of the industry as a whole but companies with their own interests, including economic ones,

even though the IPMA versions were prepared by groups of practitioners. However, it is believed that the differences and inconsistencies in the standards of the individual BOKs do not directly promote the development of PM as a professional discipline (Winch 2006, Winter et al. 2006). Furthermore, it is questionable whether PM certification is actually added value for the user or the project.

Several researchers have already pointed to the limitations of the BOKs (e.g., Wideman 1995, Koskela and Howell, 2002). One of their main criticisms has been that the complexity and uniqueness of projects does not receive enough attention. That the guidelines are a good basis for the certificates is beyond question, but this does not automatically mean that they also benefit the structure and transfer of PM knowledge.

Although the standards defined by the BOKs are becoming even more relevant, including to professionals and their employers who require and appreciate continuing qualified training and development, most employers develop individualized training programs because of the often-prevailing lack of references to individual project situations in standards and guidelines.

3.4. Available expert's books about project management

Nowadays, the project managers can depend upon a broad range of standards and tools to manage their projects efficiently; however, it is the goal of this study to scan the actuality of these methods and whether they are applicable in construction and also during the management of cross-national projects (Chen and Partington, 2006). The accessible practitioner literature such as the *Guide to the Project Management Body of Knowledge* (PMBOK) issued by the Project Management Institute (PMI) and *Project Management for Building Construction* (Sommer, 2010) has been taken into consideration. Hence, particular books and studies had a distinctive influence on the scheme of this thesis. These books helped to form an idea, to evaluate the previous topics and to conduct this research and can be also found in annex A.3.

While experts' books, like the one by Dörrenberg (Dörrenberg et al., 2014) did not go through the same rigorous peer review process, but they do highlight the key sources that the project managers use for their daily project challenges. Therefore, this literature can be considered as an accumulated experience and practical insights of the real world.

Despite the prevalence of extensive works, technical books and experts advisors for the concerned topic, only a selected few have been chosen for the completion of this study. Below is a short selection of books, which have been used for producing this research work (the extensive list is attached to this work as annex A.3):

(1) Architect's handbook of construction project management (Murray and Langford, 2004)

(2) Construction contract preparation and management (Powell, 2012)

(3) Construction Project Management (Brookes, 2013)

(4) Construction Project Management (Fewings, 2005)

(5) Construction Project Management (Gould and Joyce, 2009)

(6) International Construction (Mawhinney, 2001)

(7) Modern Construction Management (Klakegg, 2013)

(8) Project management for building construction- 35 years of innovation at Drees & Sommer (Sommer, ©2010)

(9) Project Management in Construction (Walker A., 1996)

(10) Projektmanagement für Bauherren und Planer[14] (Kalusche, 2012)

(11) Total construction project management (Ritz, ©1994)

Most of these books are the subjective experience of the author, the publishing company or are based on the secondary research by reviewing the expert's literature. From a purely subjective point of view, two books are deemed necessary for the practical application in construction projects, namely, Project management for building construction '35 years of innovation at Drees & Sommer' (Sommer, 2010) and ‚Projektmanagement für Bauherren und Planer' (Kalusche, 2012). When compared with the works of different authors, these authors did not only focus on the methodological approaches but also present detailed instructions and examples, for instance, to simulate the scheduling process by means of network engineering or a list consisting of 12 points for the complete and transparent cost calculation.

The search for academic works along the lines of the books by Dörrenberg (Dörrenberg et al., 2014), or the study about the role of a chief information officer by Hunter in 2010, which highlighted a practical summary of reports, experiences, and case studies about international PM did not generate many results. In these mentioned studies, less rigid methods and processes are conferred with practical case examples. This dissertation adopts a similar approach; it performs detailed individual interviews with experienced subject matter experts and explores the subjective project processes. Therefore, the book by Dörrenberg has greatly influenced this thesis because not only it is technically oriented, but the interviews and recordings reflect the actual experiences of the respondents on the foreign projects.

The cross-analysis of various differently structured books related to such a broad subject such as international project management seemed to be unfeasible and impracticable. Therefore, the books provided structure for the interviews, see annex A.6, and were used to add academic knowledge to the analysis of the interview responses throughout the entire chapter 6.

[14] Translation: "Project management for clients and planners"

3.5. Studies available pertaining to project management

The academic papers and empirical studies concerned with PM focus on wide-ranging topics; however, it has been observed that not many studies about PM techniques deal primarily with the construction project management. Various proportion of literature that concerns with PM focus on the project manager, for instance, the survey by Edum-Fotwe about PM competencies in the construction industry (Edum-Fotwe and McCaffer, 2000) or the work of Pheng about environmental factor influencing the work performance of project managers (Pheng and Chuan, 2006). Additionally, the existing studies and surveys in the context of PM are written from an abstract perspective, such as the study about influences of PM standards when developing PM assessment tools (Sanjuan and Froese, 2013). However, most of these studies were not directly related to the construction industry and were also, not dealing with how the project managers handle their projects, and were mostly quantitative in nature. It might be worth to mention that many papers identified were empirical, such as the works by White and Fortune (White and Fortune, 2002), or they were qualitative studies with little reference to the construction industry, such as the papers of Fortune and Whitty (Fortune et al., 2011; Whitty and Maylor, 2009).

However, while searching for academic leaders pertaining to project management, a number of results were generated out of which a minute proportion was purposeful and targeted. However, the following six academic papers have made a particularly deep impact on this thesis and are analysed eventually:

(1) The study by Hunter about the Chief Information Officer (Hunter, 2010)

(2) The survey by Ahlemann about the application of project management standards in Germany and Switzerland „Project management standards – Diffusion and application in Germany and Switzerland" (Ahlemann, Teuteberg and Vogelsang, 2009)

(3) Current practice in project management — an empirical study (White and Fortune, 2002)

(4) Looking again at current practice in project management (Fortune et al., 2011)

(5) Anforderungen an die nachhaltige Aus- und Weiterbildung von Führungskräften in der Bau- und Immobilienwirtschaft[15] (Zimmermann, Eber and Ebner)

(6) Analysis of Trends in Construction Research: 1985–2002 (Abudayyeh, Dibert-DeYoung and Jaselskis, 2004)

The survey by Hunter (2010) is similar to the research approach adopted by this dissertation. Though the subject chosen by Hunter is different, the approach that was entailed for the accumulation of qualitative and subjective data via the first-hand experience comparable with the current pursued research. This methodology offers the possibility of providing qualitative feedback and supplementary information to the respondents. To highlight why the selected interview methodology by Hunter is adapted by this dissertation, Hunter's interview protocol has been mentioned (see annex A.5).

Apart from Hunter, the study conducted by Ahlemann, Teuteberg and Vogelsang (2009) about the application of PM standards in Germany and Switzerland has also

[15] Translation: "Requirements for sustainable education and training of managers in the construction and real estate industry"

been adapted for the purpose of this dissertation. Various aspects of Ahlemann et al.'s survey are suitable for the management of construction projects in foreign countries. One objective of their survey was to analyse whether the standards of the projects meets the expectations of the customers and to determine the advantages and limitations the users identified by the application of standards. The nature of Ahlemann et al.'s survey lies in perfect resonation with the nature of this dissertation and thus, their study seems appropriate for this study. However, there are two main differences between the survey by Ahlemann et al. and this study, first, Ahlemann et al.'s used online questionnaire whereas for this research direct interviews were conducted; and second, Ahlemann et al. conducted an empirical study, whereas this study adopted a phenomenological approach. Nevertheless, the hypotheses of Ahlemann et al., could be used in this study:

- *" H1: Standards are generally rarely used in project management.*
- *H2: Standards are not used "as is". They are either used as a "pool of ideas", as a template that needs configuration or in parts for a situational improvement of project management practices.*
- *H3: Project Management standards are mainly used to harmonize terminology."*(Ahlemann, Teuteberg and Vogelsang, 2009)

To fulfil their objectives (mentioned above) Ahlemann et al.'s conducted their survey by using an online questionnaire, the results of which were used to develop recommendations for Standard-Giving Organizations (SGO) and Standard-Applying Organizations (SAO). Based on the statements obtained from the online survey, the research conducted by Ahlemann et al. compares the expectations and benefits of the project managers when applying certain methods and tools. The results of Ahlemann et al.'s study have been used to derive recommendations for SGOs and SAOs.

Zimmermann, Eber and Ebner (2011), however, concentrated on the required competencies and skill sets of the project professionals, executives and occupational beginners in the construction and real-estate industry in Germany and furtherly analysed their job profiles. While different researchers employed the use of online questionnaires, Zimmermann et al. focussed on literature review ans pursed meta-analyses of more than 300 articles, books, and expositions similar to Abudayyeh. He examined and measured the capabilities, skills, knowledge, competencies, and qualifications which are required in the construction industry. Zimmermann et al. mentioned that literature analysis barely generates findings, thus, he conducted 14 interviews with applicants and one workshop with the decision-makers of the building industry.

Various authors have selected varied methods to obtain and process the collected data. However, the most preferred method for data collection is meta-analysis of existing literature and empirical studies on the basis of questionnaires or online surveys. Online surveys possess various advantages such as the easy access to the potential sample groups, high number of respondents and the avoidance of social desirability bias due to the presence of an interviewer (Duffy et al., 2005). It has also been concluded that the response generated by online surveys are equal to or better than those generated via the traditional mail methods (Wright, 2005; Evans and Mathur, 2005). However, to understand the intent or the meaning behind any answer or to gain a better understanding of a complex topic, personal interviews are more applicable. One of the results generated by Ahlemann et al.'s study was that total of 38.9 % of the respondents use project management standards. However, the survey fails to mention how

these standards are used or whether the respondents employ these standards in their day-to-day work or every now and then.

Another empirical assessment of the application of project management methods are the surveys by White and Fortune (2002) that essentially focussed on the PM practices. In 2002, Fortune and White published a paper about 'real world' experiences of project professionals named '*Current practice in project management — an empirical study'* (White and Fortune, 2002). Seven years later, they published another paper titled '*Looking again at current practice in project management*', which was similar to their previous study. The latest paper analysed the extent to which the accessible methods and techniques are employed by the project professionals to determine their effectiveness (Fortune et al., 2011). Though the number of respondents in their second survey was not as high as in the first survey, but the responses seem to be more comprehensive and profound. White and Fortune have conducted empirical studies concerned with the recent practices in PM by mailing questionnaires to ensure the privacy of the project managers. The project managers were encouraged to express their recent projects and to analyse the factors that influence the outcome of their project. In their successive surveys, White and Fortune again used questionnaires comprising a set of yes-no questions, Likert-scale choices, multiple choice questions, and open-ended questions (Fortune et al., 2011). These were distributed to potential participants to investigate the assessment criteria. They also studied the factors influencing the project outcome and the limitations and drawbacks of the particular methods used by the respondents.

There are dominant differences between the currently pursued study and the selected epistemology of White and Fortune. The most obvious difference is with the method employed to collect data which was furnished via online questionnaires like Ahlemann et al. Furthermore, the surveys cover a wide range of industries, and they seldom focus only on the construction business (see Fig. 3-10).

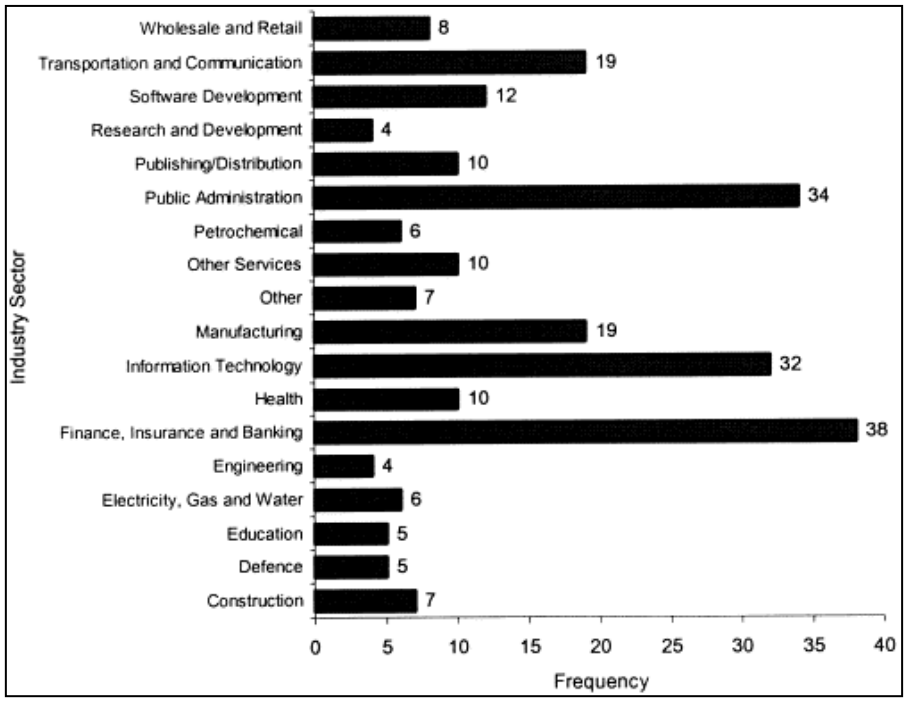

Fig. 3-10 Current practice in project management- an empirical study: industry sector breakdown- respondent's organization (White and Fortune, 2002)

Nevertheless, the findings obtained from the surveys of White and Fortune are significant for this study. Their study provided the foundation for the wider subject of construction PM by identifying a rough structure of sub-themes. The topics mentioned also resonate with the questions prepared for the interview pursued in the course of this study.

- Methods/methodologies
- Project management tools
- Decision-making techniques
- Computer models, simulations, and software
- Risk assessment tools
- Other methods, techniques

3.6. Summarizing the literature review

The reviewed studies show various possible approaches and methods for data collection, such as online-questionnaires or direct interviews, and also exhibit empirical studies that deal with project management. However, the thematic evaluation and the comparison of the key literature helped to generate a selection of the important key themes. It can be concluded that the understanding and approach of project management is versatile, as there are various intricacies involved in the sector of project management. A comparison of the literature and the topics discussed produced different key themes. Thus, the comprehensive summaries of key themes that possess the utmost relevance for this study are presented in annex A.6. The research questions formulated with the help of the literature review are answered in the course of this study.

Due to the limited amount of academic literature that focuses on international construction PM, the scope for transferability from literature to this study is delimited. The industrial field of building and construction is usually marginalised in previous studies and there is no clear distinction between the studies conducted on construction projects and projects from other industries. Different case studies are available that deal with PM in the construction industry; however, these case studies concentrate on particular projects and project environments that have limited application in this research.

Nevertheless, a really diversified range of literature associated with construction management and PM exists in the construction business (Cleland and Gareis, 2006; Sommer, 2010; Murray and Langford, 2004). There are a number of academic papers covering PM standards and methods (White and Fortune, 2002; Fortune et al., 2011; Whitty and Maylor, 2009).

The results of studies by Abudayyeh et al. (2004), White and Fortune (2002), Ahlemann et al. (2009), and Zimmermann et al. (2011) are not comparable to one another due to difference in the research content, thus the results cater to different areas of PM. Nevertheless, the studies did furnish some findings which were crucial to the study. White and Fortune discovered that the responding project managers used 1210 methods, tools, and techniques; 66 respondents did not use any specific method; 123 respondents did not use any decision-making techniques; and 154 respondents did not use any risk-assessment tools. The most widely used PM methods, tools, and techniques among the respondents were Project Management Software and Gantt Charts. There are three criteria which are majorly cited in the literature to analyse project's success: (a) delivery on time, (b) delivery within the budget, and (c) delivery according to specifications (see annex A.4). According to White and Fortune, the three main factors that are critical to project success are realistic schedule, adequate funds and resources, and clear goals/objectives (White and Fortune, 2002; Fortune et al., 2011). In their 2009 survey, White and Fortune concluded that the answers given are complementary among the participants from Australia, Canada, and the UK (Fortune et al., 2011). The survey yielded another result that centred on the observed percentage of the used PM methodologies among the respondents. In the original UK survey, approximately 28% of respondents stated that they do not use any methodology, whereas in the later survey only 8% of the UK sample did not use PM methodologies.

However, the results of the study conducted by White and Fortune in the context of the applied PM methods in the international construction industry is not conclusive due to three reasons. The first reason is the indirect method used for data collection; questionnaires were mailed, and there were no direct interviews. The study fails to grant

any conclusion about the methods and techniques used the managers and the methods listed did not refer to any international project. Moreover, the analysed advantages, disadvantages, and shortcomings of the specified methods and techniques are not related to a particular type of projects, such as IT, construction, or research and development. The second reason is that the study is deficient in the representativeness associated with the construction sector; only 5% of the projects are construction projects, and only 7% of the scrutinised projects are related to the construction industry. The complexity and uniqueness of the construction projects is unquestionable. Thus, to narrow down the results of this research, the respondents were asked to describe a recent project and identify the PM methods, tools, and techniques they used. The third reason is that the methods and tools applied by one project manager might vary from one project to another; therefore, no reliable conclusion can be drawn about the implications, advantages and shortcomings of a particular PM technique associated with the construction industry.

Ahlemann et al. discovered that the standards are not used in PM in Germany and Switzerland, and they are frequently adjusted before its application (Ahlemann, Teuteberg and Vogelsang, 2009). It was observed that less than 11% of the participants employ standards without any modification or adaptation. The participants expected that the standards would enhance the communication and process quality and also aid in the faster implementation of the PM processes and best practices; however, this seemed difficult. The expected benefits were marginalised due to the lack of acknowledgment among the project's stakeholders. In addition, there were administrative barriers and costs, lack of flexibility in various cases. Nevertheless, the survey is based on a sample of 234 records; however, only 5.1% of the respondents worked in construction, architecture, or engineering sectors. The IT sector with 31.6% respondents was overrepresented. The survey provides a supplementary and interesting aspect as the respondents were encouraged to provide feedback on their expectations of PM standards and whether these expectations have been fulfilled in practice. Although this study is an empirical survey, it also incorporates a subjective aspect of PM perception. The empirical surveys neglect the experiences collated by the respondents and fail to highlight the shortcomings, advantages or potential improvement of any particular PM method. It's a rare occurrence that the aspect of comparing the expectations of project managers to the delivered gains by applying certain PM methods has been considered.

The investigation by Zimmermann et al. gave another interesting insight into the construction industry (Zimmermann, Eber and Ebner). The main activities in the construction sector are the construction site activities (20.6%), design planning (17.6%), and quotation processing (11.8%). There were minute statements of participants that referred to the activities of construction management, PM and quality management. However, the findings by Zimmermann et al. could not be used to form conclusions on the areas of responsibilities for project managers as all the possible activities within the construction industry have been considered. The interviews were carried out according to the Critical Incident Technique, and they reflected the day-to-day work of the respondents (Flanagan, 1954). The findings of the interviews have been compared to the required profiles of vacancies and the analysed data. Thus, the approach adopted by Zimmermann et al. is applicable for this study.

As for the BOKs, it can be concluded that their practical relevance is limited mostly due to a lack of empirical data upon which they are based and because the complexity and uniqueness of projects does not receive enough attention in the standard books. BOKs

also often lack reference to individual project situations and consequently provide helpful guideline and advices for practitioners.

4. Identified PM topics, methods and tools

PM is the totality of all required activities, such as planning, organizing, resource allocation, and team leading that are required to achieve a defined project goal. The formal definition of PM is the application of knowledge, skills, tools, and methods for the implementation of a project (Project Management Institution (PMI), 2014).

This literature review pursues the investigation and evaluation of previous studies on the subject of international project management. However, the analysis of literature should also be a starting point for the identification and selection of main topics in the field of project management.

The main topics will be examined in more details during the course of this study. For instance, the various approaches and methods proposed by different experts would be discussed in chapter 6. Such an examination of different methods has been used to develop a framework for the interview conducted for this study. The conducted interviews should not be purely narrative because of the great thematic relevance and the complexity of the subject matter. Also, the interviews aren't conducted to produce a mere quantitative data. The participants have been provided with a properly prepared and thorough interview guideline prior the interviews (see annex A.10 and annex A.11 for an example response).

Different studies scrutinize, describe, and name diverse PM themes, which partially overlap or complement one another. The critical literature identified for international construction project management during the literature review have aided the selection of the main themes for the interviews and also, for the subsequent evaluation of the obtained data. The interviews and the analysis are furtherly complemented by the identified PM methods and subject by White and Fortune (2002), Fortune et al., 2011 and Abudayyeh, Dibert-DeYoung and Jaselskis, 2004.

In their survey White and Fortune have empirically recorded and evaluated the various PM tools and techniques used by the participants (White and Fortune, 2002). The maximum number of methods and techniques used by a single participant were 23. However, such a high number of methods applied cannot be verified by the interview findings of this research (see chapter 6). It is also interesting to note that 28% of the participants in the survey conducted by White and Fortune claimed of not using any particular PM methods, whereas 54% claimed to use their 'in-house' PM methods. The expansive application of one's PM methods or in-house PM methods has also been identified by this research. In the second study followed by White and Fortune, applied methods and techniques were examined (Fortune et al., 2011). The results of the studies conducted by White and Fortune are presented in annex A.7. However, it is crucial to note that the participants of the study were from various industry sectors, not just from the construction industry; thus, the transferability of the results to this study is limited. Abudayyeh et al., conversely, deals with the key themes of various articles from the expert's literature; therefore, he refers to quite a large number of PM topics (see annex A.8).

All the identified key literature along with the findings by White and Fortune (annex A.7) and Abudayyeh have been closely examined. The common key themes and subjects of their studies were also investigated and the identified common key themes are shown in annex A.9. These key themes on their part served as the basis for creating the interview guideline for this study (annex A.10).

The thematic evaluation of the literature and the previous studies (theme analysis) served above all the structural design of the interview guideline. The identified topics have been put into structure, also following Hunter's interview Guideline (annex A.5). Subsequently the individual topics have been converted into questions for the interviews. Annex A.9 shows which question is aimed at which topic complex. In addition, the literature analysis also includes the technical consideration of individual project management topics, which result from the previous theme analysis and the subsequent sections 4.1.1 - 4.1.10 present this consideration.

4.1.1. The role and competence of project managers

In the construction industry, project performance has always been an important issue. Various studies conducted by C.C Martin (1976); P.W.G. Morris, G.H. Hough, (1988); and L.R. Sayles and M.K. Chandler, (1971) have suggested factors that are vital for the success of any given project. These studies show that the project manager is a central person in a construction project. According to Del Pico the role or task of the project manager in construction is mainly planning, monitoring, and controlling (Del Pico, 2013a).

With increased emphasis on PM systems, construction firms tend to seek professionals with growing management and leadership backgrounds and additional emotional and managerial skills rather than mere technical experts (Robinson et al., 2013; Dulaimi, 2005).

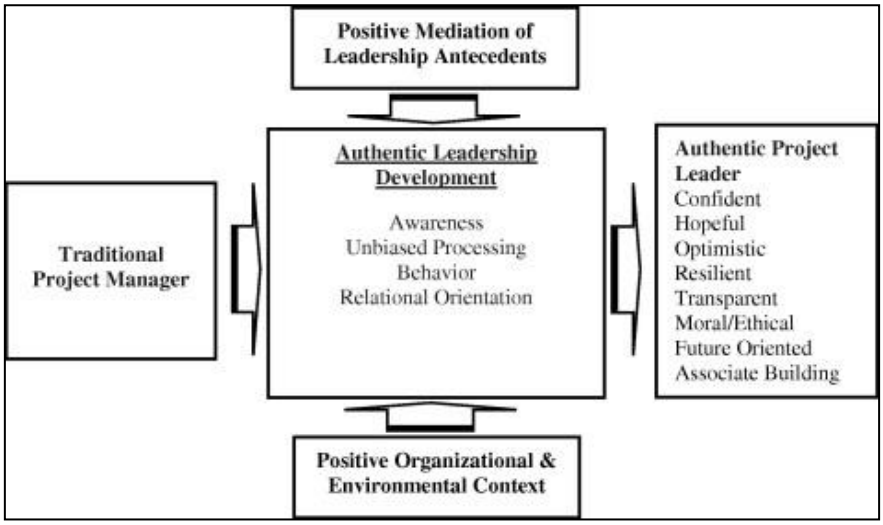

FIG. 4-1 AUTHENTIC LEADERSHIP DEVELOPMENT IN CONSTRUCTION INDUSTRY (TOOR AND OFORI, 2008)

The project manager of a large construction project must be a generalist and should be aware about the basics of PM. The manager needs to comprehend both the planning and approval phases and should be able to overlook the execution of construction works (Sommer, ©2010). Sommer explained that the mistake that often happens in conventional projects is that inadequate stress is granted to the phase of the definition of objects, namely, the project phase during which it is most possible to influence the project. Müller and Turner (2010) presented a survey of behavioural, temperamental, emotional, and intellectual attributes of project leaders to identify their individual management style. Müller and Turner presented and described the fifteen leadership competencies as cited by Dulewicz (Dulewicz and Higgs, 2005), which are illustrated in annex A.15.

The tasks of construction project managers are not only limited to the planning, monitoring, and controlling of a project; they are also required to assemble and lead the project team. By appropriately utilizing the budget, machinery, equipment, resources, and the company's internal competencies, project managers can efficiently manage both the schedule and the budget.

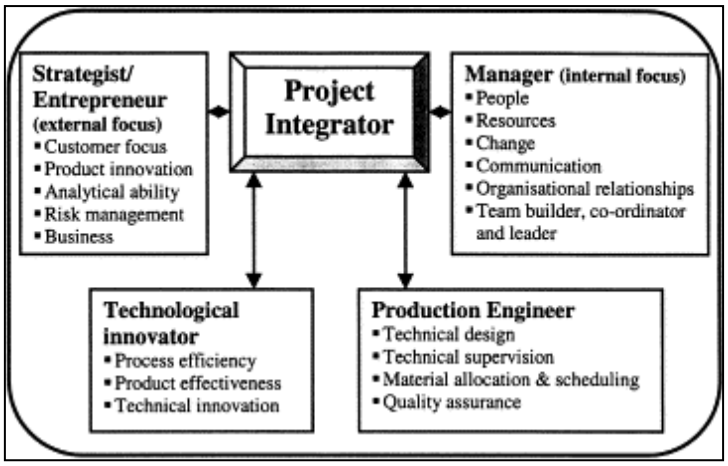

FIG. 4-2 THE EVOLVING ROLE OF THE PROJECT MANAGER (EDUM-FOTWE AND MCCAFFER, 2000)

The project manager is the point of contact for the project stakeholders and his decision and communication are often considered as the official statements for and by the employer. Koskinen and Pihlanto (2008) showed that the project managers can be at the focal point of the project networks; by interacting with their own team and the respective stakeholders, they develop a base to find solutions and complete the projects. Project managers organize their project's staff and are responsible for reporting their performance during the course of the project. Moreover, project managers play a significant role in the management and transfer of knowledge, and can be the driving force behind the mobilization of knowledge in the project and the organization (Kelly et al., 2013). Furthermore, the project managers create the project plan and protect schedules. Their key responsibility is the monitoring of the construction progress and the overall control of the project. In case the project falls behind or runs out of budget, they are required to take corrective actions to finally achieve the project goals (Del Pico, 2013a).

Kalusche described the key PM tasks as follows (Kalusche, 2012):

- Defining and planning the project within time and workload estimates
- Defining the tasks and work packages
- Selecting the methods and processes to be used
- Coordinating the project team, the individual departments, the executing companies, planners and external service providers
- Promoting and supporting the team members
- Monitoring and controlling project progress in terms of cost, schedule, quality, quantity, capacity, and resources
- Providing the driving force for necessary actions and decisions
- Performing technical tasks

- Being the hub of information and communication
- Documenting and reporting

4.1.2. Standards, guidelines, tools and techniques

Standards and guidelines

According to the studies conducted by White and Fortune, management standards, such as the PMBOK, are widespread and a large proportion of the project managers possess expansive knowledge of PM standards and rules (White and Fortune, 2002; Fortune et al., 2011). It was not possible to replicate these findings by the answers given from the participants in this survey, see 6.3.2.

PM tools

PM consists of methods, technologies, and tools for project realisation; there are a large number of different tools available for PM. Numerous studies and technical literature have dealt intensely with the application of tools and techniques by project managers. White and Fortune have empirically investigated the methods and technologies that are frequently applied by project managers and the number of tools used by them (White and Fortune, 2002; Fortune et al., 2011). It can be assumed that the interviewees employed a varied number of tools and techniques. Nevertheless, the answers of the interviewees reveal that most project managers use their own tools.

Work breakdown structure (WBS)

One of the most essential methods in PM is the work breakdown structure. The WBS is a process that can segregate the overall work into a number of manageable and hierarchically or chronologically structured tasks (Siami-Irdemoosa, Dindarloo and Sharifzadeh, 2015).

The conventional way of planning work packages, distributing responsibilities and tasks, and setting due dates and milestones is the WBS. It is a central tool for project planning and implementation. In the WBS, all work packages, responsibilities, people, and resources are defined. Furthermore, the WBS enables a comparison between the actual and desired values and allows the estimation of the remaining project scope in relation to the remaining project time. An improperly prepared WBS can delay project completion due to the improper generation of project schedules. Furthermore, without proper WBS delivery due dates, suppliers, subcontractors, and material supplies will not be in accordance with the work schedule. It is not possible to coordinate several tasks and mismatch between invoiced payments and the actual work performed is greatly possible. Moreover, the future planning and trend analysis of the remaining project's time and cost also get influenced.

A WBS is developed by identifying the project goals (scope, budget, timeframe, quality, and other deliverables) and then successively subdividing it into more detailed and manageable work packages. The subdivision of the project depends on the complexity of the project. The WBS, if appropriately prepared and structured, allows the aggregation of costs and expenditures and the time required for single packages. Consequently, by defining the subdivided work packages, the project costs and timeframe can be calculated and controlled. The particular WBS elements should be identified by title and a numbering scheme.

The WBS is a planning tool and not a scheduling one; it is a hierarchical division of work and tasks of the project which get concluded in work packages. A WBS consists of the individual work packages for the project execution, and it is a group of individual tasks connected with the project. It is recommended that a WBS is created in the team as versatile input is helpful. Generally a WBS can be structured as follows:

- *Function-oriented division*. This is a subdivision of the project analogous to the sub-business functions. Examples of subdivisions in sales are costing, legal and contracts management, procurement (including management of subcontractors), building projects—preparation and planning, manufacturing and assembly, measuring and accounting, reporting technical and commercial PM, and financial management.
- *Chronological division*. This is in accordance with the project phases.
- Object-oriented division, for example:
    - crafts
    - subcontractors and suppliers
    - building phases
    - floors
    - building segments
    - buildings
    - subproject

A WBS stipulates detailed project elements by hierarchy and level (Akrami, 2015). The purpose of a WBS can be described as follows:

- The WBS provides an overview of the project and enables easy study of the project
- The WBS breaks the overall project scope into small tasks that can be better understood and planned
- The WBS is the base for communication among all project stakeholders
- From the WBS, a list of action and time schedule is derived
- A comprehensive and sophisticated WBS allows the planning, reduction, and controlling of project costs and project time

How to create the WBS

A WBS needs to define the deliverables of the project. Therefore, the first level of a WBS consists of logical and chronological steps for project implementation. The following levels subdivide the work packages to obtain a clear description of the scope and extent, time and costs, and allocation of responsibilities and delivery deadlines. A simplified function-specific WBS is presented for the construction of a factory abroad in annex 0.

The Project Management Institute stipulates that when determining the work packages, the following questions are to be clarified (Project Management Institution (PMI), 2014):

- Who is responsible for the work packages?
- What are the individual costs of the work packages?
- What is the budget per work package?
- What is the time required for the execution of the individual work packages?

- What are the milestones for individual work packages?
- What preparations are necessary for the implementation of the work packages?
- Which works must be subcontracted?
- What are the quality requirements for individual work packages?
- What are the acceptance criteria for individual work packages?
- What are the resources necessary for the implementation?
- Who is responsible for implementing the individual work packages?

However, Siami-Irdemoosa underlined the fact that the WBS is a planning tool during initiation and planning of the impending project works. It is also considered as the management of tool for monitoring and controlling the works during execution and project closing (Siami-Irdemoosa, Dindarloo and Sharifzadeh, 2015). Hence, WBS ought to be frequently reviewed and revised until the project completion.

Decision-making

Project managers are decision-makers who often are tasked with decisions that have a major impact on the projects. Hence, it is important to examine the assistance entailed by the project managers for the process of decision-making. In section 6.3.2 the interviewed managers state which tools they use as decision making aid.

4.1.3. Lean management and big data

Lean management

One aspect that was found during the course of the interview is the lean management approach. P7 mentioned that in addition to all the discussed tools, he used lean management tools for the planning and control of the building process. 'Lean production' and its production principles originated with Womack, Jones and Roos (1990) who used it to specify and identify value, create flow, and to strive for process excellence. It was also asserted that the 'lean production' reflects the introduction of a transformation in lean theory, which is the construction industry's principle that it's not necessary for the production results to be generated in a repeated production flow (Meiling, Backlund and Johnsson, 2012). The consequential implications for managing of temporary organizations, like building projects, were also discussed by Vrijhoef, Koskela and Voordijk (2003) The study conducted by Vrijhoef asserted that the management should be divided into the three fields: contract management, process management, and value management. Value management in the context of lean construction aims to increase the building and construction values, such as the reduction of wastes, increase of quality and functionality, and reduction of price along with more subjective elements, such as design improvements (Koskela et al., 2002; Erikshammar, Björnfot and Gardelli, 2010). Koskela et al. (2002) explained that the added value to the client is often understood as meeting the original design within the defined budget, time schedule, and quality stipulations.

More detailed replies by the participants are highlighted in 6.3.4.

Big Data in construction

Big Data has been continuously shaped the lives of its users. Within the construction industry, data and information become increasingly important. For instance, the Building Information Modelling (BIM) systematically captures multi-dimensional AutoCAD information for the availability of data to other project members to define volumes, prepare building sections, create work programmes, and make cost estimations. Bid Data, according to Bilal et al. (2016) is characterized by three attributes: i) the big volume of data, ii) a variety of dates in the form of texts, spreadsheets, audio or video dates, and iii) the velocity, that is, the continuous flow of new data and information. Bilal et al. indicated that Big Data is very helpful to store, classify, cluster and analyse the information to generate statistics, optimise the usage of resources, and reduce wastage. BIM, for instance, also helps to estimate price variations because of changes in volumes and monitor construction progress along with other advantages. Moreover, Big Data enables a facility management above and beyond the solitary construction process. Nevertheless, Bilal et al. also highlighted various drawbacks of Big Data, apart from possible lack of security and privacy or higher costs associated with the use of online data systems. Bilal et al. explained that the construction industry might persist in its reluctance towards adopting Big Data trends as it requires more time to clean and process data to make it accessible as non-standardised values might lead to misleading and counterproductive analysis. Big data has also a tremendous influence on the lives of the interviewees as one can see in section 6.3.4.

4.1.4. Time scheduling

Time scheduling is one of the major responsibilities of project managers. The participants in this study mostly used MS Project for time scheduling, especially for CPM and Gantt charts. However, as P5 stated, MS Project is occasionally complex, particularly in the phase of planning and project preparation wherein only few tasks run parallel while most of them run in a separate and chronological order.

According to Pierce, the basic steps of scheduling are (Pierce, 2013):

- Planning
    - Preparing a work breakdown structure of workable activities
    - Defining the order of works to be performed
- Scheduling
    - Defining the duration of each particular activity (based on the work load, resource allocation, shift model, and dependencies)
    - Computing the duration of the entire project depending on the duration of the individual tasks and the order of works
- Monitoring and controlling
    - Measuring project progression
    - Comparing the actual progression against the scheduled development

Construction project managers can employ a variety of scheduling techniques. Some are extensive and comprehensive and reflect the complexity of construction while others are uncomplicated in nature. Del Pico described some of the most common scheduling types (Del Pico, 2013a):

- *The checklist*. This is one of the simplest and widespread scheduling types.
- *The schedule board*. This is a list of tasks for employees in which daily or weekly tasks are recorded. Although the schedule board is not a method for scheduling per se, it serves to coordinate individual work steps.
- *The bar chart*. This is the most common method for scheduling and controlling (Insert reference).
- *Program evaluation and review technique (PERT).* This is a tool for risk analysis of project schedules rather than a pure tool for planning of operations and project processes. PERT evaluates an optimistic, most likely, and a pessimistic scenario for the execution of works to evaluate the probability of time completion. PERT is explained in more detail in section 4.1.6.
- *The Work breakdown Structure (WBS).* This is a model to divide the project into logical or physical sections and is described in section 4.1.7.

4.1.5. Project control

Project success is often measured by the timely implementation within a predetermined budget and in accordance with the predefined quality criteria. Thus, the control of construction progress is one of the most important tasks of the manager. Most of the participants in this study used progress monitoring software like MS Project or Primavera. However, progress control is also the basis for various tasks, such as resource planning, recording actual job performances of individuals, teams, and suppliers, and reporting and selecting the necessary and appropriate corrective measures.

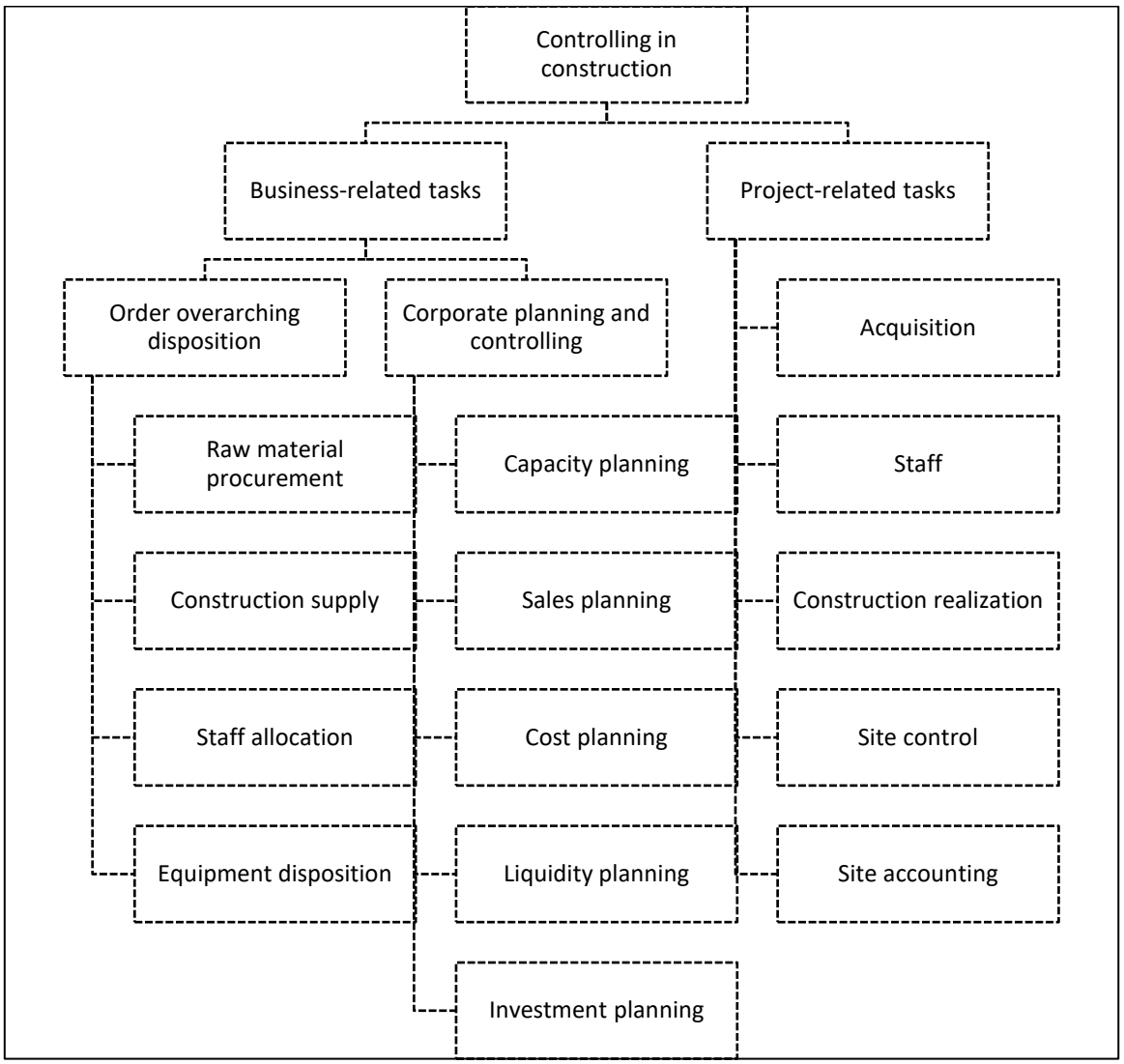

FIG. 4-3 TASKS OF PROJECT ACCOUNTING (DIEDERICHS, 1999)

International projects involve a lack of certainty, which might cause unfavourable outcomes (Ward and Chapman, 2011). Construction projects are very complex, and the overruns between time and costs are frequent in the transnational construction projects. The scope is the third dimension of the Iron Triangle (see Fig. 2-9 Iron Triangle (Atkinson, 1999)). All variables are independent but inevitably correlated to one another. In construction, which is one of the industries depended on cost and schedule, the definitions of success and failure are frequently based on the timely delivery of the project in accordance with the agreed costs (Del Pico, 2013a). The time and cost of

any construction project are usually inextricably connected. Project control can be described as a four-step procedure for measuring progress toward the project baseline (Del Pico, 2013a; East, 2015):

- Defining the project goals and the project baseline
- Monitoring the progress compared to the project schedule: Formally and regularly evaluating the development toward the defined goals
- Identifying and assessing the causes for significant deviations from the project baseline.
- Taking corrective measures to bring the project back on track

In addition to costs and schedules, project monitoring also considers the contract, the quality of construction and project risks. An important area of project monitoring is the contract changes, particularly, the changes in contractual due dates. It is crucial to affirm whether there is time extension, additional claims, construction interruptions, or other reasons for changes in the delivery dates of the project. The changes in work and scope are monitored as well. For example, the manager needs to check whether the sequence of work or the volume of work have been changed or whether new works were added that affected the milestones or altered the completion dates.

Project control and monitoring mechanisms are, consequently, established in line with the project baseline and the following evaluation criteria (Del Pico, 2013a):

- Changes in contract and works
- Costs, earnings, and budget
- Quality
- Resources
- Risks
- Schedule

The performance measurement baseline (PMB) is the ideal course for the project to perform in a timely manner without any alteration from the schedule, budget, and scope. The monitoring of the timely construction progression is initiated on the basis of PMB and by collecting and monitoring crucial data along with the construction progress. This includes assigning dates to subcontractors and suppliers, obtaining the dates for the delivery of materials or target dates for the permits and recording important data such as the percentage of completion, the status of critical activities, the delays in building execution, delays in supporting activities (e.g., subcontractor activities, material supplies, plans and drawings delivery, and approvals), and changes in contract/scope, project duration, or expected finishing date. Certainly, it is not easy to measure the progress of any given project in the context of the complexity it is incorporated with. However, it is important to determine how frequently the progress is measured: daily, weekly, or monthly. To assess the actual progress, daily site logs, weekly progress reports, and interviews with the site staff can be used.

The effective project progress is always compared with the contracted progress. Thus, during the project, the project manager needs to consider if any changes or adjustments have been made to the contract and the agreed project schedule.

Project control formulas

According to Del Pico, the most common formulas for the calculation of interim and final results of projects are as follows (Del Pico, 2013a):

- Cost Variance (CV) = Budgeted Cost of Work Performed − Actual Cost of Work Performed
- Current Budget = Original Budget + Approved Change Orders
- Schedule Variance (SV) = Budgeted Cost of Work Performed − Budgeted Cost of Work Scheduled
- Variance at Completion= Budget at Completion − Estimate at Completion
- Cost Performance Index (CPI) = Budgeted Cost of Work Performed/Actual Cost of Work Performed
- Schedule Performance Index (SPI) = Budgeted Cost of Work Performed/Budgeted Cost of Work Scheduled
- PERT Mean = O + 4(ML) + P/6
- PERT Standard Deviation = P − O/6

Project control cycles and methods for time and cost control

The project control cycle is a method to monitor and control the development of the project. The definition of objectives for specific tasks is the baseline for tracking and measuring the particular projects goals, control cycles, which are usually implemented for the time and cost control, quality, and scope monitoring (East, 2015).

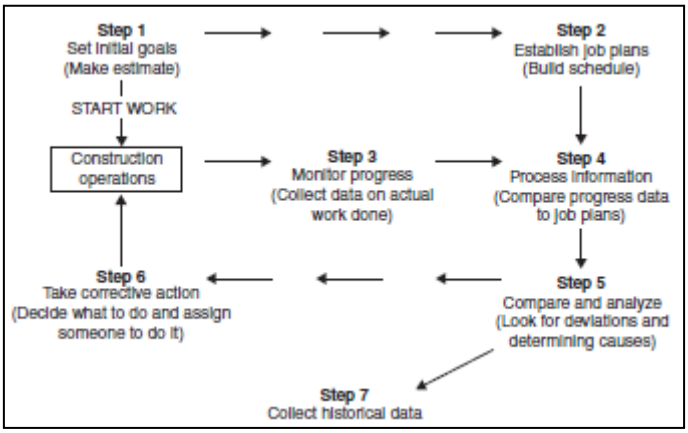

TABLE 4-1 CONSTRUCTION PROJECT CONTROL CYCLE (PIERCE, 2013)

Time control has two major concerns: the sequence of works and their duration. It is imperative to optimise the processes and sequences of each step of the project when regulating the sequence of individual work processes. Controlling the duration primarily aims to question and control the selected methods and techniques, personnel, shift models, equipment, and machinery (see Table 4-2).

Goal	Method
Sequence optimization	Fenced bar charts CPM PERT

	Line-of-Balance
Duration reduction	Seat-of-pants[16] Bar charts

TABLE 4-2 METHODS FOR TIME CONTROLLING

One of the most elementary tasks of a construction project manager is cost control. Table 4-3 shows how East divided the direct and indirect costs incurred for various possible expenses (East, 2015).

Component	**Goal**	**Method**
Material	• Price reduction • Reduction of construction waste and handling costs	• Supplier and material reviews/ selections • Inventory control • Bulk purchasing • Fabrication details • Installation and process optimization
Labour	• Increasing of efficiency and/or productivity[17] • Overheads	• Staff selection and crew assembly • Crew size (increase of productivity) • Subcontracting (if local subcontractor is less expensive) • Overtime and shift model use • Headcount management • Learning curve and training

[16] Meaning: Using or based on experience values, no particular method or instrument

[17] Increased productivity = increased output at constant resources; Increased efficiency = reduction of resources while maintaining the same output

Component	Goal	Method
Equipment	• Efficiency • Productivity • Purchasing or lease costs • Operating costs • Maintenance costs • Depreciation	• Net-present-value consideration of rent or buy • Tracking of machine running time • Tracking of costs associated with machinery operation
Suppliers	• Reduction of expenditures for external services	• Appropriate tendering and price comparison • Contract selection
Other costs	• Reduction or avoidance of: import duties, taxes, fees, etc.	

TABLE 4-3 METHODS FOR COST CONTROLLING

The economic result that is derived from any construction project is a determinant that measures the success of a project. Even the construction progress and quality have an impact on the economistic aspect of the project, for example, penalties or costs for corrective actions. Usually the target values serve the common earned value analysis (EVA) of a construction project that entails an added value for the project monitoring and control (Aliverdi, Moslemi Naeni and Salehipour, 2013). '*Earned value (EV) is the cumulative earned value either as a continuous or periodic sum of the approved budget for work performed to date*' (Chen, Chen and Lin, 2016) Earned value PM is the method that monitors the scope, cost, and schedule of a project (Vanhoucke and Vandevoorde, 2006). The EVA is designed to determine and forecast services during the implementation of the project.

EVA is directly related to the profit and loss statement (P&L), indicating the sales, costs, and return on a project. When doing an EVA and preparing a profit-and-loss statement, the following values should be considered:

- Budgeted Cost of Work Scheduled (BCWS), which shows the costs that were budgeted for planned activities to date.
- Budgeted Cost of Work Performed (BCWP), which shows the costs that were budgeted for the actions taken to date.
- Actual Cost of Work Performed (ACWP), which shows the costs incurred for the activities performed to date.
- Budget at Completion (BAC), which shows the costs budgeted to carry out all services.

The most important parameters are as follows:

- Cost = variance (BCWP) - (ACWP)

The cost variance specifies whether the costs of the building performance meet the planned costs and whether the return on investment of the project has been achieved.

- Schedule variance = (ACWP) - (BCWS)

  The schedule variance indicates the difference between the current construction and the planned construction progress.

Project cash flow

Cash flow is an essential parameter that defines a project's feasibility, and it also corresponds to the invoiced services (revenue) and the project costs (actual expenditure on staff, equipment, overheads, external services, loans, and other project-related expenses). A comprehensive cash flow forecast, planning, and management is important to PM (Jiang, Issa, Raja R. A. and Malek, 2011).

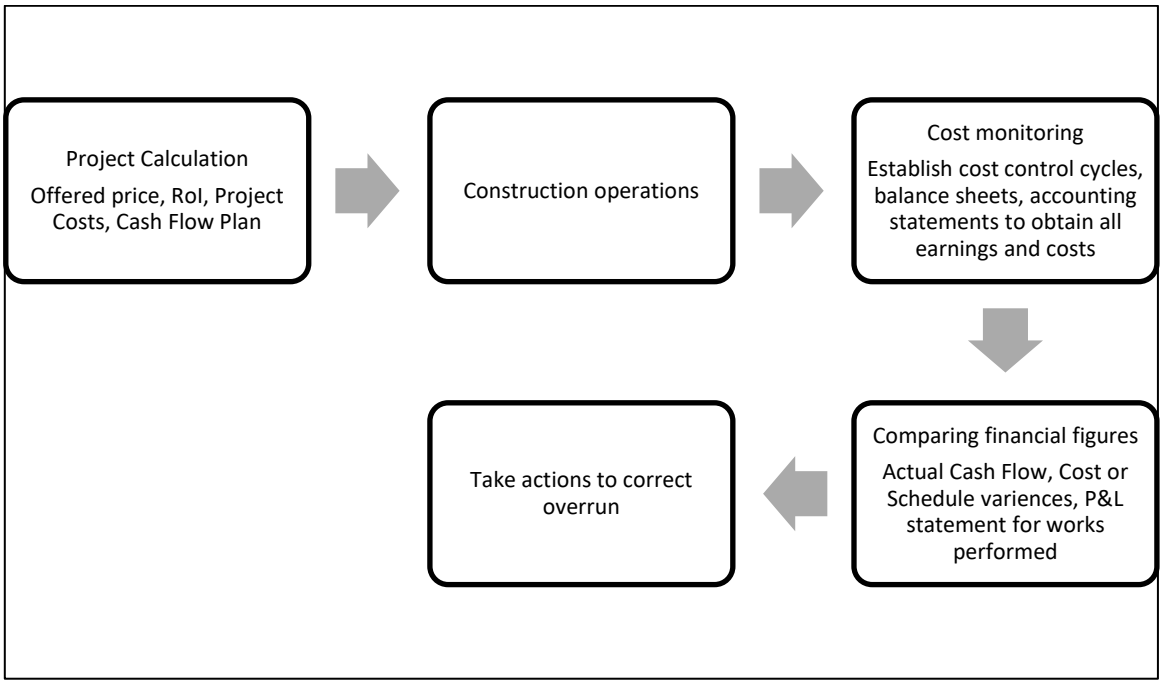

TABLE 4-4 PROJECT COST CONTROL CYCLE

Along with the cost and progress control, quality control is the third fundamental level of project control (see Table 4-5).

Component	Goal	Method
Material	• Reduction of life-cycle and maintenance costs • No deficiencies or rework	• Definition and compliance with codes and standards • Defining specifications • Material sampling
Workmanship	• No deficiencies or rework	• Method statements • Quality control

		• Training • Crew briefing

TABLE 4-5 METHODS FOR QUALITY CONTROLLING

4.1.6. Risk management

Risk management in the construction industry

The project risk management practices that are already in existence are usually challenged by the uncertain and unstable environment for global contractors. Most contractors are convinced that they can identify and assess project risks and implement plans to overcome such risks. However, managing the client or designing the elements is seemingly a challenge for the construction companies.

Majority of the responding companies in the Global Construction Survey 2009 (KPMG International) stated that initially, prior to the start of the construction, they have an effective and efficient risk management system, but when they are faced with risks, the companies have a hard time coping with them. This highlights the difficulty in anticipating risks within a global construction project. However, one of the biggest concerns of large-scale contractors is the evaluation of a project during the bid evaluation stage. Smaller companies, however, place less emphasis on this particular stage probably because of the higher number of small projects and the less critical influence of one particular project on the company's result.

According to respondents, the single biggest concern when evaluating a project is the bid evaluation stage. Smaller companies that took part in the survey consider this phase as less critical. This indicates the possibility that the risk management processes of small companies are less rigorous or that the size and complexity of their bid opportunities are low.

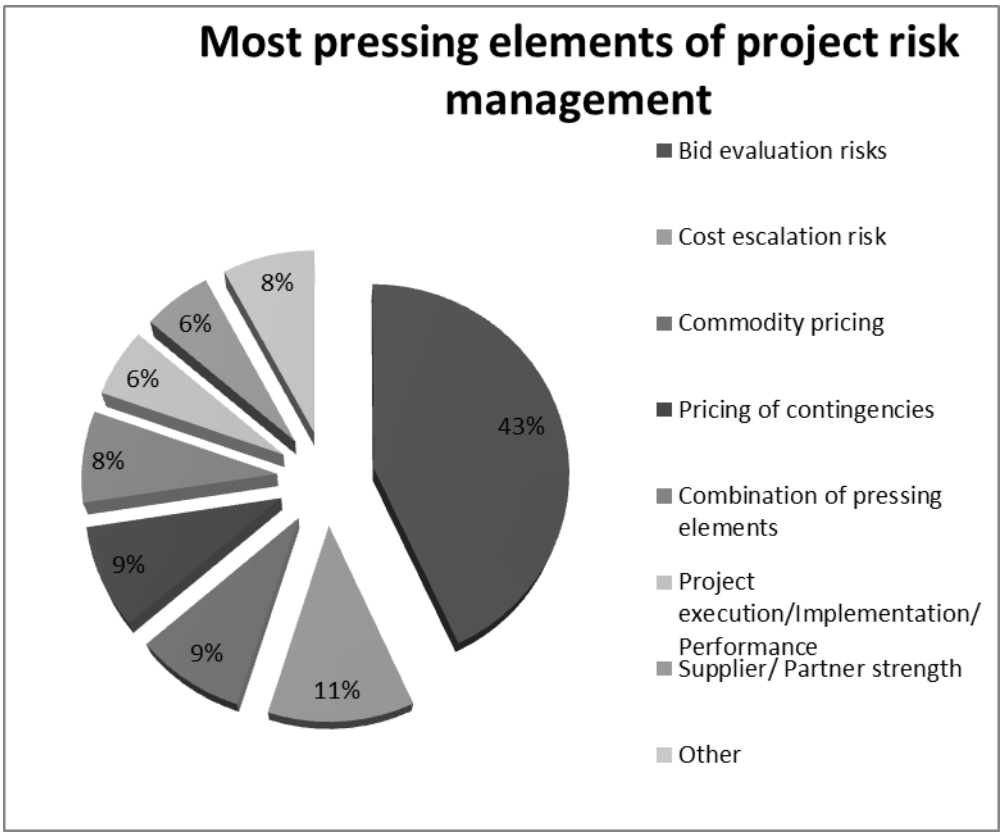

FIG. 4-4 MOST PRESSING ELEMENTS OF PROJECT RISK MANAGEMENT (KPMG INTERNATIONAL, 2010B)

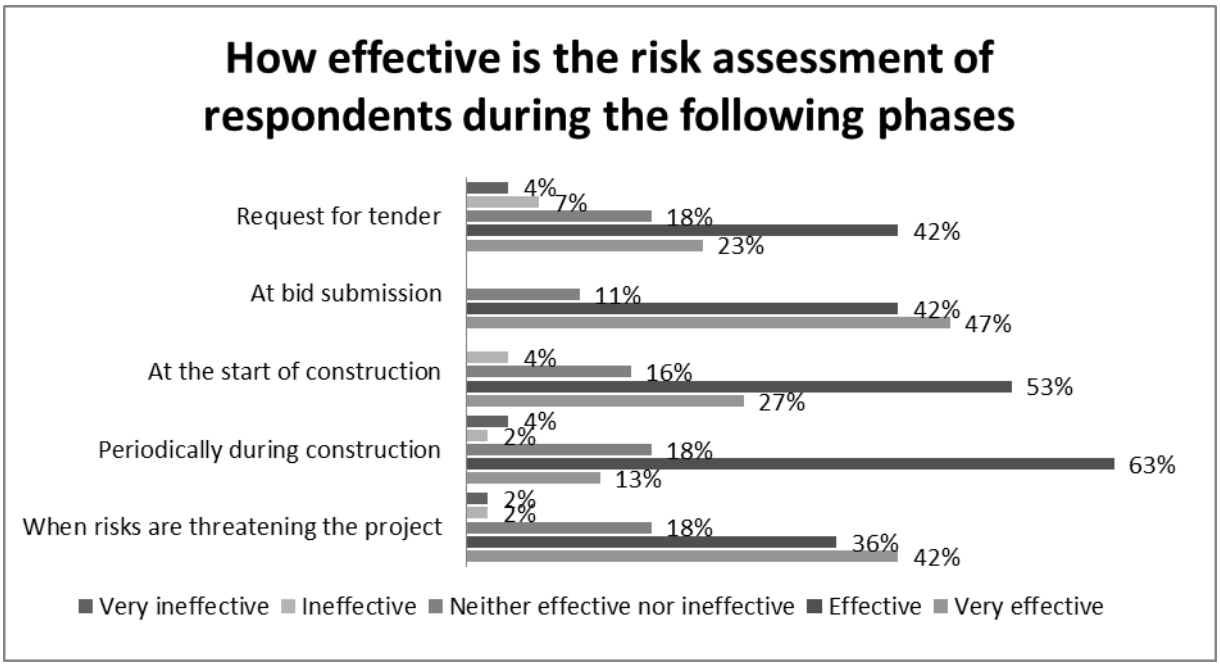

FIG. 4-5 HOW EFFECTIVE IS THE RISK ASSESSMENT OF RESPONDENTS DURING THE CONSTRUCTION PHASES (KPMG INTERNATIONAL, 2010B)

Global contractors continue to invest in risk management practices that have a positive influence on the due diligence processes prior to project commencement, for instance, during the bidding phase, and throughout the project. However, emerging industry's risks must be considered to cope with future challenges. Besides such macroeconomic influences, there are other factors that elevate the risks, such as the availability of funds for projects, the opportunities for obtaining government stimuli and subsidies, and the rising costs of material and energy. More details about construction project risk management will be presented in section 6.3.5.

Nowadays, the construction projects are increasingly becoming more complex and there is an urgent need for the construction companies to adapt to such complex dynamics of the global market. Moreover, globalisation and the consequent arrival of foreign markets have created new sales opportunities for international construction companies. Nevertheless, international construction projects are particularly hazardous and risky. Companies and project managers need to adapt to practices, processes, the working conditions, and culture of different regions to attain success. There will also be legal differences in the contractual arrangements and interpretations. The managers also have to consider the political situation and the cultural and socioeconomic environment of the country they are pursing the project in (Bu-Qammaz, Dikmen and Birgonul, 2009).

As per literature, a risk is a possible event with an undesirable impact on the project and the project's success; it can also be a possible event that could jeopardise the project. Furthermore, a risk can be understood as a measure of likelihood and impact to achieve a project objective (Kerzner, 2008). Therefore, a formula frequently used for risk assessment is as follows:

Risk Severity Value = Probability * Impact

However, if ongoing operations are investigated or potential risks are not immediately visible, the Failure Mode and Effects Analysis (FMEA) can be employed. This analysis is also applied by P6. FMEA adds another level, namely, the probability to detect the error (Ericson, 2005; Ben-Daya and Raouf, 1996; Bowles and Peláez, 1995; Braglia, Frosolini and Montanari, 2003):

Risk Severity Value = Probability * Impact * Detection

Though this process is highly developed, it is often time-consuming and lends itself to complex and long-term projects.

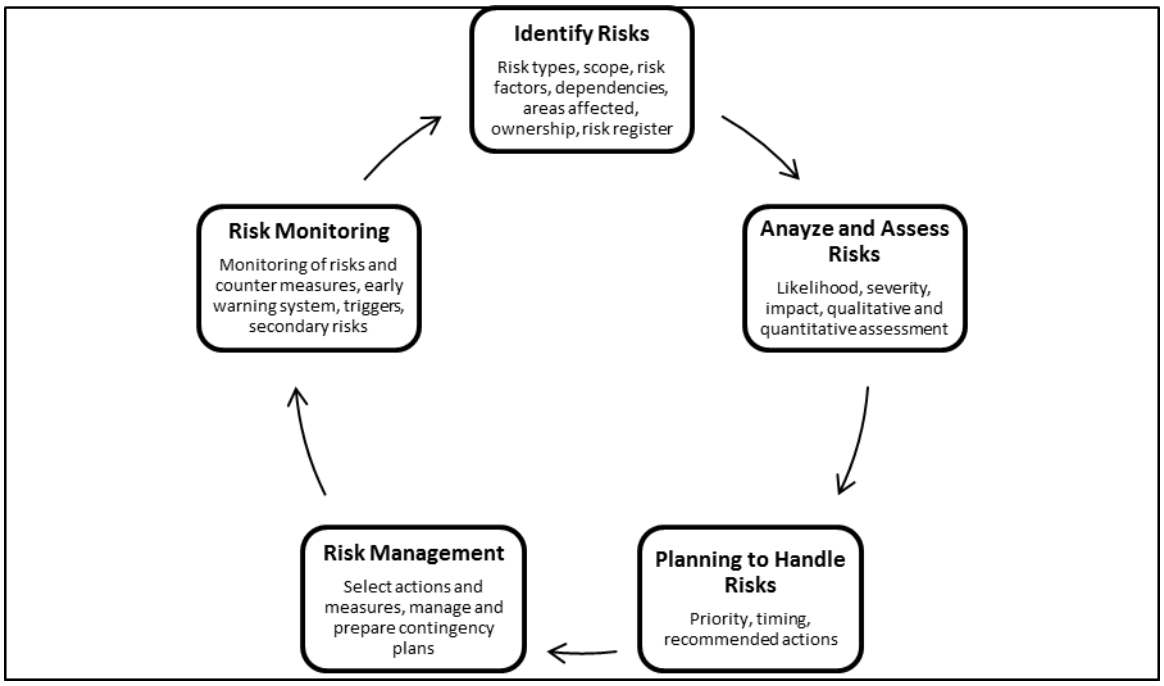

FIG. 4-6 THE RISK MANAGEMENT PROCESS ACCORDING PMI (PROJECT MANAGEMENT INSTITUTION (PMI), 2014) AND (TAH AND CARR, 2001)

The individual steps of the risk management process are shown in Fig. 4-6. When initiating the project, the manager should provide the details in the context of the execution of the risk management processes. In other words, there should be clarity on what kind of workshops should be organized, which documents, tools, and methods should be used, which employees are to be involved in the process, and how much time can be made available.

It is recommended to set up a risk management plan and to clarify the included steps. During risk identification, the individual risks are identified, described, recorded in a risk register, and analysed in a qualitative and quantitative manner. The risk management plan, as applied by P6, describes how individual risks are to be prevented or which countermeasures are to be used. It lends itself to an ABC analysis of risk impacts in order to allocate financial and other resources for the risks with the greatest possible impact. P9 created, moreover, his own Mind Maps for potential project risks. Even though such Mind Maps are helpful but are difficult to create when there is lack of appropriate knowledge.. From the literature project, risk types can be identified and categorized by main risk areas (Girmscheid and Busch, 2008; Lutzner, 1998; Franke, 1993; Guserl and Pernsteiner, 2015) (see Table 4-6).

Contractual risks (technical, commercial, customer risk)
Schedule risks
Legal risks
Cost risks
Financial and economic risks
Technological risks
Processing technology risks
Organisational risks
Management risks
External and environmental risks
Political Risks

TABLE 4-6 MAIN RISK AREAS OF BUILDING PROJECTS

Project risk identification

After the project is analysed, the first step of the risk management process is to identify the risks (see Fig. 6-11). The project risks are best divided into internal and external groups and then furtherly classified, which tends to intensive and time-taxing. Voigt suggested a simpler and more objective risk categorization according to the source of the risk (Voigt, 2010).

The most appropriate approach for gathering and processing a large amount of data about probable project risks can be pursued by preparing a Risk Breakdown Structure (RBS). A division into internal and external risks helps in the processing of such kind. In this dissertation, a Project RBS in accordance with the risk resources is prepared (see appendix A.19). This system is derived from the works of Sigmund, Tah, Dikmen, Hilson, Bu-Qammaz and Voigt (2014), Tah and Carr, (2000, 2001), Dikmen, Birgonul and Han (2007), Hillson (2003), Bu-Qammaz, Dikmen and Birgonul (2009) and Voigt (2010).

Risk assessment

Risk assessment determines both the probability of occurrence and the impact of identified risks. The seriousness of a risk is determined by two factors:

- The probability of occurrence (between 0 and 100%)
- The extent or impact

Risk assessment indicates the potential impact that the risk possesses and the degree to which the project objectives might get endangered. Thus, the risk costs can be estimated in relation to the project budget. It can also be seen if any provisions are necessary and which measures can be worked around.

Methods of risk assessment

Qualitative risk assessment is primarily a rough assessment based on experience rather than on quantifiable results. For example, individual contract contents or even loss

of reputation are hardly displayable in a monetary manner. The quantitative risk assessment may also be carried on as follows (Mastryukov and Fomicheva, 2011), (Rausand, 2011):

- Valuation based on the work breakdown structure where the project is divided into work packages and the possible result deviations are both temporally and financially cumulated.
- Event Tree Analysis (ETA) in which the concatenations of potential complex risks are examined
- Variance method (PERT[18]) for the determination of expected values and variances of a target value based on work packages (e.g., for risks of capacity, time, or costs)
- Model simulation (e.g., Monte Carlo)
- Contingency planning, where all possible project deviations are detected and potential time and cost overruns for covering the project schedule and budget are considered
- Sensitivity analysis, where the impact of individual parameters on the project results is analysed

Assessment of potential delay risks

An analytical tool, which enables the project manager to analyse the conceivable impact on the project schedule, is the PERT. It is used in the planning phase to represent the possible impact on the project schedule (Cottrell, 1999, p. 379). A very detailed example has been described by DelPico (DelPico, 2013b). Experience has shown that delay gets accumulated in a quick manner due to the occurrence of problems; time savings in an accelerated project schedule are clearly more difficult. Thus, the use of Beta Distribution Theory is recommended as it can predict the likely potential effects in negative events. Nowadays, carrying out risk analysis using Monte Carlo simulation is considerably common in construction PM and is mainly executed by computer programmes (Sadeghi, Fayek and Pedrycz, 2010).

Risk classification

Risk classification is used to select or focus the addressing measures to risks depending on their rating. For example, risks classified as ‘low’ can be accepted, whereas risks classified as ‘non-tolerance’ must be absolutely eliminated. For classification of a risk map (see Fig. 4-7) an ABC analysis can also be used.

[18] Program Evaluation and Review Technique (PERT)

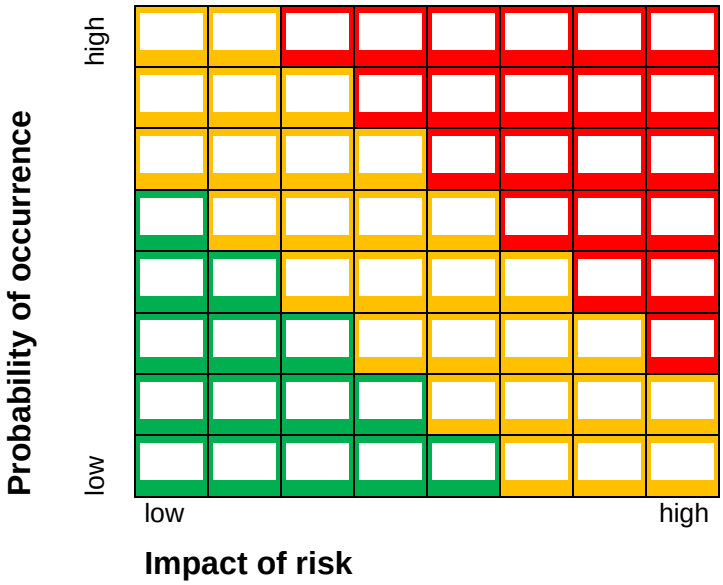

Fig. 4-7 Risk classification Risk-Map

Managing risks

The mastering of risks can be initiated in different ways. When selecting measures, different strategies may be used depending on whether the project can manage the consequences or not in the event of an occurrence of a risk. The subsequent risk management process described by Gutjahr is an ongoing cycle that should be carried out in entirety during the complete project process (Gutjahr, 2009). Risks with serious consequences for the project can be avoided or reduced, whereas risks with minor consequences can be accepted. As part of the monitoring of risks, the initial situation of risk identification, analysis, and management should be regularly checked. In case there are any deviations, risk analysis should be adapted. Early warning indicators could support the monitoring of risks and the timely detection of relevant changes. Serious risks can be coped with and the expansion of risk management can gradually take place.

The four main strategies for the risk management process are avoidance; reduction, insurance, and acceptance (see Fig. 4-8).

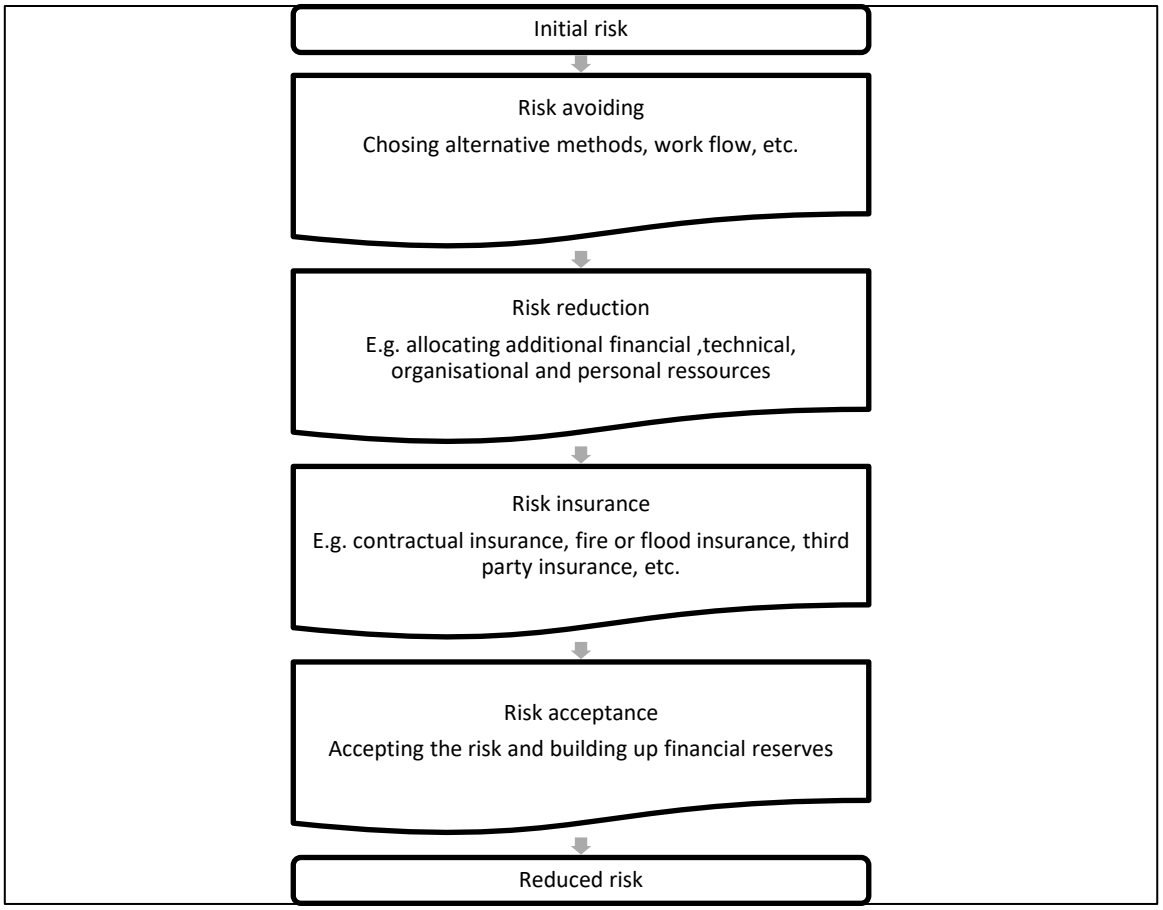

Fig. 4-8 Risk management process

The risk of cost overruns and time delays

Many construction companies record rising costs for material and labour. Escalating prices for steel, copper, and concrete have a huge influence on the construction expenses. In particular, steel prices are estimated to increase in the future due to the increase in the global demand, essentially in new regions, such as Asia, Japan, the Emirates, and the United States (Michael Gerrity, 2014; Aditi Divekar, 2014).

Construction companies are keen to take necessary precautions to avoid any cost overruns during their projects.[19] Such precautions vary from material cost escalation clauses within the contract to partnering with subcontractors and suppliers or substituting of expensive material. By avoiding large building lots, many mid-size contractors reduce the risk of increase in price and the impact on the company's thorough operating result. To reduce the impact of escalating material costs, companies tend to initiate the early-procurement and pre-purchasing of important and price-dependent materials. Moreover, a long-term agreement with suppliers and passing on of risks to suppliers and manufacturers is a common method (KPMG International, 2009). Partnerships

[19] A project is: "*a temporary endeavor undertaken to create a unique product, service, or result*" Project Management Institution (PMI), *A guide to the Project Management Body of Knowledge (PMBOK guide), fifth edition,* 5th ed. (Newtown Square, Pa.: Project Management Institute, 2013, pmi.org); as well as a "*a time and cost constrained operation to realize a set of defined deliverables (the scope to fulfil the project's objectives) up to quality standards and requirements*" *Competence Baseline (ICB)* (IPMA), www.gpm-ipma.de..

with local companies, joint-venture partnerships, and subcontracts guarantee that sufficient resources are allocated to the job site by the partner and the company that will benefit from the bid. This also reduces or avoids any contractual claims. The projects that are impacted by material price increases are those with long construction periods and vast material content. It also includes contractors with a strong labour force but a lack of material saving technology. The building sectors that require the purchase of materials upfront before starting work (such as steel construction) are also affected. Fig. 4-9 shows the reasons for cost overruns as stated by the respondents in the Global Construction Survey 2008 that was conducted by KPMG International.

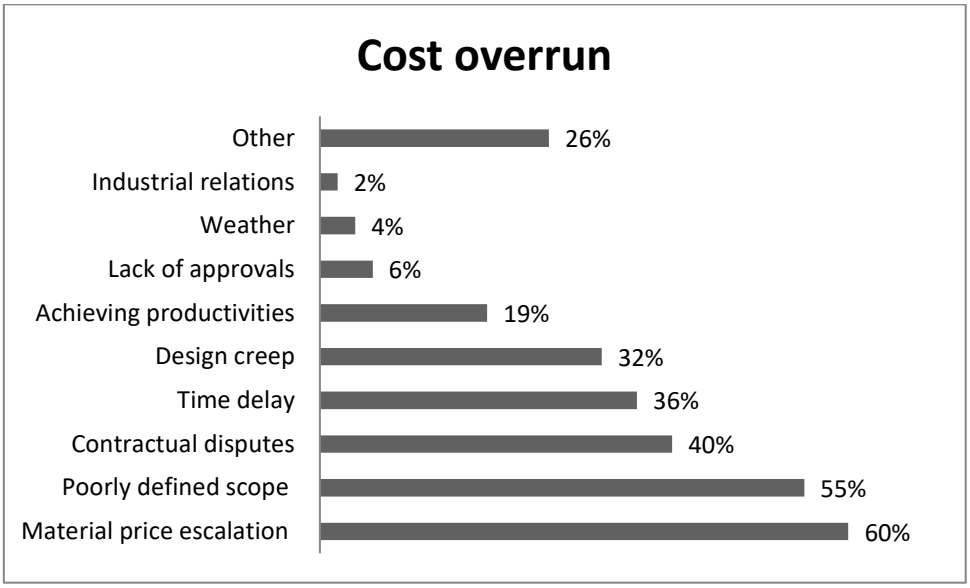

Fig. 4-9 Cost overrun (KPMG International, 2009)

In the recent years, the building industry has been subject to a continuous increase in the building prices. This rise can be attributed to the rising expenditures for materials and labour. The prices for residential buildings in Germany rose approximately 1–1.5% annually over the last 20 years (Statista.de, 2014b). However, the overall costs for building services rose by 20% from 2010 to 2013 (Statista.de, 2014a).

The most common dilemma in the field of building management is time delay. Though the aspect of time delay hasn't been specifically mentioned in the interviews conducted and the subsequent results, it is noteworthy to understand that such time-related delays have negative impact not only on the relationship with the customers, but they also elevate the expenditures. Thus, it is crucial for companies to schedule their projects accordingly to avoid any time overruns. The foremost reason for delays is the lack of proper work definition that furtherly leads to a lack of understanding of the required time durations for the upcoming work. Time delays have a huge impact on the project, especially for overseas projects, because overheads, such as travel expenditures, accommodation for the assigned employees, and contingency costs, escalate.

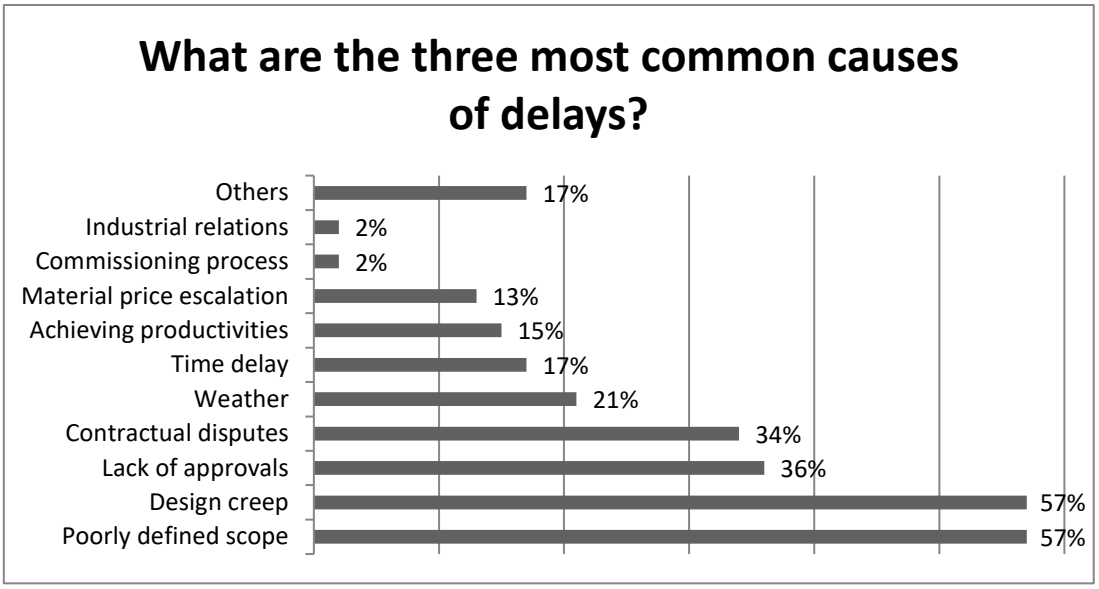

Fig. 4-10 Most common causes of construction delays (KPMG International, 2010b)

4.1.7. Project planning

According to Pierce planning involves the following activities (Pierce, 2013):

- Identification of key personnel

One of the first tasks of a project manager is to identify the personnel required, mobilise resources, and prepare an organisation diagram.

- Contract document review

Before the project starts, the project manager ought to review the contract once again to unmistakably identify the following important contract provisions:

  - The volume and scope of the project (as well as scope that is not included)
  - Required physical features and purpose of the structure
  - Required construction procedures, methods, and materials
  - Particular conditions and features
  - Documentation and communication needs
  - Methods of dealing with uncertain and unpredictable events and unusual situations
  - Contract time, due dates, and milestones
  - Payment conditions
  - Inspection, taking-over, and notification requirements
  - Claim requirements
  - General and other administrative requirements

- Process improvements

Each process optimisation of the construction process should result in a reduction of construction time and construction costs to the clients, contractors, and suppliers. There are various leverages that positively impact the construction: workforce and crew composition, equipment selection and improvement, improvement of site arrangements, schedule improvements, improvement of order of works to reduce idling time, logistics, and procurement or subcontractor arrangements.

- Kick-off meeting

In the kick-off meeting, the project scope, goals, and the overall project strategy/job approach are explained. This meeting helps in the clarification of the key elements of the job: the project control needs, availability of resources, establishment of controlling and communication, and institution of project administration and the upcoming project tasks and topics. Finally, various responsibilities are assigned and on-site coordination is pursued. In addition, separate kick-off meetings are done with suppliers, project owners and their representatives, the public, the residents, the officials, the labour unions, the suppliers, and other stakeholders.

The respondent’s answers to the question what project planning entails is stipulated in 6.3.6.

4.1.8. Project culture and participants

Culture

Intercultural aspects are extremely significant to international building and capital projects, and according to the interviewees, intercultural effects must be considered, observed, maintained, and openly discussed. P6 highlighted the fact that intercultural aspects have not been given enough weightage during the course of the interview.

As project manager for the international construction industry, the contact with foreign cultures is inevitable. Project managers of international building ventures have to take the different national and cultural behaviours and influences into account for their project (Hofstede, Pedersen and Hofstede, 2002; Hofstede, 1994). Before project commencement, it is helpful to familiarise with the existing cultural background and differences of business partners. Gutjahr summarized the categories based on the study conducted by Hofstede and Trompenaars (Gutjahr and Nesgen, 2009; Hofstede, Pedersen and Hofstede, 2002; Trompenaars and Hampden-Turner, 1998). These differences are discussed below:

Power distance. Status differences can vary greatly within a society and also within the project organisation, depending on the country. In some countries, the decisions are in accordance with the highest authority. Some societies give tremendous emphasis to status symbols, such as the office size. One must also consider whether communication between client and contractor is only allowed on evenly matched hierarchy levels; for example, would the chief engineer of the contractor be allowed to appeal directly to the project manager of the client?

Individualism. In all cultures, the activities of individuals have to be coordinated, controlled, and structured. However, the subdivision of responsibilities, coordination of work and management of the project in the social and cultural aspect has an impact on both the project team and an individual employee (Thomas, 1992). The individualism of a company determines the bonds between its individuals. The opposite would be collectivism that describes a society in which the human being is integrated into strong and closed social groups (Beniers, 2006).

Masculinity. In some parts of the world, such as Japan, Russia, and the Arab countries, there is a differentiated conception of gender roles in society. In the Middle East, it is unusual for women to pursue business or conduct public events in a successful manner (Freeland, 2014). The masculinity of a company has a direct impact on the project environment. Less masculine companies tend to have consensus and compromise; whereas more masculine societies and companies are very hierarchical and a compromise in negotiation is considered as yielding or weakness.

Avoidance of uncertainty. In certain cultures, the prevention of risk occupies a subordinated role as compared to other project goals. Hence, the willingness to take risks, which is culturally determined, is higher in countries, such as the USA, Great Britain, Sweden, and Denmark. Other cultures, however, prefer a very detailed and long-term project planning based on information and technical support.

Time orientation. The time orientation refers to the temporal objective definition of business and general project decisions. Decisions in India, China, and Japan generally take a long time, whereas decisions are usually taken at short notice in the United States. Also, the planning related to whether the tasks should be sequential or simultaneous are culturally inferred.

Context relation. In countries like Germany, projects, problems, and successes are not necessarily directly associated with the presence of responsible employees. Therefore, it is quite possible to communicate criticism of the project status without attacking the responsible project staff. In countries, such as Japan and China, however, the trustful cooperation and maintenance of a good working relationship is of supreme importance. Criticism is not directly expressed to not embarrass the counterpart.

Universalism versus particularism. In societies where there is prevalence of universal rules, such as Germany or the United States, the project content and target definition is guaranteed by contract. In particularistic cultures, however, sometimes greater attention is given to social obligations or relationships rather than the contractual obligations (Trompenaars and Hampden-Turner, 2000). Thus, this might create difficulties if the project manager's perceived social obligations compromises the success of the projects.

Expression of feelings. People from different cultures express their emotions differently. Italians and French tend to be more expressive and use a lot of gestures and facial expressions; whereas, the Germans, Japanese, and Chinese perceive too much emotional rhetoric as strange, loud, and chaotic.

Reaching social status. Members of certain societies obtain upward social mobility by performance and expertise (as in the United States). However, other societies, such as India and Australia, use other factors, such as age, family background, and titles to enhance social mobility.

Inside- and outside- controlled cultures. People from cultures having external social controls (such as workers from China or India) are accustomed to externally-dictated living conditions which is evident at the project level. Employees coming from outside-controlled societies tend to implement instructions from a senior rather than screen the instruction as per their discretion. People, however, from inside-controlled cultures are accustomed to situations where they must be the driving force behind their success. In the project environment, this means that such employees will also make decisions for the benefit of the project without waiting for instructions from their supervisors.

Based on the described categories, it is possible to characterize project partners from abroad to sensitively deal with people from different cultures. Gutjahr and Nesgen (2009) has compiled a short list of questions for classifying foreign business partners:

- Is the business partner result-oriented or relationship-oriented?
- Is the business partner individualistic or does he/she consider himself/herself as a member of a group?
- Does the business partner like to work sequentially or simultaneously?
- Does the business use clear and understandable expressions or subtle and indirect ones?
- Does the business partner respect social status or performance and qualification?
- Does the business partner behave rather formally or informally?
- Does the business partner show feelings openly or not?
- Does the business partner avoid physical proximity?

- Does the business partner strictly meet timelines?

The intercultural way of work division and scheduling

Culture can be described as a collective phenomenon as it is formulated between human beings sharing similar social sphere of life (Hofstede, 1984). Consequently, there are cultural differences between project stakeholders of international construction projects and the project managers in charge. Cultural differences that pertains to the working of projects can be classified into three groups (Langford and Retik, 1996; Zwikael, Shimizu and Globerson, 2005):

- Organizations having traditional structures
- Organizations having differences in managerial skills and practices
- Organizations having differences in understanding and interpretation of contracts and laws

The global construction sector continues to be one of the most labour-intensive industries. Therefore, the human factor in building projects is not a mere necessary for project execution, but is also important for the success of a construction project. The construction industry is partly still perceived as difficult and critical, which is why repsonsible PM aslo considers the human and cultural aspects (Haque and Ismail). Frequently, when doing project planning and organizational planning, intercultural effects on projects are neglected.

The question how something is to be realized in foreign countries is just as important as the questions of who has to do what and when. Although construction project managers lead projects in various countries that are similar in its essence, however, the management for them is generally different. It is, therefore, likely that there are significant differences in PM approaches between the home country and the project country. These differences may be because of different management styles, but it can also depend on the functions of those responsible, the different perceptions of project success factors, cultural differences in general, and different support systems that are offered by the organization and company towards executing projects (Zwikael, Shimizu and Globerson, 2005).

Team and staff management in construction projects

In section 6.3.7 the answers of the interviewees pertaining to team motivation and project culture are summarized. However, Kim prepared a table of motivational factors related to the productivity of team members as given in Table 4-7 (Kim et al., 2015).

Economic factors	Amount of pay, incentives, timing of pay, welfare, employment guarantee
Social factors	Social security insurance, participation in decision making, company policy, management policy, social recognition, social life opportunity, job autonomy, self-development opportunity, social status, cultural differences, job discretion
Psychological factors	Working conditions, sense of belonging, achievement, relationship with colleagues, satisfaction, relationship with managers, possibility of growth, sense of responsibility, equal promotion opportunity, challenge

Table 4-7 Motivation factors of team members (Kim et al., 2015)

Stakeholder management

Today, almost every building project, especially international and public projects, has a vast number of different stakeholders who play a crucial role in the project. Construction projects have both positive effects on stakeholders (such as the development of infrastructure or enhancing the standard of living) and negative effects (such as noise, dirt, pollution, or traffic hindrances), (Olander and Landin, 2005). Stakeholders are individuals, organizations, or interest groups that are impacted by the project or are directly involved in its process (Eilmann et al., 2011), and 'those groups without whose support the organization would cease to exist' (Freeman, 2010). Literature suggests a separation into internal and external stakeholders and into primary, secondary, and key stakeholders (this corresponds to the classification according to the degree of influence and participation) (Karlsen, 2015). The division into primary and secondary stakeholders serves the purpose of effectively allocating the resources in the management process of stakeholders. Managing stakeholder means to convince decision makers and sceptics, attract customers and supporters, involve interfaces managers, and successfully execute the project together with its stakeholders.

There are various important factors that creates a successful relationship with and among the stakeholders: (a) open and effective communication, (b) appropriate guidance and advice from the project manager, (c) the creation of an open and trusting atmosphere, and (d) clearly defining the roles of stakeholders (Tang and Shen, 2013). The project manager is not only required to identify the stakeholders but to consider the stakeholders responsibilities and limitations (financially, materially, legally, socially, environmentally, ethical, etc.) into application and to explore the stakeholder's needs and areas of interest within the project. The project manager is also required to communicate with stakeholders in a frequent manner (Yang et al., 2011). In addition, stakeholder management is concerned with the analysis and promotion of the relationships between different project participants. There is a variety of literature that asserts the network of relationship between stakeholder and project managers in the international construction projects. Various researchers have identified and examined a section of academic papers, such as 'Practical approaches for engaging stakeholders: findings from the UK' (Chinyio and Akintoye, 2008), 'Stakeholder management in construction' (Atkin and Skitmore, 2008), 'Response strategies to stakeholder pressures in global projects' (Aaltonen and Sivonen, 2009), 'Stakeholder salience in global projects' (Aaltonen, Jaakko and Tuomas, 2008), 'Engaging stakeholders in performance-based building' (Bakens, Foliente and Jasuja, 2005), 'Stakeholder management for public private partnerships', (El-Gohary, Osman and El-Diraby, 2006), 'Stakeholder management studies in mega construction projects: A review and future directions' (Mok, Shen and Yang, 2015), 'Measuring construction project participant satisfaction' (Leung, Ng and Cheung, 2004), 'Critical success factors for PPP/PFI projects in the UK construction industry' (Li et al., 2005).

The stakeholder management process

Several authors have attempted to discover the most efficient and promising approach to identify and deal with stakeholders. Karlsen (2015) summarised the steps in one flexible stakeholder management process to identify, analyse, and manage project stakeholders. Karlsen also stated that no formal or regular project stakeholder management process exists during the course of the project. The findings of Karlsen are combined with the methods used for the identification of stakeholders, the gathering of

information, the analysis of stakeholders, and decisions making and implementation by Yang et al. (2011). The recommended sequence of steps is given by Gutjahr and Nesqen (2009) and Greiman (2013). *The combined stakeholder management process consists of the following course of action:*

Step 1. The initial planning. In this step, the manager determines how the stakeholder analysis process is to be defined, how much time and resources are to be allocated to identify and manage stakeholders, and how often this process is to be repeated.

Step 2. Identification of stakeholders. Prepare a list of all possible stakeholders involved in or affected by the project, internal and external (see Fig. A-4)

Step 3. Analysis of interests. This step involves gathering individual expectations, desired contributions for the project, wishes and expected awards, domains, attitudes, possible interferences and stakeholder concerns. This is done by using individual or focus group meetings, interviews, questionnaires, public, or second-hand information. The stakeholders can be assessed by classifying their potential for threatening or affecting the project and their potential for collaboration with the project. This classification enables the project manager to categorize the stakeholder into four groups: supportive, marginal, non-supportive, and mixed blessing (Savage et al., 1991).

Step 4. Identification of influences and roles. In this step, the manager identifies the influences of the particular stakeholders, such as the authority to direct and give instructions and influence in the political, legal, and financial fields. Moreover, roles can be assigned, such as monitor or decision maker, overseeing authority, developer, promoter, or group leader.

It should be noted, however, that the influence and the interest of the individuals involved in the project may differ depending on the stage of the project. Olander presented a housing project in Lund, Sweden, consisting of 60 apartments, to illustrate the different stages of the project and to correlate different stakeholder interests and influences (see Fig. A-5).

Step 5. Identification of cultural influences. Detecting and defining of cultural influences in international construction management. Especially in the international construction the cultural influences of stakeholders must be considered, given the special influence on the expectations and the behaviour within the organization.

Step 6. Recognizing mutual interactions. The stakeholders not only have individual expectations of the project, but they also interact with one another. These relationships, or interactions, should be recognized and considered in the project. To visualize the mutual interrelationships, it is recommended to create a stakeholder map based on the stakeholder influence and interest matrix (see Fig. A-5).

Step 7. Determination of structures. This step determines how stakeholders can be integrated into the project and what kind of structures need to be established.

*Step 8. Planning of communication***.** Even before the project begins, the manager needs to prepare for the integration of the stakeholders. It is recommended that a communication and reporting plan should govern the future integration. Regular reporting, documentation, or meetings with stakeholders helps to assess the satisfaction with roles and responsibilities and acquire feedback on project progress, concerns, and outstanding issues.

*Step 9. Stakeholder management plan***.** In this step, the results of the analysis by the project participants are integrated into the stakeholder management plan before and during the construction project to take appropriate measures.

Step 10. Action. In order to develop a strategy to manage stakeholders, one usually selects one out of four main approaches: involving, monitoring, defending, and collaborating (Savage et al., 1991). Regardless of the selected method of engagement and stakeholder management, the daily project decisions have to be communicated and implemented. The project manager and his team might use regular meeting, workshops, interviews, negotiations, or daily social interactions to communicate and implement decisions.

*Step 11. Follow-up***.** Stakeholder management should be an issue not only before the commencement of the project but also during project implementation. Thus, the development of the project environment should be carefully observed and changes are to be incorporated into the stakeholder analysis. The project environment might change; new project stakeholders will come up; and former stakeholder will leave the project. The stakeholder management plan should be revised frequently to reflect the current status of the actual project situation. Moreover, maintaining and improving relationships with stakeholders is a continuous, holistic, and naturally rhetorical activity (Smudde, 2011). The stakeholder's feedback should be integrated into the project's processes, procedures, best practices, and standards.

See also appendix A.17 for an exemplary stakeholder identification of a building, a project for stakeholder matrix and an example of how to map stakeholders.

The KANO model

There is a need to determine how the construction companies and project manager elevate customer satisfaction and lay the foundations for future projects and market growth. The Kano model is based on the original three dimensions (basic, performance, enthusiasm) requirements of customers. It is a method to achieve customer satisfaction beyond the customer requirements (see Fig. 4-11).

The basic requirements are the must-have criteria (i.e., implied needs) (Becker, 2013); (Shahin, 2004); (Herzberg, Mausner and Snyderman, 1959); (Randall Brandt, 1988), which are defined by the contract, the terms of reference, drawings, schedules, and payment agreements in the construction industry. These criteria are also inclusive of the project costs, project time, and the expected quality of the building. It's quite obvious that the customer has distinct quality and performance requirements for the building (i.e., performance needs) that does not focus on the cost, time and quality but also considers the functions and purpose of the building.

There is directly proportional relationship between the fulfilment of the quality and performance of the building and the customer satisfaction. All project participants involved in the construction provide not only their own work but also aim to increase the benefits of the structure in making. It might be useful to recall the purpose and function the structure is entailed with and how the benefits can be elevated. It is conceivable that the contractor, through the use of materials or methods optimises the durability, usability, and maintenance requirements of the building. Discounts, completions before due date, or an extended warranty period are ways of increasing the perceived value. The third level of the Kano model is the enthusiasm requirements (i.e., delightful needs) which are not expected by the customers per se. A slight increase in performance can lead to a disproportionate benefit. It is important to investigate what special features

can be provided to increase the benefits of the building and the associated enthusiasm of the customer and the users.

Gutjahr (2009) has used the Kano model as the basis for defining customer requirements by adding two more levels of customer satisfaction. There are, for example, features that do not mean anything to the customers. These rejection features may resemble the basic features but can turn out to be quite excessive. Particularly in turn-key projects, it is possible that the features of the building or the work make it difficult or even prevent the take-over even though they were previously not mentioned. Finally, there are the insignificant features whose presence or absence will not affect customer satisfaction. Market shares and future projects can be the result of successful projects and excellent customer satisfaction (see Fig. 4-11).

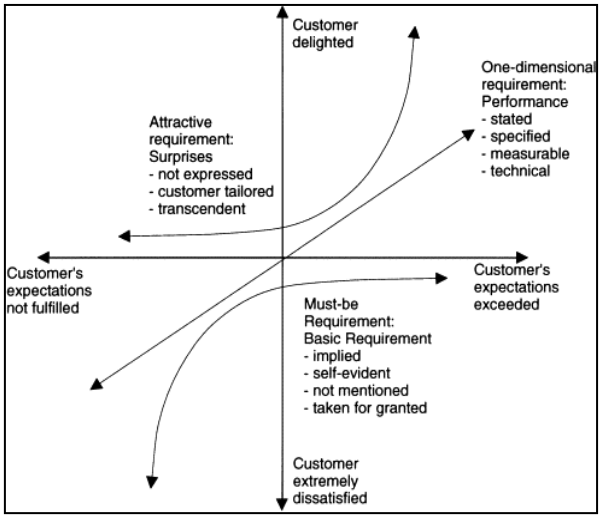

Fig. 4-11 Kano's model of customer satisfaction (Berger et al., 1993)

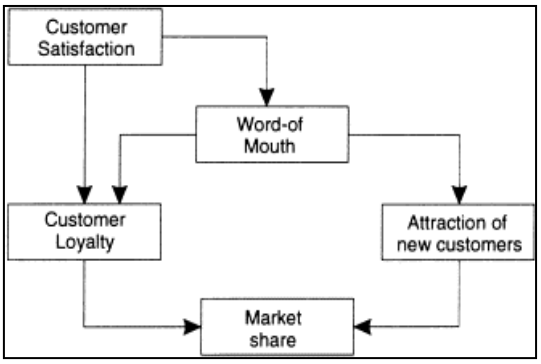

Fig. 4-12 Market share as a consequence of customer satisfaction (Matzler and Hinterhuber, 1998)

4.1.9. Cost management and tendering

Cost management

Cost management is one of the mainstays of PM, especially when it pertains to the golden triangle. The cost management includes the preparation of feasibility studies; cost-benefit calculations, creating of budgets, conducting of tenders, the procurement management and subsequent cost control in the project by, for example, cash flow analysis and profit and loss statements. The interviewees were asked how they structure and conduct the cost analysis and their answers can be seen in section 6.3.8. One element of the whole financial project management is for certain the tendering, as this is the initial stage when defining the real costs for the project execution.

According to Powell the tender documents need to include the following (Powell, 2012):

- Invitation and instructions
- Articles of agreement
- Conditions of contract
- Pricing and payment mechanism
- Scope descriptions: Bill of quantities, drawings, building descriptions, health and safety information
- Site information, soil investigation reports

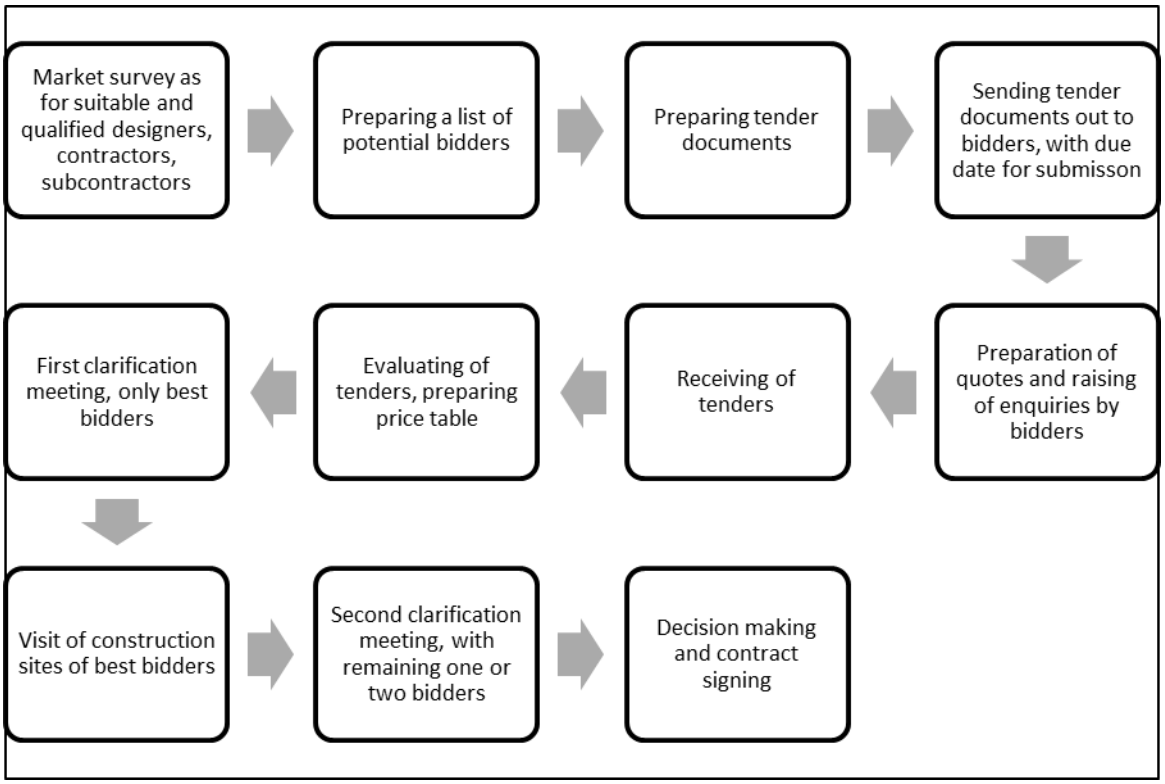

Fig. 4-13 Tendering process

Section 6.3.8 also discussions how the respondents conduct tenders as well as prepare and evaluate quotations.

4.1.10. Project marketing

Project marketing is part of the stakeholder management process and can be described as the '*multifunctional process of managing networks and buyer-seller interactions within and between projects in businesses where the value creation process includes the search, preparation, bidding, negotiation, implementation, and transition of a project*' (Jalkala et al., 2010). The activities of project marketing are often ignored despite its importance in any project-driven business (Artto and Kujala, 2008), (Cova and Salle, 2007). Project marketing can be understood as the presentation of a project in its immediate environment and beyond, which includes the active 'selling' of the project and the achieved successes. The project team executes the task well, however, it is generally ignored.. Project marketing is a very unique and comprehensive process that requires extensive planning. It is also beneficial for the company as public image can be used to enhance the market position of a project-based firm (Ahola et al., 2013). Project marketing helps to create supported visions and expectations within the project team and communicates the same to the client; however, the process is often far-reaching. Furthermore, a supporting project environment significantly motivates the influential stakeholders of the project. Project marketing elevates the competitive position of the project manager for his ability to collect scarce resources, such as finance and manpower. Ultimately, project marketing also serves transparency, communication, and one's own image within the organization and towards customers and project partners (Karavul). Project marketing can be divided into different phases: 'defining of objectives', 'conceptual and planning stage', 'implementation phase', and the 'final phase'. Project marketing should be continued from the beginning to the end of the project.

The relevant target groups for project marketing are the client; decision-makers in one's own organization, one's own project team, and the classic promoters at all levels (whose support is required for project execution). Projects marketing can also be addressed by press representatives or residents for the projects with an external impact. The communications media has to be chosen in accordance with the suitability and target groups. For example, the use of building and progress reports, workshops, meetings and presentations, newsletters, articles, or other specific events is conceivable. However, the dependence on the use of media and its relative frequency vary with different projects.

Project marketing before starting the project

The aim of project marketing is to arouse the interest of all stakeholders for the project and to secure the support of the decision makers and management. The project must be popularised by using presentations, workshops, company newsletters, intranet, newspaper articles, or organized events. Project marketing, therefore, pursues the goal of answering the following questions:

- What are the objectives of the project?
- What difficulties are expected?
- What strategy is to be followed and in what steps?
- Who is involved in the project?
- What opportunities does the project hold for the company and stakeholders?
- What are the next big and relevant steps and milestones?

Project marketing during the project

During the project, all stakeholders are regularly informed about the project and its progress. Thus, an interim status and outlook for future construction phases should be provided.

Project marketing at the end of the project

At the end of the project, a formal final report of the construction project is prepared that describes whether the project has met all the financial, timely and qualitative targets. Moreover, a retrospective overview of the project should be given that highlights the hurdles and problems faced during implementation, the remedial measures ensued and the successful implementation of the plans.

5. The research approach

5.1. Introduction

There was a proximate idea of the research philosophy at the beginning of the study. However, this idea was more substantiated after the first analysis of the literature and demonstration of the individual themes. However, the question that formulates is the importance of understanding of philosophical issues. Easterby-Smith described that a better understanding of the research philosophy helps to evaluate different methodologies and methods, and also aid the process of selection or adaptation of any research method (Crossan, 2003). The research philosophy for this study had to be readjusted from positivistic epistemology to inculcate the practical experiences of international construction executives. In the following chapters, the reason for the selection of a subjective and descriptive research approach is described and the advantages for this philosophical stance is also mentioned.

5.2. The subjective and descriptive research approach

Epistemology or research philosophy is concerned with the question of what knowledge can be acquired and which approach can be selected (Campbell, 2006; Suchting, 2006). It is the aim of this research to gain and present further insight into the lived experiences and best practices of construction professionals and to contribute to the professional practice by offering proposed advances of applicable tools, techniques, and methods.

The research is initiated by the selection of the topic and choosing an appropriate paradigm (Groenewald, 2004). This study describes the experiences gathered by the interviewees who are experienced international construction executives and discusses how they have managed their projects. This will include the experiences gained by them and the methods and measures they used. A phenomenological research approach is adopted to facilitate the respondents' experiences, recollections, interpretations, and evaluations associated with the use of PM techniques in international construction projects (Moustakas, 1994). The objective of phenomenology is to understand the lived experiences of the individuals and to study their experiences and understandings of their world (Manen, 1997).

It is crucial for the research to ensure a degree of objectivity that does not distort the answers and the subsequent interpretations. To ensure this objectivity the researcher had to acknowledge that the participants, as well as the researcher itself, are active human beings who tend to interpret and ascribe meaning to their environment. This acknowledgment helps already to try to don't interpret too much of the responses received and to try to don't influence interviewee when giving answers. Moreover, the semi-structured interview guideline provided framework to obtain context-specificity of knowledge while limiting subjective interpretation during listening, taking notes, transcribing and sense-making.

To collect the experiential knowledge of the participants as well as the impressions of the phenomena (international construction project management) experienced by the respondents, the phenomenological research approach has been preferred. Phenomenology can explore human experiences in a greater manner, and such an exploration can have a positive impact on people in similar situations or on people who are more likely to confront the same experiences (Wilson, 2015).

It can be concluded that the phenomenology explains the subjective aspects of an experienced situation and majorly focuses on the experiences rather than the individuals. However, when selecting the sample group, it is important to define the individuals and the selection criteria to achieve appropriate results. For this research, experienced construction project managers who were responsible for mid-sized and large-scale projects abroad were favourably sought for. The sample group consisted of individuals of different building industry branches, for instance, some interviewees were self-employed, and others were working for international building firms, PM companies, or as client representatives. Moreover, there was no prior need for some particular educational or training certifications for the respondents (see Table A-10); if there were respondents with PM certificates, the findings would most probably be falsified.

Therefore, a suitable approach to answering the research questions is likely to be more subjective, descriptive, and phenomenological (Stace, 1944; Boland, 2012). It is also crucial to examine whether other approaches would generate the same results and

findings while answering different research questions. The researcher, as a civil engineer and construction project manager, is concerned with objectivity and structured approaches to solving problems in the day-to-day working environment. An alternative methodology which is based on the personal preferences and attitudes of the researcher towards tasks and problems could have a positivistic stance. Contrary to qualitative research, where an inductive reasoning strategy is followed, quantitative research follows a deductive approach. This asserts that the research is manoeuvred by a stern agenda or framework (Poggenpoel, Myburgh and van der Linde, 2001). Adopting the principles of positivism signify 'working with an observable social reality and that the end product of such research can be law-like generalisations similar to those produced by the physical and natural scientists' (Remenyi and Williams, 1998c, p32). The study conducted by a positivistic researcher is executed in an environment that is devoid of any values and feelings and is based on the assumption that the researcher is 'independent of and neither affects nor is affected by the subject of the research' (Remenyi and Williams, 1998b). If positivistic methodology were chosen, this study would have been concerned with the structural elements of an organization and how these elements can produce a more desirable result. To conduct a structural or functional examination, a rational research question relating to a rational problem or an expected rational solution had to be formulated. Moreover, a positivistic approach is more deductive, wherein one initiates with the theory, clear research questions or hypotheses. Deductive research commences in a general manner and then advances at a more refined level that aims to verify, refute or test the formulated theory. A researched guided by a less-subjective approach would disregard the personal experiences and perform semi-structured interviews as these methods gravitate towards subjectivity. Hence, contrary to an objective methodology, the subjective and descriptive approach acknowledges that the success of an organization is grounded in the experiences, skills, opinions, and prejudices of its individuals and that the positive accomplishment of the organizational goals is subject to the external factors.

It is best to illustrate the chosen research philosophy in accordance with the opinion of Saunders (Fig. 5-1). Personally, the researcher does not have an all-encompassing epistemology that impacts its actions and activities in living situations. Thus, according to the given circumstances, a positivistic approach is chosen in the professional environment, while an interpretivist approach is adopted when dealing with other individuals, colleagues and stakeholders in the organization and the projects. In this study, however, a subjective and descriptive epistemology approach was adopted, since both quantitative and empirical studies are available. Moreover, the purpose of this survey is to gain a deeper insight and understanding for the implementation of project management in practice; see the researcher's individual research string (Fig. 5-2).

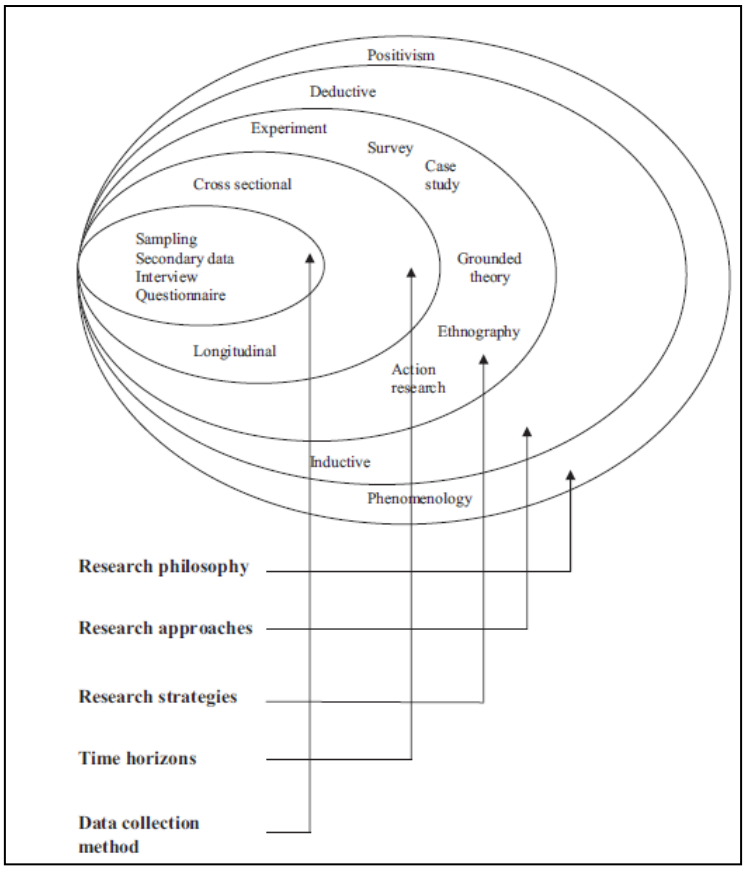

FIG. 5-1 RESEARCH ONION FROM SAUNDERS (ABDULLAH, 2014)

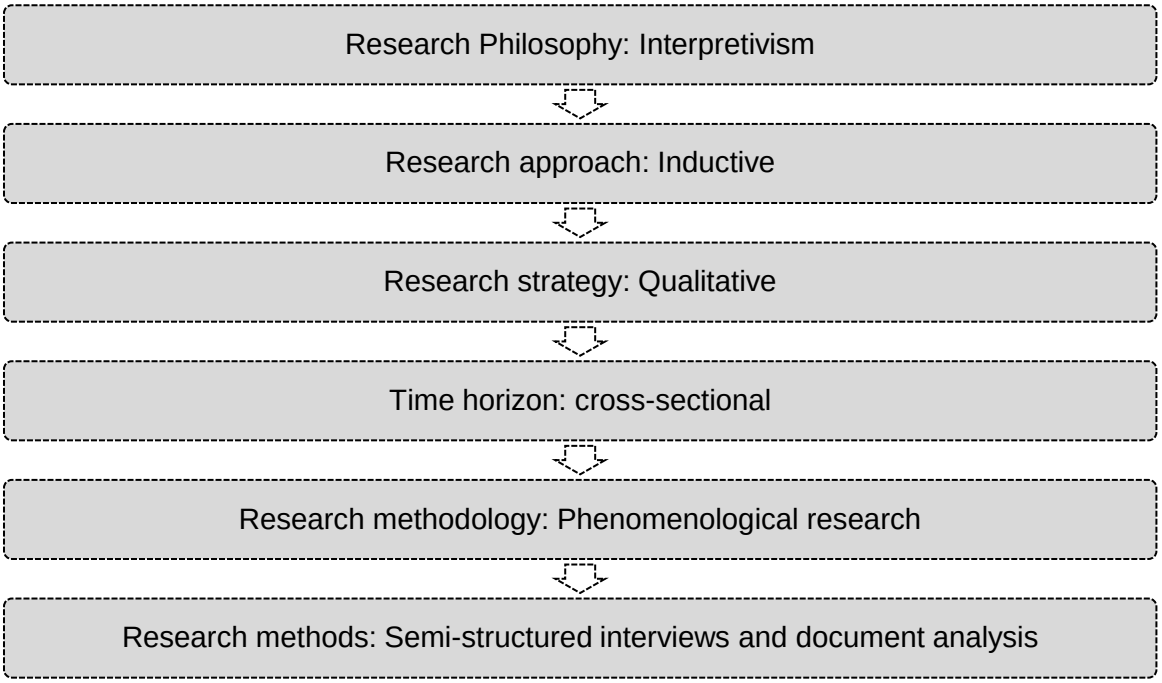

FIG. 5-2 OWN RESEARCH STRING

According to Fellows and Lui, the purpose of a descriptive research category is '*to systematically identify and record (all the elements of) a phenomenon, process or system*' (Fellows and Liu, 2015c, p11). However, in the field of business and management, the research is generally an amalgamation of subjective and objective philosophical approaches. Organizations consist of human actors and are, therefore, likely to be impacted by the individual influences of these actors. However, as organizations underline the measurable mathematical principles and goals of any operational activity, such as profits, losses, and return of investments, it can be assumed that the philosophical stance of realism is a practical approach in business and management as well.

This study has followed a qualitative, descriptive phenomenological research approach that described the lived experiences of a phenomenon from the interviewee's perspective. In this research, the phenomenon studied is the management of international construction projects, with a particular focus on the project management aspects. Semi-structured interviews have been used to collate the data that mentions the descriptions of the participants lived experiences. A challenge of qualitative phenomenological research is the influence of the researcher. The chosen semi-structured interview design is as non-directive as possible, but it does encourage the participants to provide comprehensive answers and provide an idea of the aim of the questions. All efforts were made to avoid the influencing of the interviewees. The provision of data that deals with the application of PM methods to international construction is complex in nature. The participants would not be able to provide the answers without any suggestions that highlight the aims of this survey,

5.3. Data collection and analysis- Impact of the subjective and descriptive philosophy

The chosen subjective and descriptive methodology has had great influence on the collected data and the subsequent analysis. The range of possible methods to obtain qualitative data includes questionnaires (or direct interviews), literature and document analysis, and other non-numeric data sets. However, it is likely for a researcher to encounter statistical data during the course of the study in business and management. However, it is compulsory that the subjective researcher requires data sets in standardized forms, such as numbers, values, or categories. On the contrary, a positivistic researcher would have concentrated on the objective, empirical, or statistical interpretation of the data collected previously as the role of such a researches is limited to the gathering of data and making empirical and objective interpretations to receive observable and quantifiable results (Collins, 2010). Usually, a positivistic researcher overlooks individual influences to narrow down the broad range of potential sources and to specify the parameters for successive analyses. Positivistic researchers favour quantitative data as such an analysis is used to explore, present, and describe interactions and correlations between actors within a data set. To explore and describe these interactions, quantitative data analysis uses methods, such as graphs, charts, and statistics.

Purposive sampling is a way to identify and select the research group, and it also underlines the strategic choices about the participants and their appropriateness for the given research objectives. The selection truly depends on the context and objective of the research (Given, 2008). For this examination, the interviewees were selected on the basis of certain cases and criteria. The cases are international construction projects, and the criteria is that the interviewees should be German international construction project managers working abroad.

The literature review primarily analyses the studies based on qualitative data and the specialists' books and academic articles that describe different methods, procedures, processes and technologies for successful PM. There is no relevance of statistical data in this text. For analysed studies, empirical comparisons have an informative character and merely indicate trends. Complementary data has been obtained from journal articles, industries' reports and statistics, government census reports, and government publications.

The obtained phenomenological data was deciphered for evolving themes either complementing or contradicting each other, or maybe just aggregating on some themes. Semi-structured interviews were conducted to maintain a certain structure while allowing for spontaneous responses and interactions during the interviews. Semi-structured interviews have the potential to overcome poor response rates and provide guidance for planning, structuring, and execution of interviews. Moreover, semi-structured interviews provide the possibility of exploring attitudes, values, biases, or beliefs of the respondents and also allow the space for asking additional questions to better understand or validate the answers given. A personal interview, in addition, presents a higher likelihood that most questions will be answered (Bamball and While, 1994). The semi-structured interview consisted of a set of interview questions that followed a guideline to procure information about the PM methods and techniques applied by the project manager. The interview also sought supplementary information about previously conducted projects and questions covering personal information, the current position, and the project manager's perception of PM. The interview guideline was shared with the

interviewees before the interview so that they can be well adapted to the flow. This survey aims to provide suitable guidance for the semi-structured interview that provides critical queries in relation to the main research; it provides enough flexibility to have a conversation (unlike a clinical interview) and obtain quantitative information about the projects for which the project managers are responsible (Chen and Partington, 2006). The protocols of the interview were examined using NVivo 11 for emerging topics and these topics were used to segregate the answers and assign them to individual topic complexes. Emerging interview themes (an extract from NVivo) comprises a detailed overview of the topics identified during the evaluation of the interviews. These themes were studied, and the data obtained in the interviews was compared with the data collated from the analysis of literature and various other documents.

Certainly, the experience and the described phenomenon expressed by the interviewees are dissimilar due to the varied perspective of the participants. However, the essential element of the real life experience, the experiences with particular PM methods and the context are similar. The themes and meanings that developed during the analysis would be dependent on the cultural and individual contexts. However, it is possible to interpret the statements beyond their noticeable meanings.

The responses of the interviewees were analysed content-wise; similarities and dissimilarities were also being sought between the individual statements. The objective of the research was how the respondents ‘live’ the PM and how they conduct their projects as managers of their international building ventures. The participants were from varied backgrounds; some worked for companies, some were independent, some worked for contractors while some worked as client representatives. Nevertheless, based on the statements no attempts have been made to draw conclusions on projects, countries, companies, business sectors, age, gender, or other personal or professional background aspects of the respondents. This study does not aim to analyse which companies use what methods or whether an older project manager uses PM methods different from that of a younger one. There are various authors who have already conducted empirical studies on applied PM methods and techniques. However, this study has selected a research approach that is not associated with the sector of the construction industry. This exploratory and phenomenological study explores how international construction project professionals manage their projects and which methods are applied by the interviewees and how varied and new aspects of international PM evolve. It also proposes to investigate whether there are any similarities or differences to the established in theory or literature.

5.4. Impact of the chosen philosophy on the results and conclusions

'*The results relate to the analysis of data, whilst the conclusion use those results, together with the theory and literature, to determine what has been found out through the execution of the study*' (Fellows and Liu, 2015a, p263).

It might be advantageous to look at the potential results of an alternative and an objective approach to analyse the impact of the chosen philosophy on this research. For instance, the results of the empirical work lead to the evaluation of the data in conjunction with the theory and objectives of the research to evolve a quantifiable, provable, and measurable outcome. The targeted aim of an empirical survey is to provide an explanation rather than an understanding of circumstances and correlations in an organization. Objective research methods, like applied in this research, are used to analyse data include correlation, regression, averages, variability measures, rank hierarchies, and association measures. The methods which are in relevance with the analysis of qualitative data of this study include discourse and conversion analysis, pattern production, matching, and diagram illustrations (Fellows and Liu, 2015b). The chosen methodology has a significant impact on the process used for data analysis; the results and findings of the subjective and objective research tend to deviate from each other. A broad range of studies prepared by different institutes relating to construction business in an international context are available. Statistic institutes, like the German *statista.de,*[20] the *International Monetary Fund,*[21] *(*with its World Economic Outlook Database), the *German Building Federation,*[22] and the World Economic Forum[23] (with its Global Competitiveness Report) provide comprehensive empirical and statistical data. These sources provide significant and wide-ranging data sets, and from an objective and empirical perspective that can deliver significant information to conduct statistical meta-analysis.

However, based on the selected subjective methodology, the results of the data gathered, both through the literature review and the interviews were in-depth, qualitative data. Quantitative research aims to explore the present relationships and trends within a researched topic but neglects to understand the intricacies in relation with the interaction of different factors. This is one of the main differences between subjective and objective methodologies and their research conclusion. Hence, the results and findings, based on the chosen subjective approach, provide a broader understanding of international construction PM. However, it will not provide law-like findings and will not future predictions or forecast different outcomes and events.

[20] http://de.statista.com
[21] http://www.imf.org
[22] http://www.bauindustrie.de
[23] http://www.weforum.org

5.5. Key theme determination and follow-up within the dissertation

In relation with the chosen methodology, an exhaustive review of the accessible studies and academic papers (see chapter 3) of both qualitative and quantitative nature was carried out. This was done to identify emerging topics, repeated subjects, and key themes in literature, textbooks, project management guidelines, and other literature (see also annex A.6, A.7, A.8 and A.9)

The identified and listed key themes are the foundation for generating viable questions for the semi-structured interviews and the interview guideline (annex A.10). The listed themes have also aided for the conduction of interviews. Thus, the key themes from literature are integrated into the data collection to provide a profound starting point for the interviews and to provide suitable assistance to participants in answering the questions.

The semi-structured interviews were conducted with the international construction project managers to obtain qualitative data that specifies about PM methods, tools certifications, and experiences when such methods are applied in an international project environment. The findings and conclusions derived from the semi-structured interviews consider the practical experiences, personal attitudes, and opinions (Benbasat et al., 1987). On the basis of analysis of literature and expert studies, the identified key issues have been summarized into the following main categories of key themes (see Table 5-1 Main categories of key themes of the literature review).

The analysis and presentation chapter 6 follows the identified and stipulated structure from the Fig. 2-1 and Fig. 2-2.

Analyses
Approvals, Inspections, Handing-overs, Releases
Budgeting and costs
Communication, team, culture
Controlling
Industry and markets
Miscellaneous
Organisation and structure
Other management topics
Permits
Project Management
Project Management Processes
Project Management Tools
Project manager
Project planning
Project Preparation
Reporting and documentation
Risk Management
Scheduling
Simulations and scenarios
Stakeholder
Subcontractors and suppliers
Tendering and awarding

TABLE 5-1 MAIN CATEGORIES OF KEY THEMES OF THE LITERATURE REVIEW

These superior categories were considered from the beginning of this study for the creation of the interview guideline. However, the guideline (or the questionnaire) consists mainly of four sections. In the first section, personal information, information about the professional experience and the current position are deciphered under point 5.1 (see Interview Guideline). The first section also examines the understanding of PM by different respondents. The interview guideline also serves as technical assistance for the interviewees as several years of professional experience cannot be corresponded in a conversation without any previous preparation. The research is also concerned with the practical experiences of international construction project managers; thus, it is important that the participants respond to their comprehension of the term PM. During the conduction of the first section of the interviews, various insightful answers were observed. The second part of the interview guideline consists of point 5.2, which is 'Applied PM methods and tools'; the third section has point 5.3, which is 'Sub topics of

PM'. The interviews were carried out in a semi-structured form, thus detailed templates were issued and the assistance for the answering the question was provided to the interviewees; however, often a conversational flow emerged during interviews which was not interrupted.

Thus, the important subjects recognised in the literature review could be easily identified as these subjects were inculcated into the interview guideline and were answered by the participants. It is this self-determination of the participants when giving answers that characterises a subjective and descriptive dialogue and leads to comprehensive statements.

5.6. Appropriateness of the research approach and subject

A major question that any doctoral thesis deals with is how to ensure the quality in qualitative research. Valuable qualitative research is crucial for a particular field of study and is beneficial for the reader. Remenyi asked the question: 'How can an inquirer persuade his or her audiences that the research findings of an inquiry are worth paying attention to?' (Remenyi and Williams, 1998a). The document should contain valuable topics and content and should be supplemented by sufficient data. Thus, it is imperative that a study should be accurate, self-explanatory, comprehensible and significant in its essence. When seeking literature for qualitative data, various keywords of quality are encountered; a repeatedly used keyword is 'validity'. The goodness and trustworthiness of a study are judged by the validity of the work (Kirk and Miller, 1986; Cakmur, 2012; Dadds, 2008; and Lather, 1986). In addition, it is important for a fragment of research to be reliable, objective, and transferable (Lincoln and Guba, 1985). To establish the quality in this study, the model of the eight 'Big-Tent' criteria for excellent qualitative research is pursued (Tracy, 2010). The subsequent chapters provide adequate justification for the credibility of this research.

Worthiness of topic

Qualitative research can be considered viable only when it is relevant and compelling (Kirk and Miller, 1986). The researcher should produce results that raise the level of awareness and academic authenticity (Schwandt, 1996). During the initial phase, it is recommended to generate awareness about the research industry and the field of research. The construction business is a driver for economic development and a contributor to the socio-economic and environmental development of a country (Serpell, Jorge and Sergio, 2013). Moreover, the building industry creates the infrastructure, the manufacturing facilities, and housing, which is the backbone of modern civilization; it improves the standards of living (2005). The contribution of the building industry to a country's gross domestic product (GDP) usually ranges from 3.5% to over 24% (Walsh, Sawhney and Brown, 2005). European nations tend to invest approximately 6% to 10% of their GDP in the building sector (Statista.de) which is significantly less than the investments of developing nations, such as Brazil, China, or India. In 2014, the building sector in Germany accounted for 9.8% of the national GDP.[24] Bearing in mind the great economic significance of the construction business, and employability it generates, the importance of the chosen research industry is undisputable.

The field of the investigation itself is a theme of business research that has been thoroughly studied. There is an adequate amount of literature that reflects on different PM methods and techniques, management concepts, soft skills of project managers, and leadership conceptions. Moreover, the variation of guidelines has been determined such as the *Guide to the Project Management Body of Knowledge (PMBOK)* issued by the *Project Management Institute (PMI).*[25] The idea of investigating PM methods in the construction business is based on the evolving need for collaboration between the building industry and academia (Abudayyeh, Dibert-DeYoung and Jaselskis, 2004). Furthermore, the international building project leaders practice a unique profession;

[24] http://www.bauindustrie.de/zahlen-fakten/statistik/bedeutung-der-bauwirtschaft/anteil-am-bruttoinlandsprodukt/

[25] http://www.pmi.org

building projects, on account of their uniqueness, are a special challenge. The challenges are further augmented when the project is in a foreign environment which is inclusive of intercultural and linguistic barriers added with geographical vagueness.

Additionally, foreign building projects are characterized by high-order values and project managers, especially in the international construction business, often have a very high personnel and budget responsibility. The smallest project of one of the study participants accounted for Euro 4 million; other contracts had contract values between Euro 20 to 400 million. One participant had even previously managed a project of Euro 800 million. Furthermore, the uniqueness of the projects, the external project environment, high deadline and budget pressure, new or other legal and contractual project parameters as well as the usually large distance from the original company headquarters or project office make international construction projects a unique and challenging encounter. Despite a project team, ideally consisting of specialists, project managers must manage their projects in a self-responsible and goal-oriented manner. Methodological and procedural solutions are necessary, as well as methods, techniques and guidelines which are not too theoretical, but practical and user-friendly.
This doctoral thesis explores project management methods as found in the literature and examines how the students use these methods, whether they use their own methods and techniques, whether PM certificates and further training are perceived as suitable, and which processes and methods the respondents apply in their day-to-day work.
Thus, the research subject is of particular importance to the international construction industry, especially for its project managers, and is intended to create a sustainable added value for the reader (academics, theorists as well as technical experts and practitioners).

Research consistency and richness

In qualitative research, statistical representativeness can be neglected and usually replaced by content representativeness (Lamnek, 2005). This can be achieved by selecting a purposive assortment of sample groups and avoiding any distortion. This means that international construction project managers (not project team members, junior project managers or similar) were selected with a certain experience and practice abroad; they were Germans, or were originally from a German-speaking country; and they were directly in charge of the project and consequently had to manage their project with all resulting financial, technical, contractual, legal and timely delivery responsibilities. In addition, no further selection criteria were defined, such as education and training, gender, age, type of construction project or country-specific project experience. The negligence of further selection criteria was on purposive to don't create any selection biases.

Qualitative research about the actuality of things; it is not about its frequency of occurrence, it aims to uncover the underlying meanings. Consequently, generalisation is not an objective in this research but the intention is to investigate the application of the methods and methodologies and not their frequency of occurrence.

Relevance of selected topic

The selected research subject also considers an increase in the importance of demands for professionals in the sector of the construction industry which has been discussed in the study conducted by Zimmermann et al. (2011). Zimmermann et al. carried out a document analysis of more than 60 appropriate job announcements and

concluded that much importance had been given to the educational and formal qualifications. This further corresponds with the interview statements that formal education in the realm of structural engineering, architecture or other specialised studies for building in Germany rarely influence the efficient component of PM which is required to manage the projects. Additionally, Zimmermann et al. conducted an interview with 14 participants, and the participants were asked to make statements on their own position in the context of the hierarchy level and their job duties. The interviews concentrated on participants who possessed a high portion of the executive tasks in the project work from the construction economy and real-estate economy. Zimmermann et al.'s study exhibit that the subject of PM methods impacts the requirement profiles and activities of the employees who are in the German building industry. Although there are almost 200 courses of study in the area of real-estate economy and building industry, all necessary abilities and knowledge cannot be constituted by this formal education. Moreover, according to Zimmermann et al., there are more than 50 additional certificate programmes and courses as the subject of applied PM is of increasing importance to employees in the building industry.

Transparency and credibility of the study

Transparency refers to the honest approach that was incorporated while pursuing the research and researchers should provide '*a methodologically self-critical account of how the research was done*' (Seale, 1999, p 468). Transparency can be achieved in different ways, and it is important to provide '*clear documentation of all research decisions and activities'* (Creswell and Miller, 2000, p 128). In this research, transparency has been achieved by disclosure of the interview notes which were issued by the participants. Notes and transcripts are the basis for processing data and for preparing the research results and consent was granted by all the interviewees via electronic mails.

Credibility refers to the trustworthiness and plausibility of the research findings. According to Tracy, interpretative analyses should be '*plausible and persuasive*' (Tracy, 1995a). In this qualitative research, credibility is attained by using clear descriptions and comprehensive and in-depth interviews that are influenced by the literature review; also, as mentioned above, the participant's consent was taken for the interview transcripts. The participant's consent is used to amplify the depth, credibility, and accuracy of the answers given by the respondents. The interview protocols have been sent to the interviewees for their comments and subsequent approval. The notes were sent to the interviewees who reviewed and commented on them and also suggested possible changes in the transcripts. However, by sharing the notes with the interviewees, an opportunity for additional questions, feedback, and affirmation was provided.

Transferability and generalization

The formal quantitative perception of generalisation is generally misleading and not applicable while discussing qualitative research. When conducting a phenomenological research, the occurrence of a statistical generalisation is unlikely. The sample size is rarely a guarantor for 'representative' results (NCC Staff, 2012). The knowledge obtained in this qualitative research (see Table 6-1 Checklist for successful project management) is transferable and might find application in other researches, populations, or circumstances because '*findings can be extrapolated beyond the immediate confines of the site, both theoretically and practically'* (Charmaz, 2005, p 528). The findings generated would particularly aid the practitioners and construction peers as the findings provide fresh and varied aspects on how to manage international building projects with variously cited examples.

Moreover, *naturalistic generalisation* is a practice that allows readers to gain insight by reflecting on the particular instances and descriptions presented in studies; it enables comparisons to their own experiences and situations (Hellström, 2008). This research, for instance, has been strongly influenced by the conceptual approach of the works of Zimmermann et al. (2011), the statistical survey (about PM competencies in the construction industry by Edum-Fotwe and McCaffer (2000) and the research about the chief information officer initiated by Hunter (2010). All these references were not directly transferable to this study situation, but the approaches, information, and intended research goals provided ideas for this research. Hence, it is likely that this investigation will provide other researchers with a starting point for their study. Various aspects of this study can be adapted and transferred in accordance with their respective research goals and experiences which are subject to naturalistic generalisation.

Significance of contribution

This study extends knowledge and improves practice. The findings '*contribute to our understanding of social life'* (Richardson, 2000, p 254) and '*bring clarity to confusion, make visible what is hidden or inappropriately ignored, and generate a sense of insight and deepened understanding*' (Tracy, 1995c, p 209).

To understand the significance of this study, the '*theoretical significance',* which raises the question whether a research is '*intellectually implicative for the scholarly community*' should be considered (Tracy, 1995b, p 210). To be theoretically significant, there should be '*heuristic significance'* that augments the curiosity within the reader and encourages new discoveries (Abbott, 2004, p 281), as well as '*methodological significance'* and '*practical significance'*.

With regards to the methodological significance, an academic paper might not be of importance due to its findings but also for its chosen methods and approaches. The whole of the methodological approach is characterized by the unity of the chosen methods, contributed experiences, presented concepts, and semantic structures.

In particular, this research might possess methodological significance due to the chosen reflexive element. The chosen phenomenological research approach has not been identified in any other study or literature pertaining to construction PM, with the exception of a single book by Dörrenberg et al. (2014). Therefore, the chosen methodological research approach of this study can be deemed as an addition to the theory in association with research in the context of the building industry.

Practical significance refers to the contribution to practice. This dissertation should enable the readers and participants to gain awareness and obtain a better understanding of PM mechanisms. This study follows the interpretation and belief that good qualitative research should reflect how practitioners deal with certain situations; it should also include implications that may help both the readers and participants to develop normative principles for future actions (Tracy, 1995a). Practitioners can gain applicable knowledge about the conceptual approach to international construction PM by referring to the interview results and also by the methods and processes presented in this text)

5.7. The pilot study

The discipline of PM[26] has established an extensive variety of standards, and organizations are increasingly using the PM techniques to attain their respective business goals (Fortune et al., 2011). Project managers are determined to maximize the executed quality and to minimize the project costs while aiming to terminate the projects within the timeline and anticipate and handle the risk constructively (Tukel and Rom, 1998). To manage construction projects, the discipline has generated tools, techniques, and concepts to support the project teams and project managers. The individual competence in the context of managing a project is a pre-defined set of knowledge and techniques. PM has made significant advances in recent years. It is crucial for project managers to use modern PM techniques and competent managers must be able to demonstrate their understandings about the principles of PM that are designated in a variety of standards[27]. However, it is unclear whether and how these techniques are applied by practitioners on the construction sites worldwide and whether firm guidelines help project managers to cope with the challenges and ambiguity associated with international construction projects (Drake, 1986). Furthermore, the application of the recommended standards and tools when managing cross-national projects is also unclear (Chen and Partington, 2006).

The pilot study fulfilled different objectives. Initially, the main need was to gather the data about the various methods employed. Best practices, methods, and tools majorly used by the international construction project managers who were interviewed and the shortcomings and the advantages of their applied methods was scrutinised. Secondly, the data gathered by the interviews of the pilot study was compared with the data that was expected. There was also a major concern of the results being falsified due to the individual or selective prejudices. A selective bias in this research content might be of the approaching potential interviewees organised in PM associations. It is likely that these project managers were better trained in PM and therefore, possessed certifications which were not possessed by their peers who were not organised in PM. Individual bias can stem from the claims of the interviews to be aware of certain methods or techniques to be perceived as more competent or professional. A goal of the pilot study was to analyse whether the selected sample group represented and reflected most of the target population of construction PM professionals. The pilot study also checked whether the answers and the conclusions were applicable. A third objective of the pilot study was to resonate the interview guideline with the purpose of the study. It checked whether the guideline aimed at the target and whether the questions incorporated could produce usable and reliable information that might contribute to the research. The fourth objective was to optimize the interview-guideline to amplify the quality and usability of the results. The fifth goal of the pilot study was to check whether the time required to conduct the interviews would be sufficient and optimized.

[26] Project Management is "*the professional discipline of planning, monitoring, and controlling specific resources to achieve a set of goals for a project*." Wayne J. Del Pico, ed., *Project Control: Integrating Cost and Schedule in Construction* (Hoboken, NJ, USA: John Wiley & Sons, Inc, 2013a, p 1).

[27] A standard demonstrates a common and broadly applicable set of instructions, guidelines, regulations or recommendations that should be treated as imperative guidance for professionals and are more or less embedded in formal or legal norms.

To collect qualitative data on best practices and methods in international construction management, semi-structured interviews with nine project managers who were working abroad was conducted (see Drever and Barriball (Drever, 2003), (Barriball and While, 1994)).

The interviews explored the personal information about the respondents and the projects that the respondent are/were in charge of, the type, the location, the particular characteristics of the construction projects (e.g., public, private, industrial building, etc.). The interviews also aimed to determine the applied PM techniques, and the related advantages, shortcomings, limitations, and drawbacks experienced with the methods, tools, and techniques applied at the international job sites. To identify the concept of PM preferred by the respondents (such as Project management as planning and controlling, project management as organizing and coordinating, project management as predicting and managing potential problems Chen and Partington, 2006), this research used questions with boxes to be ticked along that referred to the personal background and project experience. The results derived from the pilot study were also incorporated into the main study. Moreover, the pilot study produced the first concrete findings pertaining to the applied PM methods.

The data obtained by the interviews was deemed valuable and was in accordance with the expectations. Nevertheless, during the interviews of the pilot study, there was the need to slightly adjust the interview guideline to make it more suitable and to produce better results was recognised. The interview design was improved between the pilot and the main study, however, the nature of the guideline remain unchanged. During the interviews, there was no indication of any biases, false answers, or any other influences for making the results less beneficial to the research. The selection of interviewees and the selection criteria for the sample group were proven to be suitable.

Pilot study sample

The pilot study produced strong data, which is the main reason why the pilot study sample is being used in the main study as well. It can be stated that apart from a revision of the research guideline, no major changes have been made to the data collection method used in the main study. The same semi-structured interviews were used to obtain the participants' description of their experiences.

Adjustment of data processing

Another finding from the pilot study is the need for the data processing to be adjusted. When analysing phenomenological data, the emergent themes from the interviews can be analysed and compared with the emerging themes from other interviews. However, the experience and described phenomenon are subject to the individual's perspective and unlikely to be the same. Nevertheless, it is crucial that the essential element of the real-life experiences and the experiences gained while employing PM methods remains similar. In the pilot study, both transcripts of the interviews have been manually prepared and analysed. In anticipation of the main study, the means of analysis had to be adapted. The approach to examine the data obtained in the main study needed to become more refined; therefore, a robust model was prepared to examine the interview transcripts of the main study.

Face-to-face interviews versus phone interviews

Data collection has been carried out via both face-to-face and telephone interviews. The choice of the interview form was depending primarily on the geographic availability

of the participants. Thus the question arises whether the different interview forms have an influence on the conversation process and the findings. A personal interview is probably more positive for the conversation atmosphere. In the personal interview, the participants more tended to learn about the interviewer's opinion or receive confirmation or refusal for certain answers. On the other hand the participants of the telephone interviews have prepared themselves very professionally for the telephone calls. This may be due to the fact that international project managers are accustomed to conducting telephone conferences; or also because a telephone conference call has a fixed time horizon with the start and end times, and thus the participants are encouraged to respond more efficiently. Regarding the statements and results no deviations in the course of the interviews have been noticed. The enthusiasm to answer questions remained unchanged regardless of whether an interview had been conducted via phone or in a personal manner. And there has also no response pattern been recognized, which can be traced back to the form of the interviews.

Member validation

The subject of member validation is particularly important. It integrates the interviewees into the study after the interview, and it guarantees the academic credibility of the research conducted. The interviews were not audio-taped as requested by the participants; therefore, the interviewer took notes during the interviews. These interview records were properly summarised and later returned to the interviewees for validation and consent. All interviewees gave their final consent to the notes and interview transcripts that led to the foundation of this research.

5.8. Limitations and considerations

The methodology was chosen to garner insight into how the construction projects abroad are managed and to gain a better understanding of organizational life in a subsequent manner. Such an inductive approach usually begins with a specific observation of an event or phenomenon and aims to identify patterns and trends among the selected set of data. In this research, the answers given by the respondents were the data chosen to identify the aims of the research. An objective and quantitative approach, such as positivism, would have hampered the successful execution of this research project which has the intention of answering the research questions and obtaining an understanding of the execution of the constructions projects abroad. Certainly, there are various disadvantages attested with the chosen research approach. Such an approach cannot be generalised as it entails the examination of individual's real life experiences. Particularly for the international construction project management, the circumstances of every individual is different which provides for varied insights, views, philosophies and convictions. This also highlights that, only in rarity, the data can be saturated as a new interviewee can introduce a new perspective into the study. The critical comparison or the evaluation of the statements is also difficult with phenomenological research as the situations in which the experiences formulated differ from interviewee to interviewee. An evaluation also becomes taxing as the individual prejudices have to be taken into consideration.

Nevertheless, the decision was made in the favour of phenomenological research as opposed to a positivistic research approach. Such a choice was made as there is a common and widespread argument against positivism in business science that business and management theory is far too complex to be compared with the firm and definite laws of physical science. Humans embody the role of social actors in a complex world which cannot be analysed and understood by the mere presence of figures and values. Theoretical or logical research is used mainly in abstract sciences, such as theoretical physics; It is also used when a theoretical model explains or predicts events and scenarios is required. On the contrary, participatory strategies or experimental analyses are mostly used in the fieldwork for empirical studies to produce theories that cater to observed events (Roering, 2004; Lamberton, 1998).

The selection of an appropriate methodology is intended to enable the discovery of applicable and valid results in the right context. In order to ensure the trustworthiness of the research findings and the validity of the selected tools and processes to answer the research question different effects had to be regarded. On the one hand the recognition of individual biases, biases in sampling, and the risk of influencing the objectivity help to diminish subjective influences and biases and increase the validity and reliability of the research findings. In order to ensure the validity of the work, the interview transcripts were submitted to the participants for their comments and the transcripts have been comprehensively compiled and evaluated with NVivo to show consistent and transparent interpretation of findings.
The selected approaches and tools, such as purposive sampling, semi-structured interviews, respondent verification by inviting participants to comment on their interview transcripts as well as a well-documented trail of reviewed materials, interview transcripts and research documents are appropriate to answer the research aims and to ensure the findings validity.

There might be also another limitation. The sample group is purposively assembled. This means that international construction project managers were selected with a certain experience and practice abroad. In addition, no further selection criteria were defined, such as education and training, gender, age, type of construction project or country-specific project experience. However, another unconscious selection criterion connects all participants. They are Germans, or come from the German-speaking countries. This may well be a limitation to the study and may also influence the results compared to, for example, investigations with English-speaking participants. This is, however, speculation since the influence of the country of origin, if at all, could only be investigated by a comparative study.

5.9. Conclusion

This dissertation describes the lived experiences of the interviewees, who are experienced international construction executives, and the dissertation further discusses how the interviewees managed their projects. Moreover, the findings were examined in relation to the suggested management methods and processes of the literature. A more subjective, descriptive, and phenomenological research approach has been considered viable to attain the intended research goals. This dissertation didn’t adopt a positivistic research approach.

In this research, the managing of the international construction projects with a prime focus on the project management aspects has been examined. Semi-structured interviews have been used to gather the participants' descriptions of their experiences. The semi-structured interview design was produced to be as non-directive as possible while simultaneously encourage the participants to provide comprehensive answers.

Before the field-work, however, a comprehensive analysis of available studies and academic papers of both qualitative and quantitative nature such as specialists’ books and professional articles describing methods, technologies, procedures, and processes has been conducted. This was pursued to identify the emerging topics, repeated subjects, and key themes in literature, textbooks, project management guidelines, and other literature.

The identified key themes were the foundation for generating questions for the semi-structured interviews, for the preparation of the interview guideline and also for the conduction of the interviews. The semi-structured interviews were conducted with the international construction project managers to obtain qualitative data pertaining to PM methods, tools certifications, and experiences when applying such methods in an international project environment. The findings and conclusions derived from the semi-structured interviews consider the lived experiences, personal attitudes, and opinions.

6. Analysis and presentation of interview results

6.1. Introduction

This chapter begins with the presentation of the interview guideline and presents the demographic information of the participants of this study (section 6.2). The participant's project backgrounds and professional experiences, as well as trainings, further education and project management certificates, are presented. Subsequently, the findings from the interviews which were primarily examined are summarized, compared and evaluated in the context of the key themes. A theme analysis has been conducted using NVivo and the results are presented in annex A.13. These individual key themes have been segregated into larger topics to enhance the clarity of the findings generated; see annex A.16 for grouping of PM themes from interviews. While the chapter on literary analysis (chapter 3) was primarily concerned with other studies, academic papers and research work in the area of project management and international construction management, the evaluation and results of the technical literature have been incorporated in this study. The statements, experiences and insights from the individual interviews are summarised and presented in the individual topics (sections 6.3.1 - 6.3.9). To generate a sustainable added value to the readers, the results of the interviews in relation to the sub-topics have been also grouped in line with the results and approaches identified during the analysis of technical literature (sections 3.6 - 4.1.10). Hence, in this chapter, the methods, procedures, and approaches to individual project management-related subjects suggested by the relevant technical literature are included. This chapter also entails how the interviewed international project managers deal with their individual project management topics (practice-oriented approach). In consequence, this chapter presents and compares what the theory and the practitioners say; which similarities exist and the occurrence of different conceptions and solutions.

During the interviews, tick-the-box questions have been asked to scrutinise the participant's preferred perception of project management. The results of the individual responses are illustrated in Table 6-2 (section 6.3.9).

6.2. General information pertaining to participants – sample description

All the participants of the study were experienced international project managers, and their selection criteria were purely objective. Their demographic information is summarized in Fig. 6-1 and the following pages.

	Interviewee 1	Interviewee 2	Interviewee 3	Interviewee 4	Interviewee 5	Interviewee 6	Interviewee 7	Interviewee 8	Interviewee 9
Age	37	39	59		45	59	49	59	54
Work experinece	7	13	44	15	17	27	25	26	34
Areas of work experinece	Building material industry and mining	Project management of hotel building projects and factory projects for the electronics and automobile industry	Management of plant construction in the fast-moving consumer good market and other consumables	Achitectural planning, project management and controlling	Managing projects for international construction company	Project management and environmental service consultancy	Project management consultancy	Architectural planning, management consultancy, industrial planing, project management of fabrication plants for current employer	Floating structures, reinforced structures for railway stations, maritime structures
Gender	male	male	male	male	male	male	male	male	male
Project responsibility	17.000.000 €	22.000.000 €	800.000.000 €	200.000.000 €	4.000.000 €	40.000.000 €	100.000.000 €	40.000.000 €	120.000.000 €
Education	Bachelor of Science Civil Engineering, Master of Science Renewable Energy	Architect with Diploma	Professional project manager with Diploma (1995), mechanical engineer, motorcar mechanic	Doctor and Diploma Engineer	Civil Engineer with Diploma	Doctorate in mechanical engineering	Diploma Engineer	Diploma Architect	Licensed master builder
Certifications	No certification	No certification	No certification	PMP certification	No certification	No certification	No certification	No certification	No certification
Size of employer	500	70000	Self-employed international project manager	4000	5000	Self-employed international project manager	15000	Self-employed international project manager	Self-employed international project manager

FIG. 6-1 OVERVIEW OF DEMOGRAPHIC INFORMATION OF PARTICIPANTS

One striking aspect of the evaluation of the personal information is that all the participants are men with over 37 years of age. Certainly, it is hardly possible to generalise from nine interviews as the assembled sample group is more purposive than representative; however, it is an aspect worth noting. It is not possible to ascertain whether the international construction business is less interesting to women or whether there are other factors that could explain why only men were to be found as international project managers; the participants, as well as individuals who did not meet the selection criteria, were rejected to participate in this study. It should be noted, however, that approximately 50% of engineering students in Germany are women (German Federal Statistical Office).

Watts (2009) intensely dealt with the theme of women managers in U.K. construction companies. There are a number of cultural barriers in existence that curb women from accomplishing their career expectations in the construction sector. Watts asserted that women are poorly represented in the UK construction sector, particularly at the senior level of the hierarchy. The author mentioned a variety of possible reasons for this. Firstly, it seems very difficult for those in management positions in the building industry to work part-time or flexitime. The need to work part-time can be perceived as the lack of job commitment. A construction site job might make it difficult for women to take maternity leave or care for kids. Hence, the work-life balance might be difficult in senior positions. Another factor might be the physical presence and masculinity that characterises the building industry. The work is connected to site-related work. One of the female interviewees of Watts stated that she was intimidated by the physical presence of steel fixers whom she was supposed to instruct. However, the sample group of this survey is purposive in nature and general claims about representativeness can be deciphered. The presence of all-male respondents is merely an observation rather than the statistical tendency.

Project responsibilities

The biggest projects managed by the participants were valued at a few million Euros to eight hundred million Euros (see Fig. 6-2). Half of the participants, however, have been in charge of projects with volumes up to EUR 50 million.

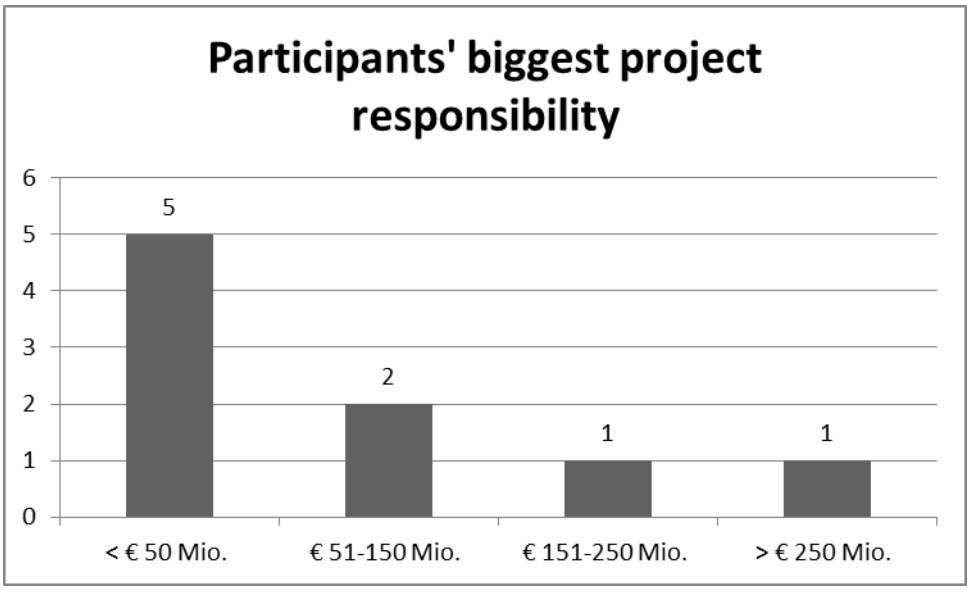

FIG. 6-2 PARTICIPANTS' BIGGEST PROJECT RESPONSIBILITY

Company background

Most of the interviewees are self-employed international project managers (see Fig. 6-3). A high degree of specialization, work experience, education, and personal and professional qualifications make international construction project managers a highly specialized but small professional group. Therefore, project managers, especially when acting as client representatives abroad, are often self-employed so that with the completion of one project, another can be ensued.

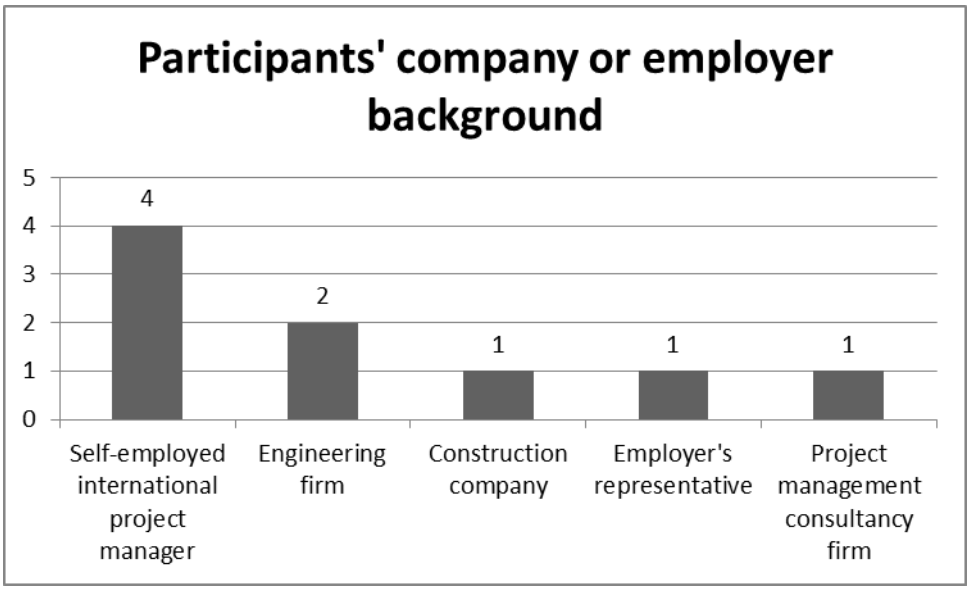

FIG. 6-3 PARTICIPANTS' COMPANY OR EMPLOYER BACKGROUND

The size of the companies for the employed participants ranges between 500–70,000 employees (see Fig. 6-4).

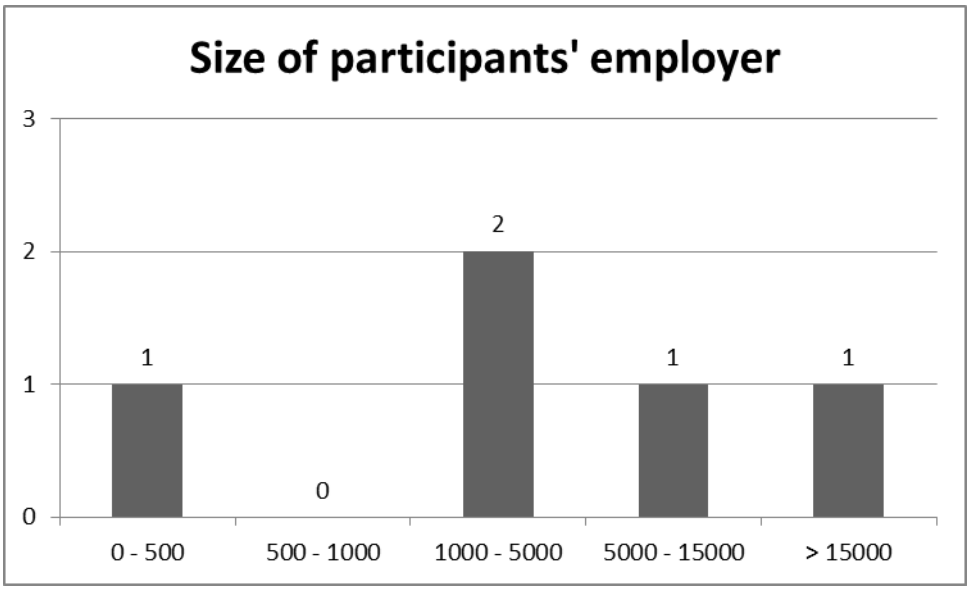

FIG. 6-4 SIZE OF PARTICIPANTS' EMPLOYER

Education of participants

The educational background of participants is a compelling part of this study. The educational backgrounds of the participants were very similar as all of them belonged to engineering backgrounds. One of the participants began his professional career as a car mechanic; subsequently, he studied mechanical engineering and obtained a diploma in PM. Currently, he is responsible for projects with a contract volume of several million Euros. An evaluation of the interviewees demonstrates that all the project managers have a college degree, and two out of the nine interviewees possessed doctoral degrees in engineering and management. However, as P4 stated, formal education in structural engineering, architecture, or other specialised studies for building in Germany hardly validates for concrete PM knowledge. It is also striking to observe that none of the interviewed project managers possess any legal or business administration education or come from the mentioned background. German construction project managers, especially when working abroad, are generalists and are responsible for the technical, commercial, legal, and disciplinary PM. The quality of German engineering education is relatively high, yet it covers only some aspects of legal and commercial aspects. Construction PM practices in different countries were also taken into account, as these multiple responsibilities and introduce additional functions, such as the quantity surveyor.[28]

[28] A quantity surveyor (QS) is a formally trained and accredited professional with a Bachelor's degree or higher who is responsible for the cost planning management, the commercial management, the contract management and the tender preparation and bid evaluation. He shall not be confused with a building estimator who is in charge of material, labor and equipment quantification.

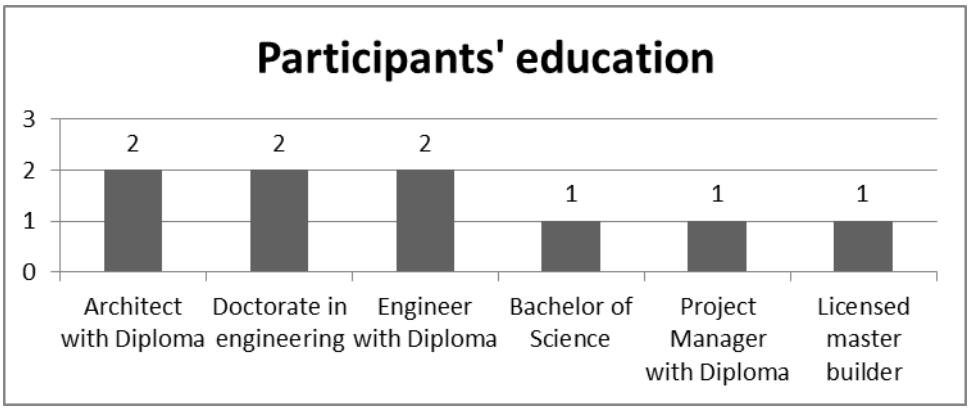

FIG. 6-5 PARTICIPANTS' EDUCATION

Certifications of participants

Nowadays, the certifications are increasingly important to exhibit professional suitability. The interviews revealed that only one of the respondents possessed a PM certification (see Fig. 6-6).

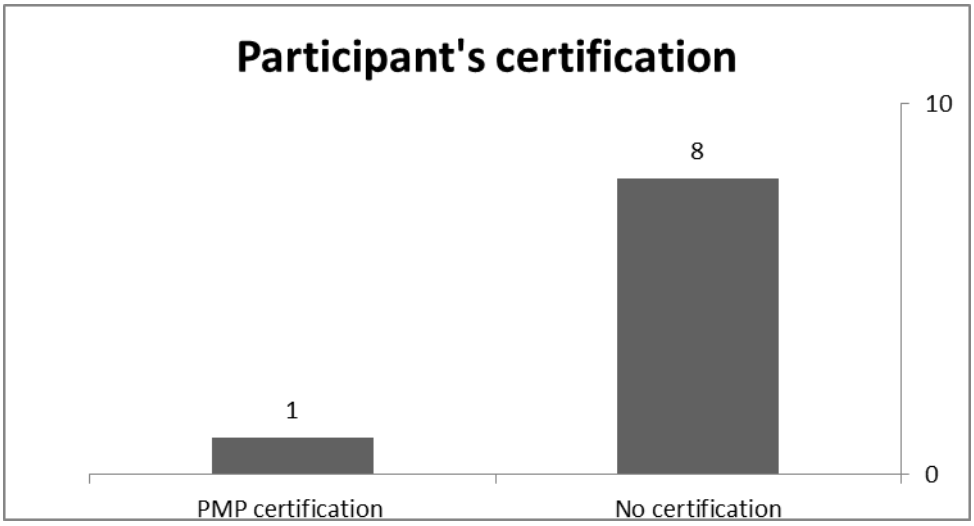

FIG. 6-6 PARTICIPANT'S CERTIFICATION

It is surprising that only one in nine project managers is certified considering the importance relegated to the certification of PM.

To provide a brief overview of available certificates, one might refer to the study by Remer and Martin (2009). They investigated various major PM certificates and the eligibility required to participate in these programmes (see annex A.14). Almost all the participants are aware of the PRINCE methods and the PMBOK, IPMA, and PMP certifications. However, only P4 had the PMP certification. P3 mentioned that PM institutes seem to be of less importance in the German-speaking regions, in contrast to the English-speaking parts of the world. P3 stated, '*For an experienced project manager the training programme*[29] *offers hardly substantially new knowledge, and the added*

[29] Note from author: PMP training program

value for the customer is also limited'. P4, however, contended that '*the PMP certification aims to train the abstract and process-oriented intellectual ability rather than being applicable in particular day-to-day tasks. Hence, the intention of methodical thinking should be to provide an action plan from a position and to have the understanding of input-activity-output*'. Moreover, in P4's opinion, the German academic education in structural engineering, architecture, or other expert studies for building lacks the methodical component to render and manage building projects. '*A large number of the project managers start a project without having clear project aims and baselines'*. In addition, P8 stated that he obtains the general knowledge of construction methods, systems, and so on, through professional fairs and exhibitions.

Previous work experience of participants

All the participants had plenty of years of extensive professional experience in their respective fields (see Fig. 6-7).

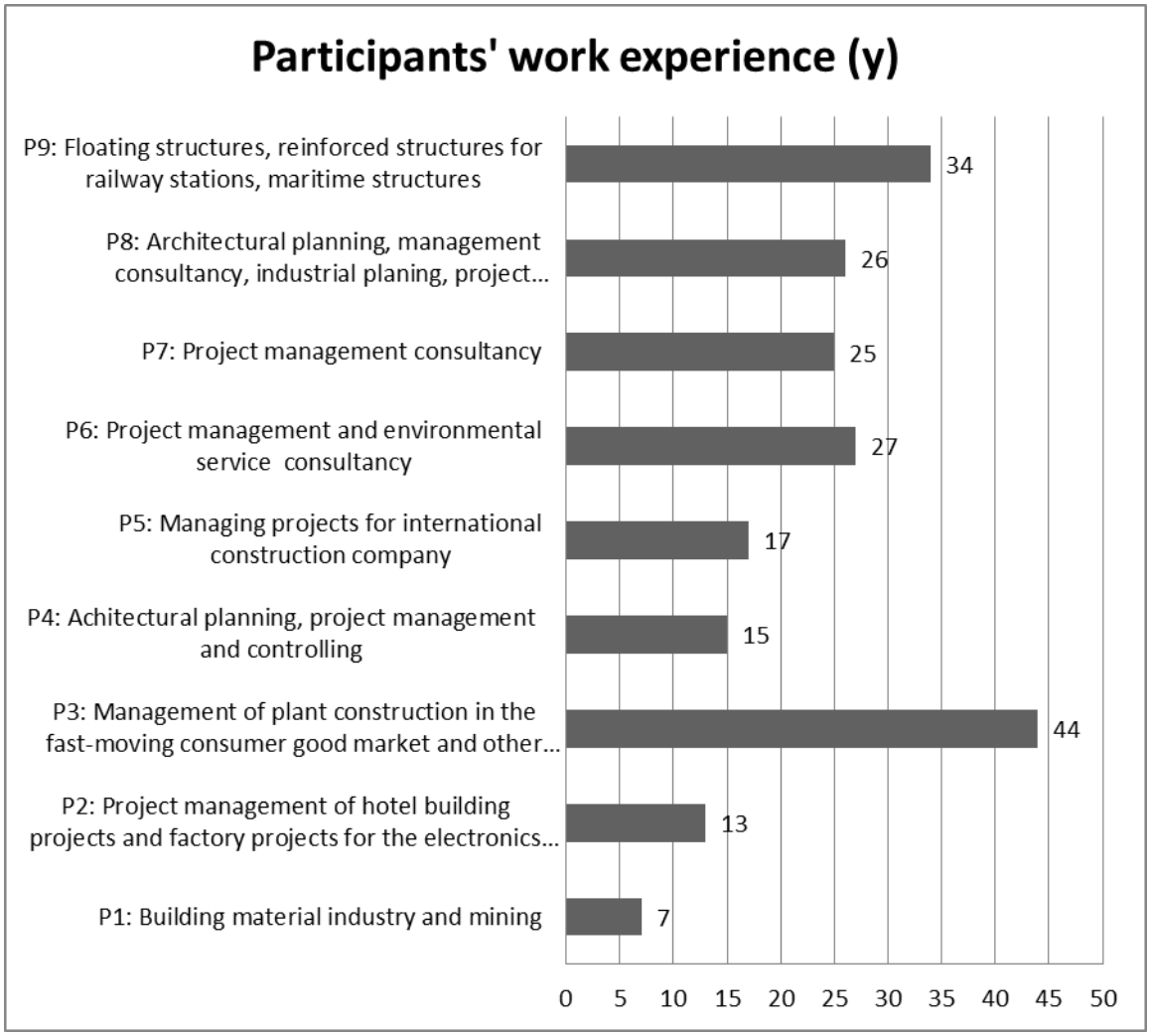

FIG. 6-7 PARTICIPANTS' WORK EXPERIENCE

Major achievements of participants

The interviews surveyed the major achievements of the participants as they lie in relevance with this study. This question is of substantial importance as it provides the participants with an opportunity to speak of experiences that they are proud of. For example, P7 stated that *'this question cannot be answered too easily'*. He observed, *'Indeed,*

I feel a certain pride if projects, above all with a difficult project environment as is often the case with international projects, are executed and realized successfully'. However, the answers reveal particular challenges that the participants have to face in their daily work. P1, for instance, mentioned that he is especially proud of '*project preparation and management from sketch to detailed design of different heavy steel maritime structures*'. However, this question developed a different insight that has not been considered during the course of the study. P3 indicated that a major achievement was the *'timely completion of the projects and the reduction of building expenses by applying the stripped-down-concept'.* In the previous literature analysis, nothing useful had been found about stripped-down concepts, especially not in connection with construction projects. However, when asked for clarification, it became clear that the respondent was referring to a lean construction approach, that is, an approach in which all the building components that are not necessary for client production are stripped down.

The responses to the interview questions clearly exhibit that one of the challenges faced in the projects is the coordination of teams and the apt documentation of costs, supplies, and time management. In one of the successful projects considered as a major achievement by P6, engineers from approximately twenty countries and four continents were involved, and the equipment had to be shipped across the world.

P5 recalled one of his projects wherein the entire team was responsible for the planning works of the projects that consisted of 100 employees, whereas the interviewee's team constituted of 20. One of the challenges the interviewee described was the alignment of the planning demands, such as those pertaining to fire safety on the German and North American side. The need arose to create one's own PM system, which was the data bank MS Access solution, which captured and processed technical and financial data. Nevertheless, P8 felt that the achievements are to be seen in the context of distinct circumstances of building projects in abroad and the basic difficulties faced like linguistic or cultural barriers. Moreover, every country follows its own laws and possesses its particular cultural individuality. '*Corruption is, for example, a big problem in East European countries',* stated P9. Therefore, he executed only two projects in Ukraine and subsequently withdrew from the Ukrainian market.

From the participants' replies, it can be concluded that language and culture are crucial parameters to manage international projects successfully. P6, for instance, indicated that the intercultural aspects had less weightage in the interview. This is mainly due to the fact that the intercultural aspects find scant representation in the literature formulated by experts.

Major tasks

Project managers have wide-ranging and complex tasks. Their responsibilities incurred were majorly susceptible to the project, clients and the project results. In general, some participants described their tasks as the managing of the international construction projects. P2 described his main tasks in an extensive manner as *'representing the client in the project; cost, time, and quality management; planning and engineering of the plants, interior stakeholder management'*. Added to these are tasks, such as design preparation, site management, and project controlling, indicated by the other interviewees. In conclusion, the following tasks can be deemed as crucial as generated by the responses of the participants:

- Client's representation
- Cost management

- Quality management
- Time management
- Design preparation
- Planning and engineering
- Stakeholder management
- Site management
- General project controlling

6.3. Findings and their analysis

Importance of PM

All the respondents asserted the importance of PM. P1 stated that the PM ensures efficiency of all the involved resources. According to P2, PM also involves the management of people as the prosperity of the project depends upon the people who are involved in the project, their individual competencies, working quality and the teamwork. P5 stated, *'Good project results are hardly achievable without good project managers and good PM; especially, when bearing in mind that at the present time, clients and projects require an increased expertise'.*

Nevertheless, PM methods and tools have their limitations. When being asked whether PM is of relevance, P2 answered: '*Yes, but particular tools are as a basis only partly important, learning by doing is more important*'.

Time division

It is crucial to understand the jobs that are usually time taxing. Any construction project manager's PM techniques, training, education, and literature should be in accordance with the requirement of tasks undertaken by the manager. P1 spent most of his time on construction planning to avoid any alterations during the static calculations, and later got involved in the construction work. The daily work of P2 usually concerned with the financial aspects, such as cost tracking and claim management. P2 noted that one of the major problems when tracking costs is the volume of additional claims and the tedious follow-up on what has already been disbursed. P8 stated that his daily activities have undergone numerous changes during his career. He dealt with building design, site management, project planning, and cost control at the beginning of his profession. Later, he started dealing exclusively with cost control, time scheduling, and control of construction activities.

'*The control of subcontractors and the inspection of works and external services as well as the cost controlling (daily comparison of committed and invoiced costs) and budget supervision are the key responsibilities of a construction manager*', said P6. This participant deemed the timely order and coordination of works and services with resource management as an essential component of the task undertaken. For P6, the claim and anti-claim management and its accompaniment by monitoring design amendments that involved deviations in the scope and (consequentially) in the project costs was also of superlative importance. When P6 was asked on what tasks he spends most of his time, he replied 'people'.

Hence, various participants spent most of their time on planning and design activities, financial aspects, cost control, contract and claim management, construction and site management, scheduling, and managing people involved directly or indirectly with the project.

Meaning of PM

PM is the totality of all required activities, such as planning, organizing, resource allocation, and team leading that are required to achieve a defined project goal. The formal definition of PM is the application of knowledge, skills, tools, and methods for the implementation of a project (Project Management Institution (PMI), 2014). Thereby, the participants in the study mentioned their subjective definition of PM which are majorly based on their experiences.

P1 indicated that PM to him means splitting the tasks into subtasks and '*measuring, controlling, and regulating*' the formulated subtasks based on cost, time schedule, and quality requirements. However, for appropriate pre-planning and monitoring of the project, the manager ought to assume the responsibility from the beginning of the conceptual phase until the project is completed. According to P2, PM involves planning in advance to avoid problems, understanding interfaces and interactions, and ensuring regular communication.

Many construction project managers are very involved with the technical details; this might be in coherence with the technical background of the manager, however, it is not always advantageous. Various companies aim to draw a distinction between the management of the project and its technical aspects. The employer of P5, for instance, divided the technical experts and the project managers; the project managers were asked to not involve with the technical details of the project. Thus, the primarily responsibility of P5 and his peers was the management and control of resources, budget, and the project schedule.

According to P5, being a good project manager means being the focal point for contact and communication as communication is a critical task for the PM. It guarantees the success of the project as marginal individual or technical shortcomings might be compensated by good communication. This view of P5 strongly corresponds with the understanding of P9. In addition to making decisions, managing and controlling the project, P9 said PM means '*To inform the customer on time and in detail so that he feels he is in good hands*'. For P8, PM means to accomplish the interests and demands of the customers in terms of architectural and technical needs, time scheduling, and finances. It also involves ensuring economical and timely completion of the building project. Usually, customers are not experts and the exceptional challenge is to recognize customer demands and put them into practice. P8 divided PM into project controlling, project leading, project planning, project scheduling, and cost management. However, besides the leading and controlling activities, P7 stated, '*When talking about project management, one must not forget the significance of the project, but equally important is the social competence of the project manager, good communication in the project team, and a comprehensive preplanning*'.

The most comprehensive answer was given by P6. The participant had built up an extensive project understanding and experience. He summarized his '*20 years of condensed knowledge'* into the following key elements of PM:

- *"Leading in and out of the project*
- *Exactly defining project scope and extent*
- *Ensuring a good start for the project*
- *Assembling the best project team*
- *Preparing a realistic time schedule*
- *Meeting the needs of team members (individual happiness, satisfaction, and individual development)*
- *Well-balanced and active stakeholder management*
- *Being ready for changes*
- *Preparing a detailed project plan (work breakdown structure)*

- *Participation in the project and the associated challenges; participation of all relevant persons*
- *Being open to new attempts and approaches*
- *Making good and timely decisions*
- *Defining the project end and aim and celebrating the successful achievement*
- *Always expecting the unexpected and handling it right"*

To conclude, PM can be defined as measuring, controlling, and regulating along with the golden triangle of costs, quality, and time. Moreover, PM means comprehensive pre-planning, project scheduling, project leading, cost tracking, claim management, and progress controlling. It also involves good and extensive communication within the team and keeping the customer informed about the details. Furthermore, being responsible for the allocation of resources and budget and making appropriate decisions in a timely fashion are also crucial for PM. The aforesaid checklist by P6 can be combined with the '14 rules for successful project management' (GPM, 2016b) and a very suitable and useful overall checklist for successful project management can be formulated (see Table 6-1).

Project management should be considered as an overall and comprehensive system and not only the optimization of individual elements but also the improvement of elements impeding the project's success the most should be the main focus
Prior commencing the project a realistic and comprehensive planning is to be done
Exactly defining project scope and extend
Clear, realistic and accepted objectives are defined regarding dates, costs, quality and scope of services for the project and all project participants
Sufficiently attention, time and resources are granted for the clarification of objectives and issues before the project starts
Preparing a realistic time schedule
Preparing a detailed project plan (work breakdown structure)
The project is appropriately structured regarding anticipated results, work packages and milestones
Assembling the best project team and the project team is assembled according to the project task and content, individual competencies and personal preferences
All project participants need to have clear responsibilities, duties and rights
People count in the project (individual happiness, satisfaction and individual development) and sufficient attention is been put on the motivation, performance and development of the project employees
Leading in and out of the project
Performing a good start into the project
Problems, risks and conflicts of interest are continuously determined and solution-oriented processed
Well-balanced and active stakeholder management, meaning all stakeholders are involved in the project in accordance with their particular role
Within the project clear agreements are made throughout all hierarchy levels, for example, as for capacity provisioning
Project controlling is constructed transparent and all relevant control and targets values are identified and communicated transparently
Any target deviation is detected immediately and corrective action are automatically initiated
Being ready for changes
Participation in the project and the associated challenges; participation of all relevant folks
Being ready to try and trying of new attempts and approaches

Good decisions in the project are taken in a timely and understandable manner
Defining the project end and aim; and also celebrating the successful achievement
Always having a Murphy's joker on hand; i.e. expecting the unexpected and handling it right"

TABLE 6-1 CHECKLIST FOR SUCCESSFUL PROJECT MANAGEMENT

6.3.1. The role and competence of project managers

The interviewees were furtherly questioned about the intricacies that leads to a competent project manager. This question is of relevance due to the responsibilities and tasks of the interviewees. P1 stated, '*A competent project manager motivates the team members and regards the golden triangle of quality, costs, and time*'. Therefore, it is important that the project manager has a comprehensive understanding of the financial, technical and time requirements of the project and is also an exceptional leader. P7 supplemented these criteria with the need to strive in their undertakings for customer satisfaction. Moreover, according to P7, the project manager must have a pleasant and efficient emotional competence. Above all, it is imperative for the PM to be flexible and adaptable to various changes, particularly when participating in international projects. However, P7 raised a concern about the German kind of PM being very stiff and technocratic; such a PM isn't conducive at all times, especially when dealing with international projects. While working abroad, it is important to be able to be flexible and get involved with the local socio-cultural situation.

According to P9, a competent project manager should always have an overview about the whole project and should always possess the latest financial status and process updates of the project. P5 presented the different characteristics which are substantial for a competent PM as: good communication skills, motivation, and the ability to be a team player who can delegate tasks with fairness. Other skills of competent project managers are personal and interpersonal competence, communication skills, and the ability to convince others. P3 stressed that besides trustworthiness and decisiveness, a project manager *has to 'be able to sell the project, his decisions, and the project results. He has to convince the creditors and investors of his choices and the concepts that have been prepared*'.

Another crucial criterion that signifies the competency of the project manager is the work experience inculcated by them. P2 believed that it is necessary for a candidate to have worked on at least two projects as an assistant project manager, before claiming the entire project. P8 mentioned that a good project manager must possess excellent construction knowledge, design knowledge, creative abilities, and planning skills to plan and manage the project accordingly. In addition, a general overall understanding of the project is crucial for the competence of the project manager. In the words of P3, '*A competent project manager should have at least 70% of knowledge of the lower disciplines to be able to guide and control the project team members*'. In the opinion of P2, '*a project manager must also understand interfaces and have sound logical ability*'. For international construction project managers, the consequent environment is a relevant determinant for success. P7 felt that a project manager should be open-minded and adaptable to the local project environment and should also have an outlook that is

convenient for the intercultural projects. P6 also concurred with this view when he stated, '*Besides the usual skills, experience plus intercultural skill-set were crucial*'.

Participants defined many requirements for a project manager to be competent. In summary, it can be said that any competent international construction project manager must entail the following temperaments. They should have sound knowledge of costing, quality, and scheduling and have empathic customer management and team management skills. They should be adaptable, capable of efficient communication, trustworthy, and be good decision-makers. They must be flexible and not too technocratic. Furtherly, it is crucial for them to have extensive professional experience and a good technical understanding of the project and its needs. They should be open-minded and open to learning from different cultures. They need to be able to defend and promote their projects and their decisions within the team and for their stakeholders. Finally, international building project managers should always have in mind an overview of the whole project and always possess the latest project status.

In the construction industry, project performance has always been an important issue. Various studies conducted by C.C Martin (1976); P.W.G. Morris, G.H. Hough, (1988); and L.R. Sayles and M.K. Chandler, (1971) have suggested factors that are vital for the success of any given project. These studies show that the project manager is a central person in a construction project. According to Del Pico the role or task of the project manager in construction is mainly planning, monitoring, and controlling (Del Pico, 2013a).

With increased emphasis on PM systems, construction firms tend to seek professionals with growing management and leadership backgrounds and additional emotional and managerial skills rather than mere technical experts (Robinson et al., 2013; Dulaimi, 2005).

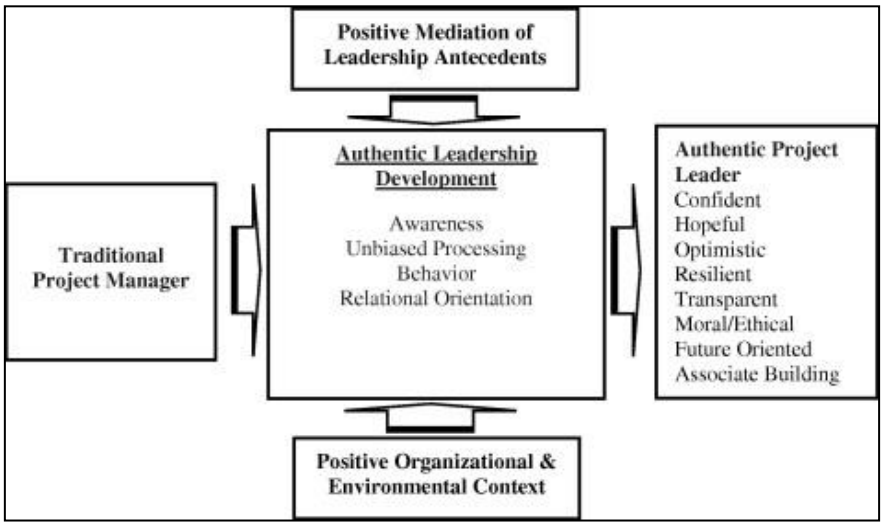

FIG. 6-8 AUTHENTIC LEADERSHIP DEVELOPMENT IN CONSTRUCTION INDUSTRY (TOOR AND OFORI, 2008)

The project manager of a large construction project must be a generalist and should be aware about the basics of PM. The manager needs to comprehend both the planning and approval phases and should be able to overlook the execution of construction works (Sommer, ©2010). Sommer explained that the mistake that often happens in conventional projects is that inadequate stress is granted to the phase of the definition of objects, namely, the project phase during which it is most possible to influence the

project. Müller and Turner (2010) presented a survey of behavioural, temperamental, emotional, and intellectual attributes of project leaders to identify their individual management style. Müller and Turner presented and described the fifteen leadership competencies as cited by Dulewicz (Dulewicz and Higgs, 2005), which are illustrated in annex A.15.

The tasks of construction project managers are not only limited to the planning, monitoring, and controlling of a project; they are also required to assemble and lead the project team. By appropriately utilizing the budget, machinery, equipment, resources, and the company's internal competencies, project managers can efficiently manage both the schedule and the budget.

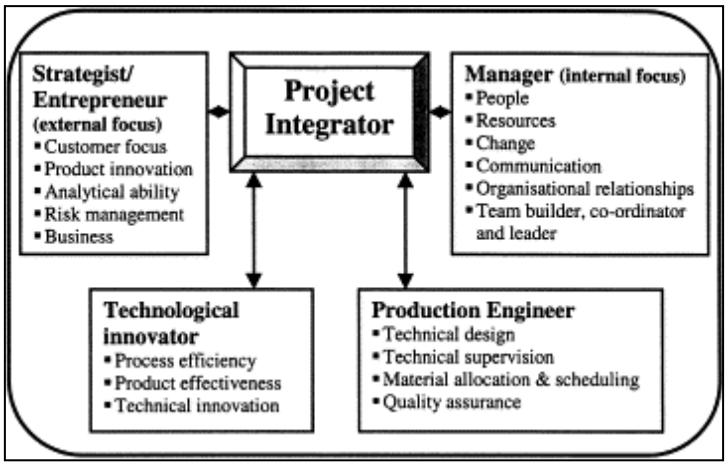

FIG. 6-9 THE EVOLVING ROLE OF THE PROJECT MANAGER (EDUM-FOTWE AND MCCAFFER, 2000)

The project manager is the point of contact for the project stakeholders and his decision and communication are often considered as the official statements for and by the employer. Koskinen and Pihlanto (2008) showed that the project managers can be at the focal point of the project networks; by interacting with their own team and the respective stakeholders, they develop a base to find solutions and complete the projects. Project managers organize their project's staff and are responsible for reporting their performance during the course of the project. Moreover, project managers play a significant role in the management and transfer of knowledge, and can be the driving force behind the mobilization of knowledge in the project and the organization (Kelly et al., 2013). Furthermore, the project managers create the project plan and protect schedules. Their key responsibility is the monitoring of the construction progress and the overall control of the project. In case the project falls behind or runs out of budget, they are required to take corrective actions to finally achieve the project goals (Del Pico, 2013a).

Kalusche described the key PM tasks as follows (Kalusche, 2012):

- Defining and planning the project within time and workload estimates
- Defining the tasks and work packages
- Selecting the methods and processes to be used
- Coordinating the project team, the individual departments, the executing companies, planners and external service providers
- Promoting and supporting the team members

- Monitoring and controlling project progress in terms of cost, schedule, quality, quantity, capacity, and resources
- Providing the driving force for necessary actions and decisions
- Performing technical tasks
- Being the hub of information and communication
- Documenting and reporting

Skill acquisition by participants

This dissertation clarifies the relevance of personal and professional abilities and skills for the successful realization of international construction projects. For the purpose of this dissertation, experts who were in charge of international construction projects were selected. These experts did not have to meet any training or education to be deemed fit for this study; thereby, it was interesting to note how the participants acquired their PM skills.

There was almost a consensus among the interviewees (with the exception of P3 and P9) that they acquired their skills via the professional experiences gained and by on-the-job practice. For example, P8 stated that all his skills and competences were grounded in work experience and learned by executing various projects. However, P3 said that he learned his skills through academic education for PM, and P9 obtained his PM skills through individual courses, such as, claim management and budgeting. Moreover, P9 also used PM standards stipulated by his employers, such as, in-house templates or forms. P9 said, '*Many big enterprises prescribe exactly how, for example, a protocol, project plan, or a release form for invoice release ought to look like*'.

P1 acquired his skills learning on the job. He did not deal with any particular literature or training as he believed that most PM methods were rarely applicable on the field. Also, P3 did not undergo any specific training but was working for some years in close cooperation with an experienced project manager. P6 attributed his skills to his hands-on work experience.

Thus, a majority of the participants possessed no particular PM as they received the required training via professional experience and senior manager guidance. As P1 testified, the collective consensus seems to be that most of the available PM methods appear to be poorly applicable to a complex and international construction project environment.

Formel education, however, in the realm of structural engineering, architecture or other specialised studies for building in Germany seems to rarely influence the efficient component of PM which is required to manage challenging construction projects, as P4 indicated.

6.3.2. Standards, guidelines, tools and techniques

Standards and guidelines

None of the respondents (except P4) has actually read any standards. P2 certainly knows the common PM guidelines, such as the DIN, ISO, and PMBOK; nonetheless, he declared that they are too abstract and hardly applicable due to the absence of particular tools that are relevant and applicable to the special challenges of a building project. In addition, the participants also believed that the standards and guidelines did not offer any useful concrete tools like check lists, roadmaps, or detailed procedure plans for PM.

PM tools

P2 and P8 mainly used self-prepared MS Excel tools for bidding presenting price tables, making cost comparisons, and accounting and cost control; they used MS project for the planning of schedules. In addition to these, P2 applied in-house PM methods, although the in-house protocols were often applicable and were too expansive. He used the critical path method, work breakdown structure, and Gantt charts when scheduling construction works and controlling construction progress, primarily via MS Project. P3 knew CPM, WBS, and CFA; however, these tools found only limited applicability in his daily business. P5 used an AHO[30] planning guide for inherited wastes and contaminated sites, which, according to the respondent, was very helpful for the individual planning phases. However, P5 also admitted that the standard literature relating to PM is not frequently read; but a training of the theoretical base might be beneficial.

P6 carried out trend analyses and schedule compression by using CPM and Gantt charts to optimize the project timeline. P6 and P7 used work breakdown structures for the planning of work procedures, analysing cash flow, and checking crafts-related lists for the examination and documentation of works. P8 primarily programmed the applied tools, such as MS-Excel-based tendering databases. The databases allowed the interviewee to control the rendered work, the work volumes, and the project costs. The work breakdown structure (WBS) has been named by the participants as a favoured tool of choice. Section 0 discusses the WBS in an extensive manner.

In-house methods

There are quite a number of available PM tools; however, many enterprises use their own tools and standards. P2 opined that the accessible PM tools are not always applicable due to their general outlook. Other interviewees, however, increasingly use in-house PM methods. P2, for instance, used Excel-based or Access-based calculations and cost monitoring sheets. P6 performed cost-benefit analyses, such as the business value option analysis or the best-value option analysis.

When asked about specific tools and methods used, P4 answered that the general application of tools and methods depends on the project itself, but within his organization, a variety of different PM tools have been used. According to the participants, it is impractical to integrate all the functions into a single tool. Thus, it is crucial that the

[30] Translation: *Committee of the Associations and Chambers of Engineers and Architects for Fee Regulations*

generic data from single tools are available to the project manager to decipher the project status and trend analyses at any given time.

One of the most interesting in-house tools is the IT-based *commission execution plan* established by P4's enterprise to efficiently commence, manage, and close construction projects. Additionally, the comparability of projects, general quality assurance, internal reporting, and a formalized structure for project execution were ensured by the use of this methodical approach. '*Germany is a country that is very much engineering focused and the PM itself is often treated only rudimentarily. So, the process quality is to be guaranteed by suitable methods to exactly define the project scope and aims*', said P4.

The *commission execution plan* entails a further programme-oriented thinking contrary to single project executions; it is mainly an internal contract management tool that reflects all the relevant contract particulars, the project aims, and the deliverables. The necessary measures are adopted from the plan and subsequently form the basis of the detailed project planning. Moreover, all changes in scope, reports, and reviews were included along with the customer feedback. P4 asserted, '*The commission execution plan allows the professional tracking of project alterations and controls corresponding to necessary contract changes or amendments*'.

Decision-making

P2 and P3 worked with cost-benefit analysis, which served as the basis for their decision-making. P7, however, stated that special decision-making techniques, such as ABC analysis or cost-benefit analysis, and risk assessment tools, like LCCA[31] or ETA,[32] are not relevant to construction projects. Also, P9 indicated that he did not apply any concrete decision-making techniques. However, when decisions are to be made by the steering committee or the board of directors, the decision papers are prepared by presenting the costs and time of the probable scenarios including the recommendations of the project manager. Nevertheless, P9 pointed out that it is imperative that the project manager has the authority to formulate decisions and put them into action. P3 mentioned that another important aspect of decision-making is the contractual base of the contract and the favoured contract type, e.g., turnkey or designed and built by the client.

Software

PM software is an extensive topic. However, P6 stated that '*traditional computer programmes like MS Project and MS Office are primarily used*'. P1 employs self-prepared MS Excel tools for resource planning and capacity allocation and MS Project as a scheduling tool. P2 uses Mind Map in addition to what P1 uses. P3 also knows MS Project but prefers Primavera for time scheduling. P3 is also one of the respondents who prepares his own software tools for PM and control. He uses MS Access files comprising labour and material prices for cost calculation and monitoring tool. However, according to P3, the ability to prepare such tools strongly depends on the individual skills of the particular project manager. P5 uses MS Excel primarily as a PM instrument, and he has created his own spreadsheets. The programme Oracle is used for reporting (financial reports are provided by Oracle). P7 uses a programme called Asta Powerproject, which is used for construction planning and time scheduling; it is

[31] Life-Cycle Cost Analysis

[32] Event tree analysis

similar to Primavera. The software used by P9 is limited to the MS Office programmes, MS Project, Primavera, and Auto CAD. Other in-house programmes are not regularly used, unless they are required by the customer or the own organization.

None of the participants has named any particular communication or network software that makes the documentation of the project and the communication within any easier. There are a variety of 'data pools' of building contractors, planners, PM companies, and web-based Project Collaboration Network (PCN) software.[33] Their functionality is illustrated in Fig. 6-10. The idea behind such software is to share data and documents, to organise communication and workflow, to upload or download drawings and construction documents, and to generate back-up files.

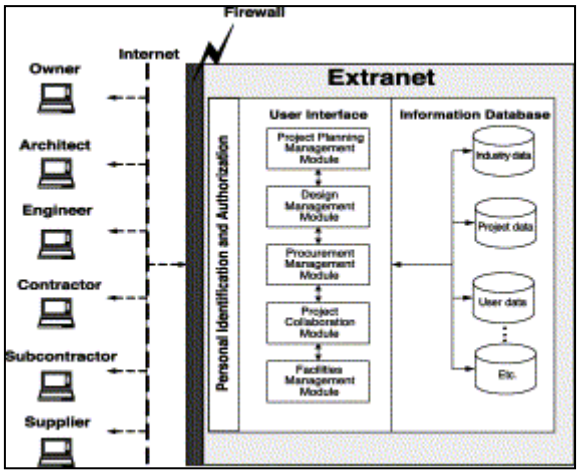

FIG. 6-10 FUNCTIONAL SCHEME OF WEB-BASED COLLABORATION SOFTWARE (NITITHAMYONG AND SKIBNIEWSKI, 2004)

[33] See for instance: http://www.capterra.com/construction-management-software/

6.3.3. Contract, approval, release and change management

Approval and release procedure

P6 was of the view that the release procedure is performed with reference to three aspects: (i) what has been ordered in the contract, (ii) what has been delivered, and (iii) what has been invoiced. If these three parameters are comprehensible, then the rendered work can be considered contractually concluded without any added objections. However, according to P9, the release of payments is a two-stage process:

> "*Firstly the submitted invoices are been checked by the site management and the construction progress and the deficiency-free execution is been recorded by a standard form. Afterwards the invoice and form are handed on to the project management to check the invoice and finally release the payments. This four-eye principle is essential*"(P9).

In general, P3 recommended that approvals and releases should be mandatorily contained in the work schedule as milestones. The approval procedure is an ongoing procedure that encompasses the project in its entirety. The conducted literature reviews represents approvals as another detailed layer of a PM process; the 'theoretical' approach is described in annex A.1.

Change management

'*Change requests are firstly recorded, then approved, and only afterwards implemented*', said P6. This process was necessary for P6 to properly control and manage variations concerning the duration, costs, and project scope. P6 named the scope list as a baseline for change management. P9 explained that daily construction reports were used as the base for the proof of changes in quantities and volumes.

Contract management

'*Well-planned and organized contract management helps reduce potential project risks*', said P3. The participants were quizzed about the management of their respective contracts. Based on the particular project background, the perspective varied from the client's to general contractor's representatives who further distributed the contracts to the representatives of contractors and subcontractors. Nevertheless, according to P4, contractual structures appear to have an elementary influence on the successful execution of national and international building projects. Consistency during planning is paramount in the context of number of changes and alterations made during the project execution to deal with the corresponding project risks.

When studying and preparing contracts, P9 used forms based on technical literature to check whether everything of importance is present in the building contract. According to P9, '*Customers in building projects are usually foreign to the field; hence, there are no ideal and flawless standard contracts. 'Building contracts include inspections and taking-over procedures, payments, deadlines, milestones, guarantees, legal venues, taxes, and many more conditions*'.. Also, P7 usually analyses relevant clauses pertaining to due dates, costs, and possible project risks.

P6 stated that the agreements used by him are based on the juridical standard contracts where the details in relevance to the individual contracts are inserted. The same approach was also chosen by P7's employer who gave standard formats for subcontractor's contracts. For foreign building projects, FIDIC contracts are often used and

the modifications occur only for the technical conditions of the contract. P7 uses predefined and standardised subcontractor's contracts, planner's contracts, and delivery agreements that are supplemented by technical conditions. When P4 was asked about standard contracts, he replied that (from his experience) incentive contracts (i.e., agreements with monetary or other bonus mechanisms) are rarely used in civil engineering. This was attested by the survey conducted by Abdulaziz et al. about incentive and disincentive contracts and its consequential effects on industrial projects (Bubshait, 2003). Abdulaziz et al. found out that a vast majority of companies that participated in their survey were employing the use of penalty systems with firm percentages of the contract price as a base to calculate the fine rather than the incentives.

P4 also pointed out that planning consistency in relation to the number of changes and alterations might aid project’s execution as it would manage the project’s risks. Project execution might differ depending on the country, location, or people involved in the project. However, according to P4, quality mechanisms should be valid regardless of individuals or external project influences.

6.3.4. Quality, lean management, safety, efficiency and big data

Quality management

Construction management is inclusive of the timely supervision of works and the control of the clearly defined quality. In P7's company, project quality management was established using quality management manuals and building-site inspection plans. Furthermore, P7's employer was certified in quality management by the German Institute for Standardization EN ISO 9001:2008.

Nevertheless, there is a need for project quality management on the site. P9 included a list of demanded quality tests in the contract. During the construction work, data sheets and forms were filled and submitted by the building contractor. Further, P9 included the quality requirements in the building contract and used testing methods (and valid norms and construction specifications) with reference to concrete technology, such as heat insulation or the sound insulation.

Lean management

P7 described lean management in such a way that it provided the customer with a production advantage or financial savings. In relation to production facilities, this means that all parts of the building and the arrangements that cannot be considered as contribution by the product of the customer or reduce the production costs of the products will be reduced and designed as 'lean'. In addition, special attention is paid to all the plant components that bring an added value to the customer production. This approach is especially applicable in industrial construction and defines 'value' in the view of the product that is generated by the customers and not with the perspective of the building meant to be built.

Added value chain in the building industry is often understood as the construction supply chain that is equated with the integration of material suppliers and production initiated by the subcontractors and the development of partnerships between the main actors (Dainty, Millett and Briscoe, 2001). However, the applied approach of P7 does not refer to the added value chain of a building project but to the added value of the product finally to be produced. For industrial building projects, the 'plant cost rate' can be used as a starting point for lean construction (Forbes and Ahmed, 2011). The plant cost rates in contrast with the production costs contain the specific work cost of a production location. Of course, the material cost, production costs, and special costs of manufacturing and the manufacturing overhead costs are also included. However, it also includes personnel expenditure, delivery expenses, administrative costs and building costs. Lean management approach can be used to reduce the capital costs in the building and the operating expenses. Moreover, the production efficiency and the volume can get augmented with reduced production costs. A project manager's goal is to reduce the plant cost rate while increasing the plant's efficiency and the product quality. The aspects that indirectly impact the production, such as employee workplace satisfaction, should also be considered. Nevertheless, it is advisable for the project managers of industrial building projects to know the added value chain of the customer; the product costs or plant cost rates are computed to be able to choose a suitable and lasting lean management approach.

Health and safety

According to P5*, 'Health and safety is an area for construction coordination and the PM area that tends to end up almost in oblivion and insignificance, as far as everything*

functions properly'. In the interviewee's projects, a health and safety plan is organized and supervised by health and safety coordinator with the use of weekly protocols.

According to P3, health and safety is an important focus of the construction PM activities, which is frequently not paid attention to. Health and safety should be an undisputable contract component as it is driver for costs, quality, and the smooth construction progress. The health and safety system authorises clear responsibilities. P6 said that it should be in accordance with the project content, country, project status, situation, and individual project environment. All the respondents agreed that health and safety regulations and construction and safety standards vary with different countries. P9 also recommended instructing local experts about the norms and regulations and having good contacts with the local authorities as measure to ensure the discussed parameters.

Big Data in construction

Nowadays, the projects seem to be moving fast despite the increase in complexities and the need for an increased precision in data and figures. P4 stated, '*The significance and need for improved PM is based on a higher demand on process quality and data generation*'. According to P4, all data must be collected, processed, structured, and made available to the project manager. Frequently, the interviewed project managers often concentrated too much upon technical details. This happens due to the predominant technical background of the managers; they neglect the management of projects and the preparation of project reports. Therefore, P4 argued that it is important to enhance the transparency, comparability, and consistency of projects with the generation of data. It was also concluded from the answers that program-oriented thinking is recommended when managing a large number of small-part projects or crafts. Other respondents, such as P5, used customer databanks via MS Access and databank systems comprising of quotations, orders, and references. Big Data has been continuously shaped the lives of its users. Within the construction industry, data and information become increasingly important. For instance, the Building Information Modelling (BIM) systematically captures multi-dimensional AutoCAD information for the availability of data to other project members to define volumes, prepare building sections, create work programmes, and make cost estimations. Bid Data, according to Bilal et al. (2016) is characterized by three attributes: i) the big volume of data, ii) a variety of dates in the form of texts, spreadsheets, audio or video dates, and iii) the velocity, that is, the continuous flow of new data and information. Bilal et al. indicated that Big Data is very helpful to store, classify, cluster and analyse the information to generate statistics, optimise the usage of resources, and reduce wastage. BIM, for instance, also helps to estimate price variations because of changes in volumes and monitor construction progress along with other advantages. Moreover, Big Data enables a facility management above and beyond the solitary construction process. Nevertheless, Bilal et al. also highlighted various drawbacks of Big Data, apart from possible lack of security and privacy or higher costs associated with the use of online data systems. Bilal et al. explained that the construction industry might persist in its reluctance towards adopting Big Data trends as it requires more time to clean and process data to make it accessible as non-standardised values might lead to misleading and counterproductive analysis.

6.3.5. Risk management

Sophisticated risk management can lead to successful project implementation. One of the principles of a project manager is to identify risks, prevent problems from occurring, and subsequently solve them when they arise. As P3 stated, every risk and problem costs money. All interviewees performed risk management, while some followed structured risked management and planned in advance, other managed the risk in a general manner. P2, for instance, applies the event tree, despite the fact that it is basic, and he also knows how to do a probability analysis.

P3 is also aware about risk-assessment tools; however, he uses in-house risk assessments tools that are tailored to the particular project environment.

P5 uses Excel to carry out risk assessment of different project parameters, such as contractual contents, customer knowledge, scope, or general risks, when implementing the project.

P6 carries out life-cycle cost analysis[34] and also applies an in-house risk management plan. Risk management, in general, is based on the experiences from latest projects, and mostly concerns with project scope and extent, and the effects of cost and time. Risks are already considered when pursuing the preliminary planning and defining the project scope. P6 maintained that he applies the standard method FMECA (Failure mode, effects, and criticality analysis).

P7 noticed that the risk identification and risk assessment were certainly done for his projects; however, it was done rather generically in accordance with the project environment, project contents, and possible problem factors by means of experience value and Mind Maps.

P9 does a risk analysis primarily on account of the available reports and surveys, such as the soil survey stipulating the load-bearing capacity of the ground or the earthquake and flood risk. P9 also considers other certificates and documents pertaining to property rights of the building land plot. Nevertheless, P9 also prepares and evaluates scenarios for the course and the duration of the construction works to define optimistic and pessimistic construction durations.

P8 does not carry out any particular risk analysis or cost analysis before commencing the project. Problems are solved after they arise or when they are noticed. If no problems occur, no action is deemed necessary.

The participants' responses show that risk management is an important aspect of PM. The approach used for managing risks, however, strongly deviates among the respondents. In general, it could be concluded that the participants differ in preventive measures and reactive measures. Preventive measures prevent the occurrence of a risk in the project. Despite this, not all risks can be prevented; appropriate measures should be used to manage risks. Whereas, reactive measures are only triggered after the occurrence of the emergency. These measures should be coordinated in advance

[34] The life-cycle cost analysis (LCCA) is a method to assessing the total cost of a facility considering the acquisition, owning, operating, maintaining and disposing of a facility or building elements. The LCCA is especially helpful when a decision is sought pertaining the maximum possible net savings and return on investment between technically equivalent alternatives with different initial costs and operating expenditures. If one considers, for example, only the purchasing price of windows while ignoring the fact that multiple glazing saves more energy over product life span than single glazing he will more likely decide in favor of the initial investment disregarding the overall life-cycle costs.

with all managers so that rapid action is not stalled due to discussion or missing approvals.

P6 explained that he uses an in-house risk management plan which is helpful and is usually based on the project-related risk management process (see Fig. 6-11).

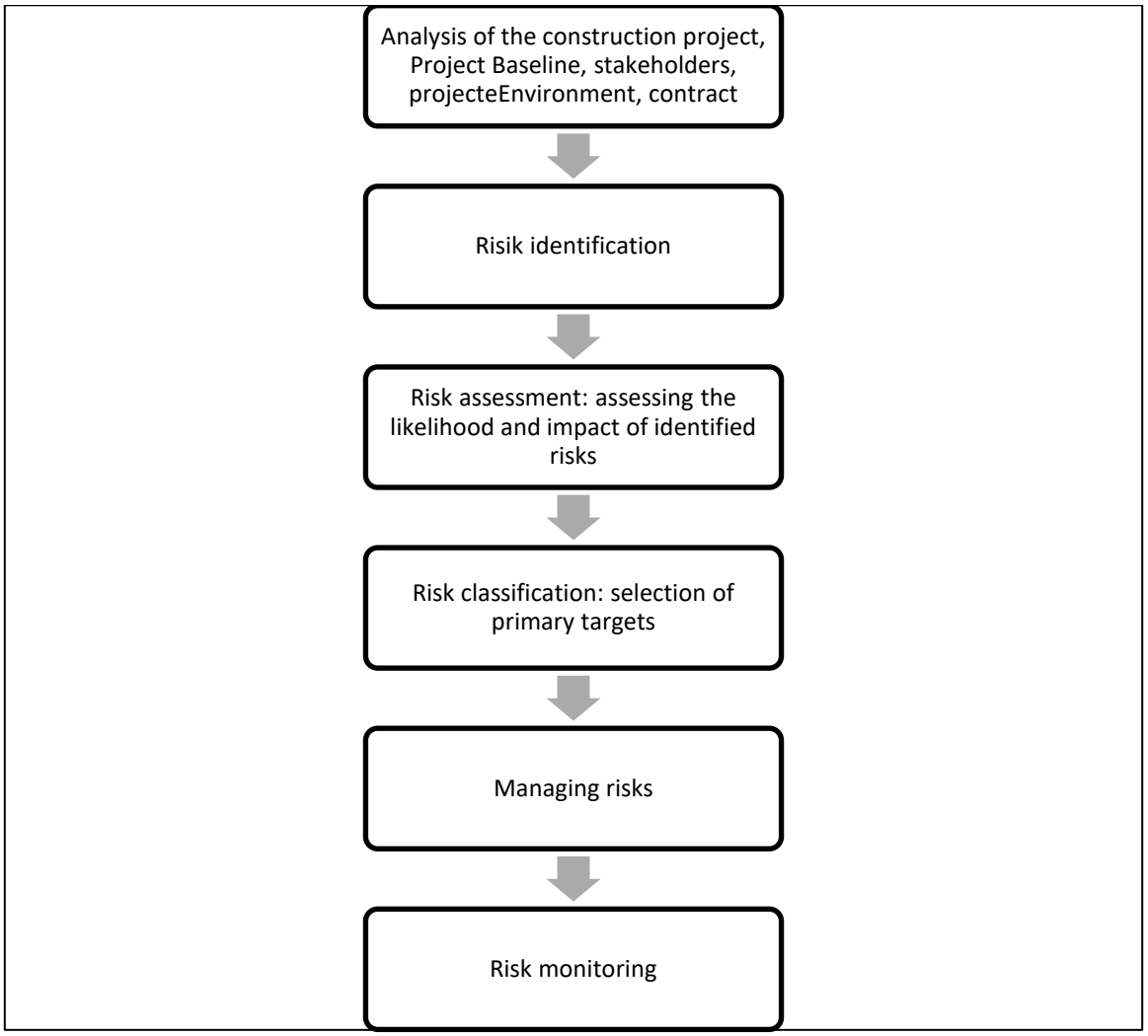

FIG. 6-11 PROJECT RELATED RISK MANAGEMENT PROCESS

The first element of the *project-related risk management process* is the analysis of the construction project itself. Only after the project baseline is defined, the work breakdown structure is drafted, the project environment and the stakeholders are analysed, and the possibilities for order and scope changes are taken into account. It is also possible to identify risks.

Risk identification involves the purposeful and structured search for risks and their causes. Although it is not easy to create a complete catalogue of risks, the analysis of the projects aids to characterise the project chronologically, thematically, and causally. It is recommended to search for potential risks in a comprehensive manner as these risks would only entails a fraction of the initial danger. When identifying potential project risks, the result is often nothing more than an extensive catalogue of risks that are not easy to comprehend and even more difficult to manage.

6.3.6. Planning, supervision, reporting and documentation

Project Planning

According to P2, successful PM in a construction project includes the development of substantial technical understanding by the project manager, efficient and thorough planning and project preparation, and logical and structured actions, procedures, and instructions.

Project planning is one of the most significant tasks for project managers, but it is difficult to construe the concept before the commencement of the project. In the words of P5, '*Planning before the commencement of the project is an important area of responsibility because many expensive mistakes are done made the project launch*'. Hence, it is not surprisingly that P3, for instance, does not use any explicit methods for project planning. P3, nonetheless, calculates the main cost and time drivers for the project based on the experience values to estimate the required liquid assets and time requirements. This is the foundation for the budgeting and contract preparation. According to P6, the planning of works contains a number of factors:

- The procurement of all necessary building permits
- The workload definition
- The preparation of a work programme stipulating all project activities and successive programme scheduling
- The preparation of the project budget
- The planning and allocation of required material and human resources
- The organization of site mobilization
- The preparation, arrangement, and ordering of materials and external services.

As a tool, the employer of P7 offered an Internet-based planning platform. He also mentioned that although every project is unique, there are always some constant subjects with every different project. Nevertheless, there were no standards for most of the methods and procedures for the planning of works.

In addition, P4 explained that if amendments within the course of the project should be understandable and trackable in the design or in the contract, a management program must be enforced in the initial phase of the project. He also said that the *project baseline* is extremely relevant in this respect as it can help in the stipulation of costs, scope, quality, and time of the project. This further elaborates on the intricacies of the project. Additionally, the *project baseline* is used for the project reporting and follows a feasibility check for the planning parameter. P4 informed that usually a market survey for vendors, suppliers, products, and prices is carried out before commencing the project. P8 collects all project's and customer's demands and processes them in a graphical manner. He not only counts on the written project objectives but also tries to show the planning parameter visually in drawings to illustrate potential problems. By these visualizations, P8 explained, possible troubles become apparent to many customers, and these are solved before beginning the project.

Supervision

In some countries, the presence of external technical construction supervision on the building site is necessary and authenticated legally. For example, in Ukraine, a technical inspector called 'Technadzor' is nominated for this job. Any experienced international construction project manager is aware of the different types of statutory construction standards in the different countries. In addition, the client's representation on the building site and the author's supervision is required in every case and is provided by the designer, the site manager and the supervisor of the building contractor. The responsibilities and duties of the individual project members and the technical, economic, and legal knowledge of the responsible staff depend on the project.

P8 uses local construction controllers who know the qualifications of the country and supervise the building works in accordance with the local building standards and norms. The controller checks daily controls and certifications and tests documents, material samples, and data sheets and their exact implementation. This serves along with the documentation and usually accredits the quality of the project. Moreover, the controller encourages the involved companies to inform themselves about building methods and materials.

Reporting

P3 pointed out that two of the important tools often remain unused: project reporting (in which suitable reporting tools are to be adapted to the project) and controlling (which pertains to finance and progress). According to P3: '*Reporting and controlling is the underlying practice for the approval, acceptance of work and release of payments*'.

According to P4, the usual procedure for construction reporting is the arrangement of reports on the site level and the subsequent hierarchical escalation throughout the project team and company. However, the transparency of such a report is rare as the report tends to be subjective and can be altered in various levels of hierarchy. This lack of transparency might entail the risk that on a programme-level, no fitting allocation of resource and no appropriate tracking of costs, time, quality, or changes is feasible.

P4 opined that the project governance could be accomplished by means of IT reporting tools as they can create transparency and comparability which would further leads to the initiation of appropriate decisions. In addition, a uniform consistency of control mechanisms could help enhancing the efficiency and the cautious use of personnel and resources.

P6 distributed weekly status reports (coloured two-pagers) to everybody who must be up-to-date regarding the project status. Monthly and quarterly reports were provided to all relevant project stakeholders. Within the project, P6 assured the progress by a daily meeting with the core team for approximately half an hour. Additionally, the stakeholders meeting were arranged every three months or after any suitable period in accordance with the project status. P7 distinguished between internal and external reporting. Internally, project reporting occurs through financial statements, monthly achievement statements, and budget and cost controls. Externally, the reporting is done in accordance with the expectations of the customers and project's needs. Along with these reports, the customers are presented the construction progression, cost control, and project forecast.

6.3.7. Project communication and staff management

We could summarise the participants' views on project communication under three subheads. Firstly, the regular meetings and the conferences. P8 stated that part of the communication in his projects occurs through regular, weekly progress meetings between the general contractor, the subcontractors, the planner, and the construction controller. From this communication, an official memorandum arises, which is to be understood as a construction diary.

The second subhead is regular reporting within projects. Accordingly, P8 the project reporting towards the customer is not initiated if it is demanded or necessitated, the customer is also informed in case of some problems. The project manager has to grasp and document the problems formally when they occur.

The third subhead includes the channels for regular communication and reporting. The respondents (e.g., P8) used e-mails, phone conversations as communication devices. However, more sophisticated tools were also used. P7 used an Internet-based project repository, which substituted personal emails and served for communication and documentation. P9 included electronic data pools and building management solutions, which recorded and documented details of the employees who had access to the data pool and when any document is being uploaded, downloaded or altered. This already leads to BIM (see section 6.3.4).

Team and staff management in construction projects

For P6, team development is the decisive PM method that guarantees the success of international building projects. In defence of his views, he said the following:

> *'The people in the project are extremely important, and not only customers but suppliers, externals, and business partners as well as one's own team too. It is important to note that the project stakeholders must be won and be persuaded at three levels: head, heart, and belly. What do project stakeholder want and expect in detail is significant for cooperation in the team and for project success, particularly in international projects. In the ideal case, this is studied and understood before the project launch*.'

P4 stated that suitable and certified staff is crucial in the project business and that the required profiles of the team members should be provided on generated data or complex programmes; these should be verifiable.

Of course, not every project manager has influence on the selection of team members. In the ideal case, the building project leader can search and select the staff. However, occasionally employees from other departments or from other projects are assigned to his project, and therefore, the project manager is sometimes not the disciplinary superior.

P7 obtains his project employees from different departments of his company based on his planning requirement. After the employees from the central and specialised departments have been assigned to the project, the participant is responsible for the coordination within the project. This implies that human resource management occurs merely by the coordination of the on-site employees. Often, the project staff do not know one another; the local employees and the expatriates, regardless of their cultural differences, need to be brought together to work efficiently.

According to P8, '*Human resource management is, above all, to be understood as the assembling and managing of the project team. The project's success and failure is bound to the employees of the project team. A good education, linguistic proficiency, and an understanding of the local mentality are necessary*'. In addition, P8 preferred younger employees in the project team because these employees are usually more flexible and pliable. P8 also reminded that *good employees also need to be 'paid well*'.

6.3.8. Cost management, procurement and bidding

Cost management

Cost management is one of the mainstays of PM, especially when it pertains to the golden triangle. The cost management includes the preparation of feasibility studies; cost-benefit calculations, creating of budgets, conducting of tenders, the procurement management and subsequent cost control in the project by, for example, cash flow analysis and profit and loss statement. P1 mentioned that cash flow analysis was not frequently pursued during his tenure. P6 said that cash flow does not belong to his area of responsibility. P2 and P9 stated that cash flow analysis and tendering, awarding, and invoicing are decisive to them and are mostly accomplished with the aid of bill of quantities and requirement specifications provided in Excel.

Nevertheless, when evaluating these interviews, it became obvious that cost management is an elementary duty for most participants. There is also a general consensus in the context of the economic duties of the project manager. Currently, there are suitable computer programmes for the cost management of building projects, yet most participants still relied on the use of MS Excel for expense budgeting and cost control.

P8 used MS Excel data banks as cost control sheets for tendering, presenting (of price tables), comparing costs, accounting, and controlling costs. Financial project control is done using Excel-based bill of quantities and documents that serve as a point of departure for the contracts and for the control of quantities, volumes, and corresponding expenditures.

The estimation of cost can be provided by different procedures at the beginning of the project. P8 prepared cost estimates based on his own reference values of analogous building projects with comparable construction segments. The interviewee had already managed projects with special programmes for tendering and cost management. However, he felt that these programmes are usually theoretical and lack practical relevance. When preparing cost estimates, P3 used pre-tender as a tool for defining the project budget and for decision-making. The respondent usually called for pre-tenders that were analysed and made the foundation for project budgeting. The subsequent invitations for tenders produced contracts that generally met up to 90–95% of the budgetary allocation.

The information provided by the interviewees exhibited that various elementary components, like cost controlling, are included. The tasks of project managers can be summarized as follows:

- Obtaining of quotations and offers
- Estimating costs using experiences or pre-tenders (an appropriate approach, especially, for large-scale projects)
- Considering economic efficiency and cost-benefit analyses as the basis for decision-making

- Preparing budgets based on experience values or pre-tenders
- Managing procurement; awarding suppliers and contractors
- Preparing payment plans based on the appointment plan and its milestones
- Controlling cost by cash flow analysis and profit and loss statements

Most interviewees preferred Microsoft Excel. Conventional tendering software, such as SIDOUN was used for smaller and standardised building projects.[35] However, the respondents stated that conventional planning software is not applicable for economic efficiency, cost-benefit analyses and to guarantee proper cost control. Furthermore, the software should be able to be used continuously from the beginning to the end of a building project. Thus, it should be simple and understandable for the user with an ease in its complementation. However, a distinction has to be made between construction management and PM. BIM has a number of advantages because elements are integrated along with their prices and volumes. Nevertheless, for superior PM, similar programmes do not seem to be too suitable.

Procurement management

P7 stated that *the sequence of the tendering and awarding process is as follows:*

1. Preparing the tender documents

2. Preparing a bidder's list

3. Distributing the tender documents by the means of the Internet-based company tender software

4. Receiving bids, assessments, and pre-selections

5. Negotiating technical clarification of the contract

6. Assigning and signing the contract signature

Quotation preparation

To prepare quotations, P6 stated that the first task is to characterise the volume of works, quantities and material needs and the time required for rendering of particular tasks. Subsequently, suitable methods and materials have to be selected; the work load has to be evaluated and required external works and services to be tendered. In the words of P6, '*A major responsibility of a construction project manager is the calculation of project costs associated with the construction works, including material costs, expenses for tools and equipment, contingency costs of machinery and site equipment, expenses for suppliers and external services, labour costs of direct workers, and time-related costs, such as site overheads or indirect labour and general company overheads and other expenses*'. The predominant obligation of a project manager is to anticipate expenses associated with the project, to include them into the project budget, and to determine and maintain the projected revenue.

For the preparation of bids and the preliminary planning of the project. P7 uses the software RIB iTWO. This software is the construction management software that amalgamates CAD, planning data, volume estimation, cost calculation, and construction process simulation.

[35] http://sidoun.de/?lang=en

The query that arises when a request for quotation is received is whether one should use experience cost values from recent projects, cost estimations, or actual offers from the subcontractors for the preparation of one's own quotation or budget. As P7 stated, it is recommendable to use suppliers' proposals before a budget has been prepared or an offer has been delivered to the client. P7 and P8 agreed that if this is not possible due to inflexible submission deadlines, then one must rely on the similar experiences from building projects that were comparable in construction management in the respective region or country.

Concerning requests received for quotations, P9 believes that one can assess how professional a customer is by observing the tender provided by the customer. As P6 mentioned, it is more difficult when only building components are stipulated in the tender documents. Such 'functional' tenders that lack the material specifications and volumes might lead to confrontations when the project is being executed.

6.3.9. Perception of project management

	Answers given by participants: "How important is this task to my work" (1 (not at all) to 10 (utmost importance))								
	P1	P 2	P3	P4	P5	P6	P7	P8	P9
Planning of work	10	9	10	10	8	9	10	10	8
Approving subcontractors' programme and methods	5	6	10	3	8	5	7	10	8
Controlling the work process	1	9	10	10	10	9	10	6	8
Understanding the construction process and detailed requirement	8	10	10	6	6	10	10	10	8
Understanding particularly the 'H & S' legislation	6	6	10	7	10	7	5	5	5
Understanding the work interfaces and subcontractors' work interactions	8	10	8	8	8	9	10	6	8
Knowing the construction industry	7	8	9	5	7	7	3	10	5
Being aware of the history and future development of the construction industry	10	8	9	2	5	8	3	8	5
Communicating with project members by regular meetings	8	10	10	10	9	10	10	9	10
Controlling the implementation of the work and keep the plan updated	2	9	10	10	8	9	10	9	8
Motivating to assist in organizing and coordinating work on site	2	9	7	3	8	10	10	8	7
Allocate work tasks to team members	9	9	10	10	9	9	10	9	7
Controlling and supporting people in their work and with their tasks	9	9	7	5	6	10	10	10	8

Ability to teamwork	2	10	9	10	10	10	10	6	7
Building a team and creating a spirit of mutual support, trust and openness	1	10	10	10	8	10	10	6	7
Motivating and empowering the team members	1	9	10	6	8	10	10	5	7
Supporting (in-house) team members with their career development	1	8	9	2	5	8	8		7
Being aware of the contract and any potential loopholes	8	10	10	8	9	9	10	10	8
Managing variations and changes to the contract	2	10	9	10	8	9	10	5	8
Being aware of potential risks and problems prior to the contract signing	1	9	10	10	10	7	10	10	10
Coordinating subcontractors' work interfaces to avoid disruption and inefficiency	1	6	10	5	8	9	10	8	9
Ability for an over-all picture of the project	2	4	10	9	9	9	10	8	10
Identifying of potential risks to avoid problems	4	10	10	10	8	7	8	3	10
Thinking ahead in order to predict problems	4	10	10	10	8	10	10	8	10
Taking precautions to be able to resolve problems quickly	2	9	7	10	7	8	4	3	10
Consequential Perception of Project Management	Planning and controlling	Organizing and coordinating	Predicting and managing potential	Planning and controlling	Predicting and managing potential	Organizing and coordinating	Organizing and coordinating	Organizing and coordinating	Predicting and managing potential

			prob-lems		prob-lems				prob-lems

Table 6-2 Perception of project management of the respondents (Chen and Partington, 2006)

7. Results

This study investigated the relevance of PM for managers working on construction projects. Extensive investigations revealed that the formal rules and guidelines of PM are not irrelevant. All the project managers considered detailed, professional, and structured PM to be of utmost importance. As P5 said, "*Good project results are hardly achievable without good project managers and good PM, especially when bearing in mind that at the present time, clients and projects require an increased expertise*'.

Furthermore, various techniques, methods and procedures which were not included in the literature were highlight by the participants. The approach of the participants in certain situations that concerns around specific problems proved to be insightful. Before conducting the interviews, the research objective of identifying PM subjects and methods the literature suggests pertaining to construction PM was answered.

There are some studies, mainly empirically, in the context of applied PM methods, for instance the studies of White and Fortune (2002); Fortune et al. (2011); Remer and Martin (2009) and Feldmueller (2016). However, the results of these studies do not correspond with the findings of this dissertation as the PM methods and standards find fewer applications among the respondents than suggested in the aforementioned studies. However, this dissertation does not claim to support or refute other existing studies. The target of the dissertation is to investigate and explore the experiences of participants in managing the construction projects abroad.

This also takes direct reference to the research objective of scrutinising whether the respondents feel that PM skills, techniques, and standards from the academic and technical literature are relevant in an international context including cross-border construction projects. However, this might partly owe to the less representativeness of the participants, or this might also signify that the techniques mentioned in the literature are abstract to be applied in a practical manner. Another finding is that, in general, PM certifications are considered less necessary by the participants because they do not seem to add any value to the project.

Participants perceived academic education and further training and PM programmes as only partially target-oriented and valuable. Most participants are familiar with the most common programmes like PM PRINCE, PMBOK, IPMA, and the PMP, only P4 actually possessed a PM certification. The collective consensus seemed to be that most of the available PM methods and certifications are poorly applicable to a complex and international construction project environment.

In the study by Feldmueller (2016), approximately two-thirds of the participants stated that they perceived PM skills as one of the key requirements for their job which resonates with the finding of this dissertation. Furthermore, in the study of Feldmueller it was also asserted that the certification increased the knowledge about PM standards, project expertise and subsequent job application. However, according to the general consensus of this dissertation, this claim can be refuted.

From the responses received, it is clear that PM certification programmes provide limited value to an experienced construction manager. P3 opined that training programmes offer hardly any 'substantially new knowledge' for experienced managers. P4 felt that German academic education in structural engineering, architecture, and other specialisations lack the methodical component required for building projects. Therefore, it seems plausible that the academic and the additional PM education do not meet the needs of the managers. In an international project environment that is

characterised by cultural influences, the abstract PM approaches find little relevance. Therefore, it might be useful to align PM programmes and certifications more with the unique nature of building projects. Academic education in structural engineering and architecture should place more emphasis on the international building business.

This study also found that project managers hardly read the literature pertaining to PM. A participant who was familiar with common PM guidelines, such as the DIN, ISO, PMBOK, found the guidelines to be impractical, majorly due to the lack of relevant tools that are applicable to the challenges of building a project. If international project managers that are held responsible for multi-million dollar construction projects find the literature relevance of PM standards as obsolete, it raises question on the integrity and applicability for SGOs, training centres, and universities. German engineers tend to be receiving sound technical training, whereas PM courses remain unpopular.

Almost all the methods and techniques of PM are inclusive of goals that lead to successful implementation of the projects. Therefore, it is hardly surprising that literature deals with factors that positively influence the results. This study investigated the main factors and criteria for successful projects and gave detailed explanations based on the experiences of the respondents in this study.

The most influential and credible finding of this research is the inference of the term PM for different participants. For one respondent (P1), it meant the splitting of tasks. His preferred conception of PM[36] included the following: assuming responsibility for the project from beginning until the taking-in-operation, thinking ahead to avoid problems, understanding interfaces and interactions, and ensuring regular communication.

This study also dealt with the methods and techniques used by international construction project managers which have major practical and relevant explanations for PM procedures. Cultural differences that arise in international projects are also explained in detail.

The findings also show that intercultural aspects have a high relevance in international construction PM, however, they are rarely considered in literature. Another interesting methodological approach is lean management, presented by P3. In lean management, as defined by P7, primary attention is given to the building aspects having a production advantage or providing financial savings for the customer. This approach is especially applicable in the industrial construction and defines the ‘value’ of the product to be produced for the customer.

Another finding of this study discusses the personal perceptions of the participants on the requirement of their position and on the competency of a project manager. In literature, there are different approaches to describe the tasks, the areas of responsibility, and the necessary skills of project managers. However, participants have placed particular emphasis on team motivation and the comprehensive understanding of the financial, technical, and time requirements of the project. Moreover, the participants considered knowledge of designs, creation possibilities, and construction and planning knowhow along with the notion of emotional competence as the core competencies of an effective project manager.

This study is inculcated with a survey that analyses the daily working time of the project managers. The study showed that a substantial amount of time went in pre-planning,

[36] Project management as planning and controlling; Project management as organizing and coordinating, Project management as predicting and managing potential problems Chen, Partington 2006)

especially financial aspects and claim management. Moreover, P8 named the building design, site management, project planning and cost control, time scheduling and control of the general construction activities as the main tasks.

This study showed that Microsoft Excel is the preferred planning software. Managers used other tools and methods also; nevertheless, the answers of the interviewees revealed that most project managers used their own tools. P3 used pre-tenders as a tool for defining the project budget and for decision-making.

One of the most interesting named in-house tools is the IT-based *commission execution plan* for the appropriate commencing, managing, and closing of construction projects. It entails a more programme-oriented thinking and is mainly an internal contract management tool.

During the interviews, the aspects of quality assurance and management also became clear and it was concluded that they are not as well-planned as cost management of time scheduling. These parameters are intuitively executed.

The participants felt that pre-planning involves the procurement of all necessary building permits, the workload definition, preparation of work program, preparation of project budget, the planning and allocation of materials and human resources, feasibility checks or market surveys, and graphical project planning.

Project success is often measured by the timely implementation within a predetermined budget and within the predefined quality criteria. These success criteria are essential to any construction project. The important areas of PM that were affirmed by this study are financial management and cost controlling.

One of the most fundamental areas of project preparation and PM is risk management. Sophisticated risk management can be one of the key factors for successful project implementation. Therefore, one of the key principles of a project manager is the identification of risks, prevention of problems occurring, and solving problems that crop up. The study makes it clear that a risk management plan is recommended as is the application of the FMECA for risk analysis and evaluation.

This study highlighted the importance of two important tools: reporting and controlling. These tools help to proper project governance, especially when reports are knowingly or unknowingly falsified. In general, it became clear that an objective and empirical investigation of applied PM methods can produce only limited knowledge about the actual implementation of procedures in the international environment.

8. Conclusion

The study intended to draw a comparison between the theoretical approaches of the academic literature and the methods implemented by experienced construction project managers who participated in this survey. Chapter 2 presents the research's aim and objectives as follows:

- The first objective of this research was to provide a description of PM as well as an understanding of the disciplines of PM.
- The second objective focused on existing BOKs and their influence on project management. Existing BOKs and associated literature are reviewed and the participants' familiarity with the standards of the BOKs is determined. Moreover, the study addressed the question of whether such BOKs have a sustainable benefit to the execution and success of international building projects.
- The third objective was to analyse whether the application of PM is widespread in actuality and to evaluate whether the results of previous, mostly empirical studies are confirmed by the findings of this dissertation.
- The fourth objective was to examine how German construction project managers manage their international projects. The interview results are presented and structured in line with the structure of the literature review.
- The fifth objective was to provide an overview of key PM tasks and to examine and compare the proposed approaches with the literature and the recommendations from the interviewees.

The construction industry has established into a crucial factor that determines the development of the global economy. Chapter 2 (International construction industry) illuminates its contribution to the sustainable development of countries considering its socio-economic and environmental impact. Moreover, construction projects, essentially the international ones, are evolving to be complex and varied and a considerable number of researchers are dealing with the subject of the critical success factors in construction projects and international projects. So different success factors are presented and a construction industry outlook is provided.

One of the aims of this study was to analyse the prevailing academic and professional literature that precisely explains how the project managers work. Various literature has been reviewed and presented in Chapter 3 (Review of literature and Project Management in academia); such as academic papers, surveys and technical literature. Due to the limited amount of academic literature that focuses on international construction PM, the scope for transferability from literature to this study is delimited. The industrial field of building and construction is usually marginalised in previous studies and there is no clear distinction between the studies conducted on construction projects and projects from other industries. Different case studies are available that deal with PM in the construction industry; however, these case studies concentrate on particular projects and project environments that have limited application in this research.

Nevertheless, a really diversified range of literature associated with construction management and PM exists in the construction business (Cleland and Gareis, 2006; Sommer, 2010; Murray and Langford, 2004). There are also a number of academic papers covering PM standards and methods in general (White and Fortune, 2002; Fortune et

al., 2011; Whitty and Maylor, 2009). Surveys, especially through web-based questionnaires, are often tried and tested means of empirical data collection and also, for the exploration of the application of project management methods as demonstrated by Fortune and White (2002), Fortune et al., (2011) or Besner and Hobbs (2008). However, these quantitative research approaches do not provide a deeper insight into the nature and extent of the application of individual methods and standards. They also fail to provide any improvement in the approaches or practice-oriented recommendations for action.

Moreover, the study addressed the presence of BOKs in the building and PM business and which benefits and shortcomings the use of these standard guidelines entail. The original approach of professional associations for project management was to exchange information and transfer knowledge. Nevertheless, although BOKs certainly define the scope of the discipline and also the knowledge areas for practitioners, they also define the certification parameters for professionals, which can be considered the prevailing reason for their existence. Several researchers have already pointed to the limitations of the BOKs, and this study comes to the same conclusion. The complexity and uniqueness of projects does not receive enough attention, and consequently, despite being a good basis for certification programmes, BOKs do not necessarily create a sustainable benefit for professional knowledge and for users and professionals managing projects.

The comprehensive analysis of available studies and academic papers of both qualitative and quantitative nature such as specialists' books and professional articles describing methods, technologies, procedures, and processes has been conducted in order to identify emerging topics, repeated subjects, and key themes in literature, textbooks, project management guidelines, and other literature highlighted in Chapter 4. The identified key themes were the foundation for generating questions for the semi-structured interviews, for the preparation of the interview guideline and also for the conduction of the interviews.

Chapter 5 (The research approach) describes the chosen methodology to produce the intended research results and to pursue the set research aim. This dissertation describes the lived experiences of the interviewees, who are experienced international construction executives, and the dissertation further discusses how the interviewees managed their projects. The managing of the international construction projects with a prime focus on the project management aspects has been examined by using semi-structured interviews to gather the participants' descriptions of their experiences.

This phenomenological research project, through its qualitative research approach along with a different and non-empirical research perspective, aimed to gain fresh insights in the context of international construction project management.

Chapter 6 (Analysis and presentation of interview results) begins with the presentation of the interview guideline and presents the demographic information of the participants of this study. Subsequently, the findings from the interviews which were primarily examined are summarized, compared and evaluated in the context of the key themes. The statements, experiences and insights from the individual interviews are summarised and presented in the individual topics. To generate a sustainable added value to the readers, the results of the interviews in relation to the sub-topics have been compared with the results and approaches identified during the analysis of technical literature. Hence, in this chapter, the methods, procedures, and approaches to individual project management-related subjects suggested by the relevant technical literature are

included. This chapter also entails how the interviewed international project managers deal with their individual project management topics (practice-oriented approach). In consequence, this chapter presents and compares what the theory and the practitioners say; which similarities exist and the occurrence of different conceptions and solutions.

The benefit of this study to the academic field would be to provide a thorough knowledge about the applied construction project management and also to provide a suitable answer to the question whether the formal and rigid project management guidelines are perceived as valuable tools which prove to be viable in practice. Practitioners, however, can gain applicable knowledge about the conceptual approach to international construction PM by referring to the interview results and also by the methods and processes presented in this dissertation.

On the basis of the findings of this study (without statistical representation) it can be concluded that theoretical-academic project management methods and techniques are less applicable than suggested by the literature. This is due to various reasons, such as the inadequate applicability of standardised methods and techniques in daily international building practice.

Furthermore, project management certificates and guidelines do not possess the relevance and value to the participants of this study as expected. However, what does project management mean if one disregards the firm definitions of the literature and the Bodies of Knowledge? This question exhibits that the basic or fundamental understanding by executive experts does not coincide with the definitions provided in the literature. Thus, it further complicates the search to discover project management approaches which are feasible in the context of international construction projects. Hence, P1 defines project management as ‚*Splitting tasks into subtasks; supervision of costs (in relation to subtasks), of time schedules and of quality (measuring, controlling and regulating)*' or P3 declares that to him project management means '*Being responsible from the concept till taking-in-operation. However, that might be subject to the level of hierarchy'*.

During the course of the interviews, participants presented and explained various methods and techniques which have been developed by them and help them with their daily tasks. Hence, different and practice-oriented approaches have been incorporated into this research work, such as, for example, experience-based recommendations of the participants for the intercultural handling of the project as well as team and staff management in construction projects which resonates with the methods and techniques of the literature. For further insights into this study and practical approaches to construction, Chapter 6 provides an analysis and summary of theoretical and practical building-related project management know-how that inculcates practical perspective as well.

This thesis also summarises the competencies of an efficient project manager, according to the participants' statements, and the requirements profile of international construction project managers in accordance with the literature. The role and competence of project managers is also considered both theoretically and academically, for example, based on the authentic leadership development model in the construction industry by Toor and Ofori (2008) and the relevant answers given by the participants.

Very interesting statements could be noted during the interviews, as for example by P3 '*A competent project manager should have at least 70% of knowledge of the lower*

disciplines to be able to guide and control the project team members'; or the statement that a project manager has to *'be able to sell the project, his decisions, and the project results. He has to convince the creditors and investors of his choices and the concepts that have been prepared*'.

When the international construction projects are concerned, the applicability of standardised methods is limited. There are many books that can be used by project managers, such as Cronenbroeck (2004), Carmichael (2002), Grisham (2010) and Godwin (2013). According to the perception of the participants, expert books and standards can enhance the basic understanding of project execution. However, experienced and competent project managers must be able to design and develop methods and techniques themselves that focus on the individual project environment and project-specific conditions.

A complementary aspect of this research work is the scrutiny of success factors for the execution and assessment of project results. This study also dealt with the factors that are relevant for the successful execution of a project and the relevant factors that assess such success. Nowadays, every project leader is aware about the Iron Triangle, but different factors from the literature are presented.

Moreover, the results of this study also suggest that civil engineering education in Germany places too little emphasis on economic and management aspects.

In summary, it can be stated that the chosen methodology freed itself from former research approaches in the area of project management which supplement the existing knowledge. Many of the previous quantitative studies have provided an empirical overview of methods, however, such findings failed to bring value to practitioners and users. This research project, thus, demonstrates that phenomenological methodology is a research approach that produces many relevant and practical findings.

The contribution to best practices is based on the thematic analysis of a wide range of literature that identifies differences, similarities, and common themes. This study identified themes that are most relevant to experienced construction project professionals when managing their projects abroad. There are a large number of empirical studies that exclusively deals with the application of PM methods. However, this dissertation adds a different perspective and methodology by conducting a qualitative and phenomenological research in the context of applied PM in the German (but internationally aligned) construction industry. This study is similar to the interview approach of Dörrenberg et al. (2014), but it is based on a thorough literature analysis and concentrates on PM rather than on intercultural aspects. Finally, this research approach could be used in future by researchers and industries to evaluate whether theoretical guidelines, expert literature, and methods can be applied by professionals in the construction business.

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A. APPENDIXES

A.1. Overview of project management processes

Overview of project management processes (PM processes) (2009b).

	Initialization	Definition	Planning	Steering	Controlling	Completion
1. Procedure and due dates		Define milestones	Planning of processes; preparing time schedule; preparing project plan	Initiate processes; steer target dates	Control target dates	
2. Changes			Planning how to handle changes	Steer changes	Control changes	
3. Information/ Communication / Documentation	Grant approvals	Defining procedures for information, communication and reporting; define project marketing; grant approvals	Planning procedures for information, communication and reporting; grant approvals	Steering procedures for information, communication and reporting; grant approvals	Communication management	Creating project completion report; creating project documentation
4. Costs and finances		Estimating workload	Prepare cost- and budget plan	Steer cost- and budget plan	Control cost- and budget plan	Prepare post-calculation
5. Organisation	Clarify responsibilities and select PM processes	Create project team	Plan project organization	Render Kick-off; support and develop project team		Perform debriefing perform; appreciate performances of team members; resolve project organization
6. Quality		Define success and quality criteria	Planning quality assurance	Assuring quality	Control quality	Retain and save project experiences
7. Resources			Preparing resource plan	Steering resources	Control resources; managing the project	Give back resources
8. Risk		Risk management definition; Stakeholder analysis: Feasibility analysis	Risk analysis; Planning countermeasures to risks	Steering risks	Control risks	
9. Project structure		Prepare project structure	Create Work Breakdown Structure (WBS); describe work packages and processes			
10. Contracts and claims		Define how to handle contracts; specify contractual terms with customers	Specify contractual terms with suppliers	Execute contracts with customers and suppliers; make additional claims	Control contracts and claims	Finish contracts
11. Goals	Outline goals	Define goals; define project content		Steer goal achievement	Control goal achievement	

TABLE A-1 OVERVIEW OF PROJECT MANAGEMENT PROCESSES (PM PROCESSES) (2009B)

A.2. Significant differences in usage of PM tools, according PMBOK®Guide, across three types of projects (Besner and Hobbs, 2008)

Tools and Techniques	E&C	IT	BuS
Scope and requirements definition			
Scope statement	more *	more *	
Requirements analysis	less *	more *	
Project charter	less		more *
Cost/benefit analysis			more *
Stakeholder analysis			more
Contract award			
Bid documents	more *	less	
Bidders conferences	more	less	
Bid/seller evaluation	more *	less	
Organizing			
Communication plan	less	more *	
Project communication room (war room)		more	
Project Web site		more	
Kick-off meeting		more *	
Responsibility assignment matrix		more *	
Self directed work teams		less	
Team building event	less		more *
Planning and control metrics			
Financial measurement tools	more *	less	more *
Estimating cost			
Database for cost estimating	more *	less	
Top-down estimating	more *		
Parametric estimating	more		
PM software for cost estimating	more		
Planning			
Quality plan	more *	more	less
Baseline plan		more *	
PM software for task scheduling		more *	less *
PM software for resources scheduling		more *	
PM software for resources levelling		more	
Critical path method and analysis	more *		less
Control			
Progress report		more *	
Change request		more *	
Configuration review		more	less
PM software for monitoring of schedule		more *	less *
PM software for monitoring of cost	more		less
Earned value	more	less	
Trend chart or S-Curve	more	less	
Quality inspection	more *		less
Control charts	more		
Work authorization	more *		
Client acceptance form		more *	
Rebaselining			less
Design			
Quality function deployment	more		
Value analysis	more	less	
Risk			
Risk management documents		more *	
Contingency plans		more *	
Ranking of risks		more	

Note. E&C = engineering and construction, IT = information technology, BuS = business services
The * indicates tools that are among the most frequently used on each type of contract.
Those without a * remain at lower use levels.

TABLE A-2 SIGNIFICANT DIFFERENCES IN USAGE OF PM TOOLS, ACCORDING PMBOK®GUIDE, ACROSS THREE TYPES OF PROJECTS (BESNER AND HOBBS, 2008)

A.3. Key literature and expert's books

A guide to the Project Management Body of Knowledge (PMBOK guide), fifth edition	(Project Management Institution (PMI), 2013)
Alle ziehen am selben Strang![37]	(Tumuscheit, 2013)
Analysing project management research: Perspectives from top management journals	(Kwak and Anbari, 2009)
And then came Complex Project Management (revised)	(Whitty and Maylor, 2009)
Anforderungen an die nachhaltige Aus- und Weiterbildung von Führungskräften in der Bau- und Immobilienwirtschaft[38]	(Zimmermann, Eber and Ebner)
Architect's handbook of construction project management	(Murray and Langford, 2004)
Competence Baseline (ICB)	(IPMA – International Project Management Association)
Construction contract preparation and management	(Powell, 2012)
Construction management in practice	(Fellows, 2002)
Construction Project Management	(Brookes, 2013)
Construction project management	(Fewings, 2005)
Construction project management	(Gould and Joyce, 2009)
Critical path method tutor for construction planning and scheduling	(East, 2015)
Current practice in project management — an empirical study	(White and Fortune, 2002)
Das Ende des Projektmanagements[39]	(Hanisch, 2013)
Der nackte Projekt Manager[40]	(Ottmann, 2012)
Der Projektmanager Bau- Anforderungen und Aufgaben[41]	(Walker, 2007)
Developing project management competency: perspectives from the construction industry	(Edum-Fotwe and McCaffer, 2000)
Guidance on project management	(International Standards Organization (ISO))
International Construction	(Mawhinney, 2001)

[37] Translation: "All pull in the same direction!"

[38] Translation: "Requirements for sustainable education and training of managers in the construction and real estate industry"

[39] Translation: "The end of project management"

[40] Translation: "The naked project manager"

[41] Translation: "The construction project manager- requirements and tasks"

Internationale Projekte leiten[42]	(Gutjahr and Nesgen, 2009)
Internationales Projektmanagement in der Praxis[43]	(Dörrenberg et al., 2014)
Looking again at current practice in project management	(Fortune et al., 2011)
Matching the project manager's leadership style to project type	(Müller and Turner, 2007)
Modern Construction Management	(Klakegg, 2013)
PM Standards by APM	(APM Association for Project Management)
Project Control: Integrating Cost and Schedule in Construction	(Del Pico, 2013a)
Project management - Project management systems	(Deutsches Institute für Normung (DIN))
Project management- A systems approach to planning, scheduling, and controlling	(Kerzner, ©2009)
Project management for building construction- 35 years of innovation at Drees & Sommer	(Sommer, ©2010)
Project Management in Construction	(Walker A., 1996)
Project management standards – Diffusion and application in Germany and Switzerland	(Ahlemann, Teuteberg and Vogelsang, 2009)
Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria	(Atkinson, 1999)
Project Management: Planning and Control Techniques	(Burke R., 1995)
Project risk analysis and management—PRAM the generic process	(Chapman, 1997)
Project risk management	(Chapman and Ward, 1997)
Project Scheduling and Management for Construction, Fourth Edition	(Pierce, 2013)
Projektmanagement für Bauherren und Planer[44]	(Kalusche, 2012)
Projektmanagement-Netzplantechnik und Projektmanagementsysteme ; Normen[45]	(Berlin, Wien, Zürich: Beuth, 2009b)
Projektmarketing im Bauwesen[46]	(Stempkowski, 2003)

[42] Translation: "Managing international projects"

[43] Translation: "International project management in practice"

[44] Translation: "Project management for clients and planners"

[45] Translation: "Project management - network plans and project management systems; standards"

[46] Translation: "Project management in construction"

Projektmarketing: Grundlagen und Instrumente für den Projekterfolg[47]	(Friedrich, 2005)
Reconstructing project management	(Morris, Peter W. G, 2013)
Rethinking Project Management: Researching the actuality of projects	(Cicmil et al., 2006)
Risikomanagement im industriellen Anlagenbau[48]	(Voigt, 2010)
Standardized project management may increase development projects success	(Milosevic and Patanakul, 2005a)
The “real” success factors on projects	(Cooke-Davies, 2002)
The influence of academic education and formal training on the project manager's behavior	(Dulaimi, 2005)
The role of project management in achieving project success	(Munns and Bjeirmi, 1996a)
The role of project management in achieving project success	(Munns and Bjeirmi, 1996b)
To Study Critical Factors Necessary for a Successful Construction Project	(Arti J. Jari, Pankaj, P. Bhangale, 2013)
Total construction project management	(Ritz, 1994)
Working towards best practices in project management: a Canadian study	(R. Loo, 2002)

Table A-3 Key literature – expert’s books

[47] Translation: “Project marketing: Basics and instruments for the project success”

[48] Translation: “Risk management in industrial construction”

A.4. Factors affecting the success of construction projects

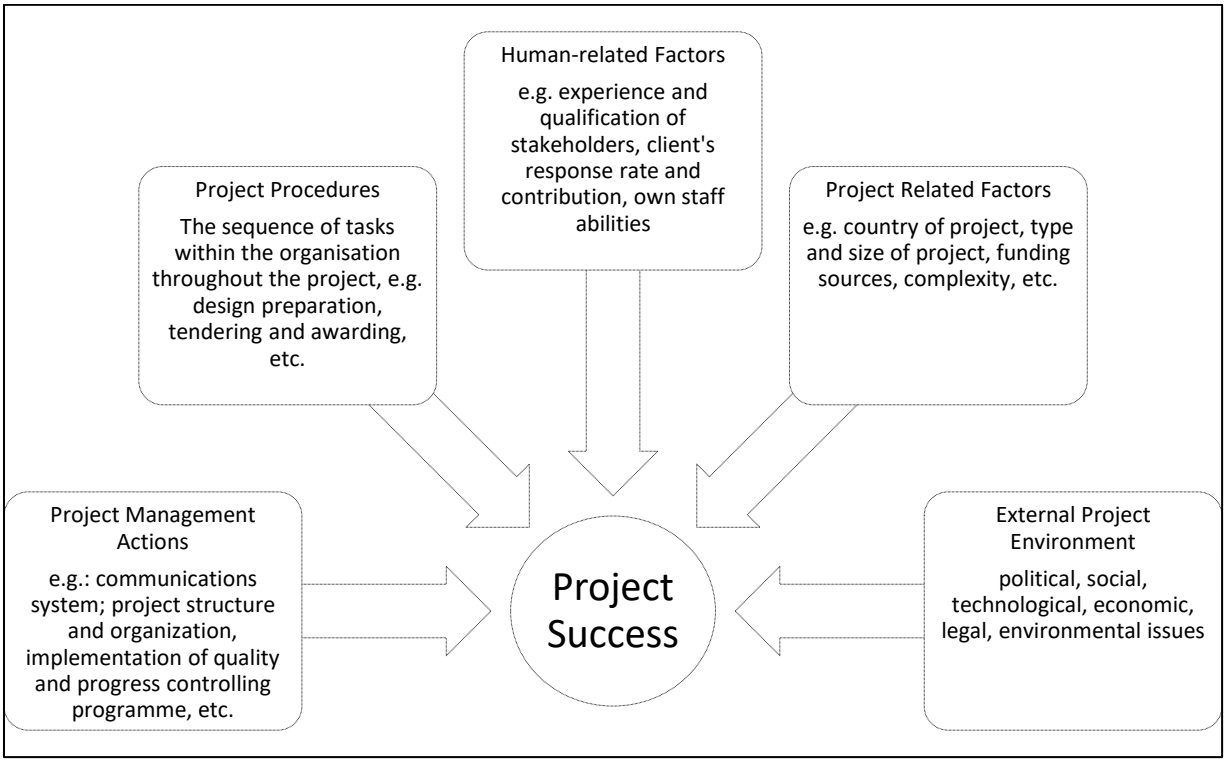

Fig. A-1 Critical success variables

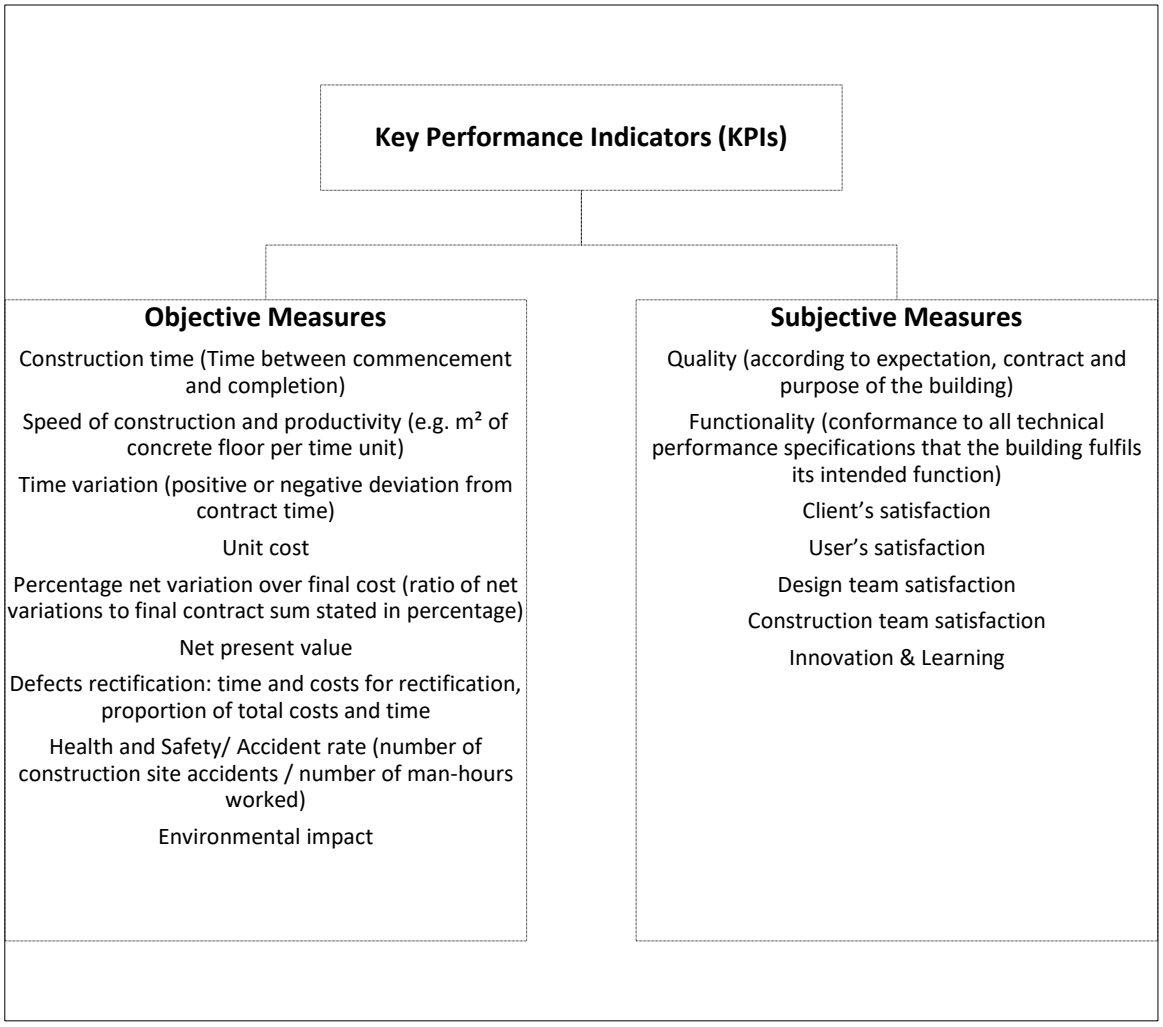

Fig. A-2 KPIs of construction projects

The project phases can be subdivided as follows:

- Period of execution
- Completion of project
- Delivery of the project
- Assessment 1–5 years after project completion

Atkinson divides the success into four areas (Atkinson, 1999):

- The Iron Triangle (cost, time, and quality)

  For construction projects the following conditions in terms of quality performance are critical (Walker, 2007):

  - Compliance with all services and ancillary services, in accordance with contractual specifications, bills of quantities and technical specifications
  - Compliance with recognized rules of construction engineering
  - Compliance with all building codes and regulations
  - Compliance with the agreed tolerance
  - Observance of labor, health and environmental protection
- The information system
- Benefits to the organization
- Benefit to the stakeholders

This means that on reaching project completion, project managers should check the following factors:

- Whether the budget was complied with
- Whether the costs and returns on investment are as expected
- Whether the project has been completed on time
- Whether the actual quality corresponds with the contractually agreed quality and the customer expectations
- Whether the project has been beneficial for the organization and for the stakeholders
- Whether the information and communication system has worked well.

To implement and deliver a successful project, the project managers should consider the following factors before the project begins (Abdullah et al., 2010):

- Which Project Excellence Models (PEMs) and Project Management Assessment Models (PMPAs) should be applied to the project?
- Which KPIs will apply to control the project progression?
- Which Project Success Indicators (PSIs) will apply for measuring the project success?

  Further potential literature pertaining PSIs the researcher identified: Determining Critical Success Factors of Project Management Practice: A Conceptual

Framework (Alias et al., 2014); Factors Affecting Success of Construction Project (Chan, Albert P. C., Scott and Chan, Ada P. L., 2004); Key performance indicators for measuring construction success (Chan and Chan, 2004); Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other success criteria (Atkinson, 1999); Measuring Project Success in the Construction Industry (Hughes, Tippett and Thomas, 2015)

- How is PM to be ensured and which PM factors will be important?
- Which design considerations shall be taken into account?
- Is the planning quality good?
- What is the project mission?
- What is the project structure and organization?
- What is the organizational culture (of all involved stakeholders)?
- How is the communication and reporting ensured?
- How is cooperation among the project stakeholder and the project organization ensured?
- How is teamwork established?
- Which formal acts need to be considered?
- How is consultant engagement promoted?
- How is knowledge shared throughout the project?
- How is benchmarking incorporated in the project?

The main objective of project management is the project completion within the intended time, budget and quality requirements and in accordance with the given project environment. Benchmarking is an instrument of continuous improvement of projects with the aim to determine reference parameters that are used to compare and measure the success of particular projects within an organization and above and beyond. Benchmarking can, therefore, be applied to either individual projects or the whole organization. Based on an empirical study of the University of Duisburg-Essen, presented in the *projektManagement* magazine (GPM, 2016a), most of the respondents use the following analysis tools in Project Benchmarking:

- Project Scorecard
- Project Excellence
- Capability Maturity Model Integration (CMMI)
- Software Process Improvement and Capability determination (SPICE)
- IPMA-Delta
- Project Management Maturity Model (PMMM)
- Organizational Project Management Maturity Model (OPM3)

"Lessons Learned" is also often mistakenly called as a means of benchmarking. However, "Lessons Learned" is a self-reflective ex-post analysis of individual projects

to determine useful experiences from the project execution applicable to similar future projects, but there is no comparison with other projects or "Best Practices".

A.5. Appendix of the interview protocol used by Hunter

"APPENDIX INTERVIEW PROTOCOL

PART A

1. Personal History

a. Where were you born?

b. Where did you grow up?

c. Are you married?

d. Any children?

e. Please relate a personal interest story.

2. Family History

a. Parents

b. Siblings

c. Where you lived

3. Education

a. Where and when did you go to elementary school, high school and university?

4. Previous Work Experience

a. What companies have you worked for?

b. What positions have you held at these companies?

c. What were the highlights as far as tasks performed and major accomplishments?

PART B

5. Current Position

a. Company background

i. What is the industry?

ii. When was the company formed?

iii. What is the company's industry relationship (market share)?

iv. What is the company Mission?

v. Are there any unique aspects to the company that you find interesting?

vi. What is the URL for your website?

b. Why did you accept your current position?

c. What issues initially required your attention?

i. Describe the issue.

ii. Discuss what you did.

iii. Discuss the final result.

iv. Repeat the above for another issue.

d. What issues are you currently addressing?

i. Describe the issue

ii. Discuss the status and anticipated outcome.

Table 5. Comparison of Investigations

Concept	Lindstrom et al. (2006)	Law and Ngai (2007)
Business Operations	Computer-aided support	BPI
Internal IT Operations	IT Costs	ITC
Interdepartmental Relations	Improving	Mediating between divisions

iii. Repeat the above for another issue.

e. What issues do you foresee addressing or requiring your attention in the future?

i. Describe.

ii. How do you plan to address the issue?

iii. What is the anticipated outcome?

iv. Repeat the above for another issue.

PART C

6. Pick a week and tell me what you did

a. Describe the task

b. Indicate the number of hours you spend doing the task

c. Was there something that you did not do that week that you normally would?

7. Dealing with Users.

a. How do you determine what your users want/require?

Table 6. Hofstede's Cultural Dimensions Indexes

Country	Cultural Dimensions				
	Individualism/ Collectivism	Power Distance	Uncertainty Avoidance	Masculinity/ Femininity	Long/Short Term Orientation
New Zealand	79	22	49	58	30
Taiwan	17	58	69	45	87
United States	91	40	46	62	29

Source: Hofstede (1980)

b. How do you know that you have responded to what your users want/require?

c. How do you know that you have delivered what your users want/require?

8. How do you decide on investments in:

a. Hardware?

b. Software?

c. People?

d. Tools?

e. Techniques and methods?

9. General comments about CIOs and their management experiences."(Hunter, 2010).

A.6. Key PM methods, tools and themes of selected expert's literature

	1[49]	2[50]	3[51]	4[52]	5[53]	6[54]	7[55]	8[56]	9[57]	10[58]
Analyses										
Environmental analysis (PESTEL analysis[59])								x		
Feasibility study			x					x		
Project evaluation				x						
Requirements analysis			x							
SWOT analysis								x		
Approvals, Inspections, Handing-over, Releases										
Approvals								x		
Handing-over				x	x					
Inspections								x		
Taking in operation					x					
Budgeting and costs										
Budgeting and cost monitoring				x	x		x			

[49] Construction contract preparation and management Geoff Powell, *Construction contract preparation and management: From concept to completion* (Basingstoke: Palgrave Macmillan, 2012).

[50] Risikomanagement im industriellen Anlagenbau Kai-Ingo Voigt, *Risikomanagement im industriellen Anlagenbau: Konzepte und Fallstudien aus der Praxis* (Berlin: Erich Schmidt, 2010).

[51] Project management for building construction- 35 years of innovation at Drees & Sommer Hans Sommer, *Project management for building construction: 35 years of innovation at Drees & Sommer* (Berlin, New York: Springer, ©2010).

[52] Internationale Projekte leiten Lothar Gutjahr and Christoph Nesgen, *Internationale Projekte leiten* (Freiburg, Br., Berlin, München [i.e.] Planegg: Haufe-Mediengruppe, 2009).

[53] Projektmanagement für Bauherren und Planer Wolfdietrich Kalusche, *Projektmanagement für Bauherren und Planer,* 3rd ed. (München: Oldenbourg, 2012).

[54] Project Scheduling and Management for Construction, Fourth Edition David R. Pierce, *Project Scheduling and Management for Construction* (Hoboken, NJ, USA: John Wiley & Sons, Inc, 2013).

[55] Project Control: Integrating Cost and Schedule in Construction Wayne J. Del Pico, ed., *Project Control: Integrating Cost and Schedule in Construction* (Hoboken, NJ, USA: John Wiley & Sons, Inc, 2013a).

[56] Projektmanagement-Netzplantechnik und Projektmanagementsysteme ; Normen *Projektmanagement: Netzplantechnik und Projektmanagementsysteme ; Normen,* 1st ed. (Berlin, Wien, Zürich: Beuth, 2009b).

[57] A guide to the Project Management Body of Knowledge (PMBOK guide), fifth edition Project Management Institution (PMI), *A guide to the Project Management Body of Knowledge (PMBOK guide), fifth edition,* 5th ed. (Newtown Square, Pa.: Project Management Institute, 2013).

[58] International Construction Mark Mawhinney, *International construction* (Oxford, Malden, MA: Blackwell Science, 2001).

[59] PESTEL analysis = political, environmental, social, technical, economic and legal analysis

	1[49]	2[50]	3[51]	4[52]	5[53]	6[54]	7[55]	8[56]	9[57]	10[58]
Capacity planning					x					
Cash flow analysis				x		x				
Cost controlling, planning and management			x	x	x	x		x	x	
Cost-benefit-analysis				x				x		
Earned value						x				
Efficiency analysis and sustainability			x							
Financial planning				x	x					
Post calculation								x		
Project funding										x
Usage costs in construction					x					
Communication, team, culture										
Communication (e-mail rules)				x						
Communication in international Teams				x						
Communication management				x			x		x	
Communication plan				x						
Communication styles by Friedemann Schulz von Thun				x						
Culture				x						
Information management, communication and controlling					x					
Kick-off				x		x		x		
Leadership stiles				x						
Project communication			x	x						
Project team				x				x	x	
Responsibilities								x		
Team cultural check				x						
Team management				x						

	1[49]	2[50]	3[51]	4[52]	5[53]	6[54]	7[55]	8[56]	9[57]	10[58]
Telephone- and video conferences				x						
Working culture				x						
Controlling										
Performance measurements (baseline)				x			x			
Project control			x	x	x	x	x			
Project controlling (monitoring and controlling)						x				
Industry and markets										
Construction industry and markets	x									x
International trading										x
Miscellaneous										
Case studies										x
Change request				x	x			x	x	
Creativity techniques					x					
Debriefing				x						
Decision making				x						
Errors in project execution					x					
Harvard-negotiation				x						
Iceberg model				x						
Insurances					x					
Logistics					x					
Operating and sustaining a business										x
Payment of project management accomplishments					x					
Project order									x	
Site investigation										
User and tenant coordination			x							
Organisation and structure										
Project Organisation			x	x	x			x		
Other management topics										

	1[49]	2[50]	3[51]	4[52]	5[53]	6[54]	7[55]	8[56]	9[57]	10[58]
Agile project management							x			
Approaches to Project management							x			
Change management				x						
Conflict management				x						
Contract management, construction law	x		x		x		x	x		
Extreme project management							x			
Human resource management									x	
Knowledge management				x						
Multi-project management[60]								x		
Project development					x					
Project marketing								x		
Quality management			x		x			x	x	
Quality vs budget				x						
Quantity management					x					
Resource management						x				
Resource planning								x		
Scope and quality				x						
Scope management									x	
Success criteria								x		
Technical execution			x							
Permits										
Building permits			x							
Project Management										
Project management during construction					x					
Project management during planning					x					
Project phases									x	

[60] See also Multiprojektmanagement by Hüsselmann Claus Hüsselmann and Jörg Seidl, eds., *Multiprojektmanagement: Herausforderungen und Best Practices,* 1st ed. (Düsseldorf: Symposion Publishing, 2015).

	1[49]	2[50]	3[51]	4[52]	5[53]	6[54]	7[55]	8[56]	9[57]	10[58]
Project steering					x					
Project Management Processes										
Project management processes (Initiation, planning, execution, controlling and steering, closure)									x	
Project Management Tools										
Balance Score Card (BSC)								x		
Checklist project closure				x						
Project management plan									x	
Project management tools and methods				x					x	
Project manual					x					
Room book					x					
Work Breakdown Structure				x		x	x			
Project manager										
Project manager			x				x		x	
Project planning										
Design Planning (Detailed design)			x							
Project planning						x		x		
Project structural planning				x	x			x	x	
Project Preparation										
Building materials and equipment										x
Goals of the project							x	x		
Investment process	x									
Pre-planning and design planning			x				x			
Project preplanning (after bid has been won)						x				
Reporting and documentation										
Documentation					x					
Reporting				x				x		

	1[49]	2[50]	3[51]	4[52]	5[53]	6[54]	7[55]	8[56]	9[57]	10[58]
Risk Management										
Risk identification		x								
Risk analysis		x		x						
Risk matrix				x						
Risk management		x		x					x	
Project Risks								x		
Scheduling										
Scheduling	x		x	x	x	x		x	x	
Scheduling (appointment list)								x		
Scheduling (arrow-diagram-method)						x				
Scheduling (concepts)							x			
Scheduling (critical chain project management (CCPM))							x			
Scheduling (critical path method)				x		x	x		x	
scheduling (Gantt bar chart)								x		
Scheduling (line of balance scheduling)						x	x			
Scheduling (linear scheduling)			x							
Scheduling (milestones)								x		
Scheduling (network plan)			x					x		
Scheduling (procurement scheduling)						x				
Scheduling (program review and evaluation technique (PERT))							x			
Scheduling (shop drawing submittal)						x				
Scheduling(milestone trend analysis)				x						
Simulations and scenarios										
Ishikawa-Method				x						

	1[49]	2[50]	3[51]	4[52]	5[53]	6[54]	7[55]	8[56]	9[57]	10[58]
Stakeholder										
Stakeholder analysis				x						
Stakeholder management	x			x				x	x	
Stakeholder management (Kano- Model when defining customer requirements)				x						
Stakeholder management (RACI-Matrix)							x			
Stakeholder portfolio				x						
Subcontractors and suppliers										
Subcontractors					x					
Supplier management								x		
Supply management									x	
Tendering and awarding										
Tendering (design tenders)			x							
Tendering and contractor selection	x									

Table A-4 Key themes of selected expert's literature

A.7. PM methods/methodologies/tools/techniques identified by White and Fortune

Project management methods/methodologies/tools/techniques[61]
Project management methods/methodologies
Projects in controlled environments (PRINCE)
Projects in controlled environments 2 (PRINCE2)
Structured systems analysis and design methodology (SSADM)
The European risk management methodology (RISKMAN[62])
The RIBA plan of work[63]
Other project management methodologies
PMBOK
Agil
"Methodology developed 'in house'"
Managing successful programmes
Rationale unified process
In house project management methods
In house similar to PRINCE
Wysocki's adaptive project framework (APF)
Project management tools
Critical path method (CPM)
Work breakdown structure (WBS)
Cash flow analysis (CFA)
Gantt bar charts
Graphical evaluation and review technique (GERT)
Programme evaluation and review technique (PERT)
Strengths weaknesses, opportunities and threats (SWOT)
Other project management tools
Project management software

[61] This table combines the finding from the 2002 and 2009 survey by White and Fortune Diana White and Joyce Fortune, "Current practice in project management — an empirical study," *International Journal of Project Management* 20, no. 1 (2002)., Joyce Fortune et al., "Looking again at current practice in project management," *International Journal of Managing Projects in Business* 4, no. 4 (2011). but it doesn't reflect the ranking of the finding from the initial survey.

[62] RISKMAN is a software system to render quantitative risk analyses

[63] RIBA Plan is published by the Royal Institute of British Architects (RIBA) and organizes building processes and consists of different building or project stages.

Project management methods/methodologies/tools/techniques[61]
In house project management tools
GANTT bar charts
Lessons learned (also known as project reviews/project audits)
Monte Carlo
Earned value management
Delphi method
Agile board
Project goals charter
Decision making techniques
Cost benefit analysis (CBA)
Decision analysis (DA)
Sensitivity analysis (SA)
Expressed preferences
Implied/revealed preferences
Other decision-making techniques
In house decision-making techniques
Decision trees
Stakeholder analysis
Project management software
Microsoft project
Other project management software
Primavera
MS Excel
Project management software developed in house
MS Visio
Open plan professional
SAP
@task
CA clarity
Project place
MS PowerPoint
Oracle

Project management methods/methodologies/tools/techniques[61]
Risk assessment tools
Probability analysis
Life-cycle cost analysis (LCCA)
Failure modes and effect analysis (FMEA)
Reliability analysis
Hazard and operability studies (HAZOP)
In house risk assessment tools
Fault tree analysis (FTA)
Other risk assessment tools
Hazard analysis (HAZAN)
Risk analysis using ASNZS 4360_2004
Risk register
Delphi method
Risk assessment
Information communication technology support tools
Integrated groupware (e-mail, collaborative tools, shared access to web portals, etc.)
Groupware (e-mail only)
Video conferencing
Voice over internet protocol
Virtual environments
Other information communication technology support tools
In house communication and reporting system
Communities of practice enabling tools

Table A-5 Project management methods/methodologies/tools/techniques (White and Fortune, 2002), (Fortune et al., 2011)

Factors critical for project outcome

The critical influence factors for the project results based on the results of the two studies mentioned are summarized in Table A-6.

Factors critical to the project's outcome[64]
Clear goals/objectives
Realistic schedule
Support from senior management
Adequate funds/resources
End user commitment
Clear communication channels
Effective leadership/conflict resolution
Effective monitoring and feedback
Flexible approach to change
Taking account of past experience
Recognising complexity
Taking account of external influences
Effective team building/motivation
Effective management of risk
Training provision
Contextual awareness
Provision of planning and control systems
Appreciating the effect of human error
Considering multiple views of project
Having access to innovative/talented people
Other factor(s)
Having relevant past experience
Support from stakeholder(s)/champion(s)
Having a clear project boundary
Stable/skilled/integrated project team
Taking account of regional/international cultural differences

[64] This table combines the finding from the 2002 and 2009 survey by White and Fortune Diana White and Joyce Fortune, "Current practice in project management — an empirical study," *International Journal of Project Management* 20, no. 1 (2002)., Joyce Fortune et al., "Looking again at current practice in project management," *International Journal of Managing Projects in Business* 4, no. 4 (2011). but it doesn't reflect the ranking of the finding from the initial survey.

Factors critical to the project's outcome[64]
Effective selection/use of technology
Effective stakeholder engagement/management/sponsorship
Wide/well-considered/unchanged scope

Table A-6 Factors critical the project's outcome (White and Fortune, 2002), (Fortune et al., 2011)

Criteria for project success

The studies by White and Fortune also deal with the criteria used for judging project success. These criteria for both studies have been summarized Table A-7.

Criteria used for judging project success[65]
Meets client's requirements
Completed within schedule
Completed within budget
Meets organisational objectives
Yields business and other benefits
Causes minimal business disruption
Meets quality/safety standards
Is capable of adapting to internal and/or external changing needs
Delivers the best value possible
Provides strategic or operation learning for the organisation
Facilitates leading the organisation into future business/direction
Delivers return on investment
Makes only limited use of contingency funds
Delivers enhanced reputation for the organisation
Other criteria

Table A-7 Criteria used for judging project success (White and Fortune, 2002), (Fortune et al., 2011)

[65] This table combines the finding from the 2002 and 2009 survey by White and Fortune Diana White and Joyce Fortune, "Current practice in project management — an empirical study," *International Journal of Project Management* 20, no. 1 (2002)., Joyce Fortune et al., "Looking again at current practice in project management," *International Journal of Managing Projects in Business* 4, no. 4 (2011). but it doesn't reflect the ranking of the finding from the initial survey.

A.8. Project management themes by Abudavyeh

Bidding
Build–operate–transfer
Computer systems
Constructability
Contractors
Contracts
Cost control
Education
Equipment
Estimating
Expert systems
Innovation
International construction
Management
Modelling
Optimization
Performance
Planning
Productivity
Risk
Safety
Scheduling
Simulation
Technology

Table A-8 Project Management Themes by Abudayyeh (Abudayyeh, Dibert-DeYoung and Jaselskis, 2004)

A.9. Superior topics of the literature analysis, the interviews and the answers received

Main categories of key themes of the literature review	Questions from the interview-guideline	Clustered answers/ topics from semi-structured interviews
Personal information		
	Age	Age
	Gender	Gender
	Education/ Degree	Education
	Years of work experience	Years of work experience
	Biggest project responsibility (by project volume and time)	Biggest project responsibility
	Previous Work Experience	Previous work experience
	What positions have you held at your previous employers?	Previous positions
	What were your major achievements and accomplishments?	Major achievements
	What is the company's background and branch of industry?	Company's background
	What is the company's size (employees and turnover)?	Company's Size (Number of Employees)
	What is the major task of your current position?	Major task
	What means project management work to you?	What means project management
	Do you believe project management is important to the project success?	Importance of project management
Project manager	What entails a competent project manager in your prospective?	Competent project manager
	On what do you spend the most time of your work?	How acquired skills
	How did you acquire your PM skills?	Most time of work
Project Management Information		

Main categories of key themes of the literature review	Questions from the interview-guideline	Clustered answers/ topics from semi-structured interviews
Approvals, Inspections, Handing-overs, Releases	Do you apply particular procedures for releasing of payments?	Approval and release procedure
Communication, team, culture	Do you use any particular methods for the project communication?	Communication
	Do you use any particular methods for the human resource management?	Team and Staff
		Culture
Budgeting and costs	Which methods do you use for the progress controlling?	Quotation preparation
Controlling	Do you use any particular methods for the financial controlling?	Cost management
	How do you handle variance requests?	Change Management
Other management topics	Which methods do you use to establish and monitor the health and safety on site?	Health and Safety
Miscellaneous	Which decision making techniques do you use?	Resource Planning
	Do you use any particular methods for the preparation of quotations?	Contract management
	Do you use any particular methods for the preparation and studying of contracts?	Work breakdown structure
	On what do you spend the most time of your work?	Lean management
	Are there any other methods or techniques you use?	Big data in construction projects
		Promoters of successful PM

Main categories of key themes of the literature review	Questions from the interview-guideline	Clustered answers/ topics from semi-structured interviews
Project Management	Do you use any particular methods for the project goal definition and communication?	Project management general
Project Management Processes	Which methods, methodologies or certifications do you use or possess; also referring to the DIN 69901-69905, the ISO 21500:2012, PMBOK® Guide or other relevant PM models, like PRINCE or ICB, methods and methodologies? Which project management tools do you use?	Certification
Project Management Tools	Do you use any particular methods for the supervision of works?	Supervision
	Do you use any particular methods for the project quality management?	Quality
		Standards and Guidelines
		Decision making
		In-House Methods
		PM Tools
Project planning Project Preparation	Which method do you use for the project planning?	Project planning
Reporting and documentation	Which methods do you use for the reporting?	Reporting
	Do you use any particular methods for the project monitoring and documentation?	
Risk Management	Which risk assessment tools do you use?	Risk management

Main categories of key themes of the literature review	Questions from the interview-guideline	Clustered answers/ topics from semi-structured interviews
	Do you use any particular methods for the risk identification, assessment and management	
Scheduling	Which methods do you use for the progress controlling?	Time scheduling Progress Controlling
Simulations and scenarios	Which software, computer models or simulations do you use?	Software
Subcontractors and suppliers Tendering and awarding	Do you use any particular methods for the procurement management?	Procurement management
Stakeholder	Do you use any particular methods for the stakeholder management?	No substantial answers received.
Analyses Industry and markets Permits Organisation and structure	Not particularly asked.	No substantial answers received.

Table A-9 Superior topics of the literature analysis, the interviews and the answers received

A.10. Interview Guideline

THE BUSINESS SCHOOL OF THE EDINBURGH NAPIER UNIVERSITY

DBA - Interview Design

Examination of project management techniques applied by German construction project managers executing projects abroad

A redefinition of professional skills through the experiences of expert's prospective

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List of abbreviations

CAPM.....*Certified Associate in Project Management*
CBA.....*Cost benefit analysis*
CFA.....*Cash flow analysis*
CPM.....*Critical path method*
ETA.....*Event tree analysis*
IPMA.....*International Project Management Association*
LCCA.....*Life-cycle cost analysis*
PA.....*Probability analysis*
PM.....*Project Management*
PMBOK.....*Project Management Body of Knowledge*
PMP.....*Project Management Professional*
PRINCE.....*Projects in Controlled Environment*
WBS.....*Work breakdown structure*

1 Aim and objectives of the study

The researcher is exploring the lived practical experiences of construction project management professionals to enhance the ongoing professional development. In accordance with the experiences of the participants, the researcher scrutinises the best practices, methods and tools which are commonly used. Various advantages and shortcomings of particular methods have also been analysed along with the review of skills, critical factors, tools and methods which might require further academic attention.

2 Structure of the study

To collect qualitative data of best practices and methods in international construction management, the researcher conducted semi-structured interviews with a sample project managers and project professionals that are in charge of construction projects abroad (Drever 2003; Louise Barriball, While 1994). Embedded in the semi-structured guideline for the interviews are questions that aim for the identification and examination of the respondents preferred project management methods and techniques. A questionnaire is prepared to obtain supplementary information about the respondents, their professional and educational background as well as their particular project content and environment.

3 Method and design of the data collection

The scholar has chosen an inductive and explorative research approach to investigate the applied project management methods and techniques to facilitate the respondents' experiences, recollections, interpretations and evaluations associated with the applicability of project management techniques (Scholes 1980).

The researcher considers first-hand experiences as most important to this research. In general, face-to-face interviews are more desired than interviews carried out via the telephone; however, due to the tight calendars of many interviewees phone conferences are considered as a valuable alternative. The interviews are not being audio taped; the transcript is being prepared based on the notes taken during the interview and the responses to the submitted questionnaire. The interview protocols are based upon the Long Interview Technique (McCracken 1988).

The researcher will conduct semi-structured interviews in order to maintain a certain structure while allowing spontaneous responses and interactions during the interviews. Semi-structured interviews have the potential to overcome the risk of poor response and to provide a guidance to execute the interviews. Moreover, semi-structured interviews provide the possibility to explore attitudes, values, biases or beliefs of the respondents and to ask additional questions to better understand or validate the answers given. A personal interview, in addition, presents a higher likelihood that most questions are answered (Louise Bamball, Alison While 1994).

Prior to the semi-structured interview a set of questions is being submitted as a discussion guideline. The questions are related to the project manager's applied PM methods, techniques, previously conducted projects and personal information such as the current position and the project manager's perception of project management.

One of the major concerns of the researcher, while preparing the guideline and questionnaire for the interviews, is the risk of false replies or non-respondents that can distort the results of the survey. In case the response rate is low or particular questions remain unanswered there is the possibility that reliable conclusions can hardly be drawn. Hence, it is the goal of the researcher to create a suitable guidance for the

semi-structured interview that provides key questions related to the main research matters, that provides enough flexibility to have a conversation rather a clinical interview and that aims to obtain quantitative information about the projects itself the project managers are responsible of (Chen, Partington 2006).

4 Participants consent

By participating in this research project the interviewee confirms that:

- He has read this information sheet about the study
- He has had the opportunity to ask questions and discuss this study
- He has received satisfactory answers to all his questions associated with this study
- He has received enough information about this study
- He has understood that his research data is being used for this research project in anonymous from. No detailed information about his identity is being collected and retained. The records of this study will be kept strictly confidential and his identity is not being disclosed in the material that is published.
- He has understood that he is free to withdraw or refuse, without giving a reason, from this study at any time until the final thesis is being prepared and submitted
- He has understood that his research data may be used for further research projects in anonymous form
- He has understood that he will not receive any payments or reimbursements for participating in this study
- He agrees into taking part in this research project

5 The interview

The interview explores the personal information about the respondent and the projects the respondent is/has been in charge of, the type, location and particular characteristics of the construction projects (e.g. public, private, industrial building, etc.), the applied project management techniques and the correlating advantages and shortcomings as well as the limitations or drawbacks experienced with the methods, tools and techniques applied at the international job sites.

5.1 Personal and project information of the respondent

Personal information:

- Age
- Gender
- Education/ Degree
- Years of work experience
- Biggest project responsibility (by project volume and time)
- Previous Work Experience
    - What companies have you worked for (only types and industries of employers, no names)?
    - What positions have you held at your previous employers?
    - What were your major achievements and accomplishments?

Current position:

- What is the company's background and branch of industry?
- What is the company's size (employees and turnover)?
- What is the major task of your current position?

Understanding of Project Management:

- What means project management work to you?
- Do you believe project management is important to the project success?
- What entails a competent project manager in your prospective?
- On what do you spend the most time of your work?
- How did you acquire your PM skills?

5.2 Applied PM methods and tools

Below you will find a list of *suggested PM methods and tools;* please indicate the methods and tools you use in your every-day work! Please *complete any additional methods* and tools you apply.

- Which methods, methodologies or certifications do you use or possess; also referring to the DIN 69901-69905, the ISO 21500:2012, PMBOK® Guide or other relevant PM models, like PRINCE or ICB, methods and methodologies?[66]
- Which project management tools do you use?[67]
- Which decision making techniques do you use?[68]
- Which risk assessment tools do you use?[69]
- Which software, computer models or simulations do you use?[70]
- Which method do you use for the project planning?
- How do you handle variance requests?
- Do you apply particular procedures for releasing of payments?
- Which methods do you use for the progress controlling?
- Which methods do you use to establish and monitor the health and safety on site?
- Which methods do you use for the reporting?
- Are there any other methods or techniques you use?

[66] E.g.:
- PRINCE; PRINCE2
- PMBOK
- Project Management Professional (PMP)®
- Certified Associate in Project Management (CAPM)®
- IPMA Certification
- Other in-house project management methods/ methodologies

[67] E.g.:
- Critical path method (CPM)
- Work breakdown structure (WBS)
- Cash flow analysis (CFA)
- Gantt bar charts
- Other in-house project management tools

[68] E.g.:
- ABC analysis
- Cost benefit analysis (CBA)
- Other in-house decision making techniques

[69] E.g.:
- Life-cycle cost analysis (LCCA)
- Event tree analysis (ETA)
- Probability analysis (PA)
- Other in-house risk assessment tools

[70] E.g.:
- MS Project, Primavera
- MS Office (Excel or Access)
- Other in-house or other professional computer models and software
-

5.3 Subtopics of PM

The subsequent set of questions is comprehensive and should provide assistance to identify and categorize applied methods and tools. The researcher has chosen a grounded-theory approach and is, therefore, developing his claims based on the results of the interviews. The below mentioned list of questions shall be, therefore, only considered as a recommendation and any additional topic, information and supplementary data are valuable and appreciated.

- Do you use any particular methods for the preparation of quotations?[71]
- Do you use any particular methods for the preparation and studying of contracts?[72]
- Do you use any particular methods for the planning of works?[73]
- Do you use any particular methods for the supervision of works?[74]
- Do you use any particular decision making techniques?

[71] E.g. for the successive responsibilities:
- Identifying the volume of works, quantities and material specification
- Identifying the timeframe to execute the works
- Defining materials and methods for the execution
- Defining the required time frame for all activities Defining the expected work load
- Preparing of tenders for external works and services
- Searching for, negotiating with and awarding of subcontractors and suppliers
- Investigating sources of material supply
- Calculating all costs associated with the rendering of construction works(such as material costs, expenses for tools and equipment, contingency costs of machinery or site equipment, expenses for suppliers and external services, labour costs of direct workers, time related costs such as site overheads or indirect labour and general company overheads
- Preparing the quotation based on all anticipated expenses and expected profit

[72] For instance when preparing or studying relevant contractual clauses, deadlines and due dates, the procedure of communication, the stipulated quality specifications, financial and payment agreements, general terms and conditions or the specified penalties.

[73] E.g. to plan activities such as:
- Obtain all necessary building permits and approvals
- Defining the work load
- Preparing the budget planning and cash flow
- Planning of required resources such as labour, machinery, material in order to accomplish the construction programme
- Preparing the site and site mobilization
- Preparing the work program that stipulates all activities as well as the required resources, permissions and due dates of the construction activities
- Scheduling of all activities and tasks, preparing the construction time schedule
- Ordering of material and external services
- Allocating all required resources mainly along the critical path of the work programme
- Preparing of shop drawings

[74] E.g. to supervise the following project parameter:
- Timely construction supervision
- Quality control
- Inspection and taking over of subcontractor's works and external services
- Cost control in line with the budget planning, cash flow predictions
- Coordination of suppliers and subcontractors on site
- Timely order of material and external services
- Supervising the sufficient allocation of resources, mainly to critical activities
- Revising of designs, drawings and methods in line with altered client's needs and wishes
- Scope supervision with regard to the contract, the stipulated clauses and required work
- Claim supervision/ management including avoiding of claims from suppliers and considering own additional work that entitles to raise claims

- Do you use any particular methods for the procurement management?
- Do you use any particular methods for the project communication?
- Do you use any particular methods for the project goal definition and communication?
- Do you use any particular methods for the human resource management?
- Do you use any particular methods for the project monitoring and documentation?
- Do you use any particular methods for the project quality management?
- Do you use any particular methods for the risk identification, assessment and management?
- Do you use any particular methods for the stakeholder management?
- Do you use any particular methods for the reporting?
- Do you use any particular methods for the financial controlling?[75]

[75] Such as profit & loss statements, cash flow supervision, invoicing and accounting

5.4 Conceptions of construction project management

In order to identify the preferred conception of project management[76] of the respondents, the researcher hands over the following tick the box questions together with the prior described questions referred to the personal background and project experience.

The main question the respondent has to ask himself in order to answer the questionnaire is: **"How important is this task to my work"** and tick the corresponding box ranging from 1 (not at all) to 10 (utmost importance).

The purpose of filling in the tick the box questionnaire is to identify the foremost work of a project manager in order to align relevant management techniques appropriately in accordance with the importance to the construction project manager. By identifying the tasks that are most important to the respondents the researcher can assess whether the standards and methods suggested by the literature and provided by the standard-giving organisations meet the needs and requirements of the interviewed construction project managers.

Planning of work									
1	2	3	4	5	6	7	8	9	10
Approving subcontractors' programme and methods									
1	2	3	4	5	6	7	8	9	10
Controlling the work process									
1	2	3	4	5	6	7	8	9	10
Understanding the construction process and detailed requirement									
1	2	3	4	5	6	7	8	9	10
Understanding particularly the 'H & S' legislation									
1	2	3	4	5	6	7	8	9	10
Understanding the work interfaces and subcontractors' work interactions									
1	2	3	4	5	6	7	8	9	10
Knowing the construction industry									
1	2	3	4	5	6	7	8	9	10

[76] Project management as planning and controlling; Project management as organizing and coordinating, Project management as predicting and managing potential problems Chen, Partington 2006)

Being aware of the history and future development of the construction industry
1 2 3 4 5 6 7 8 9 10
Communicating with project members by regular meetings
1 2 3 4 5 6 7 8 9 10
Controlling the implementation of the work and keep the plan updated
1 2 3 4 5 6 7 8 9 10
Motivating to assist in organizing and coordinating work on site
1 2 3 4 5 6 7 8 9 10
Allocate work tasks to team members
1 2 3 4 5 6 7 8 9 10
Controlling and supporting people in their work and with their tasks
1 2 3 4 5 6 7 8 9 10
Ability to teamwork
1 2 3 4 5 6 7 8 9 10
Building a team and creating a spirit of mutual support, trust and openness
1 2 3 4 5 6 7 8 9 10
Motivating and empowering the team members
1 2 3 4 5 6 7 8 9 10
Supporting (in-house) team members with their career development
1 2 3 4 5 6 7 8 9 10
Being aware of the contract and any potential loopholes
1 2 3 4 5 6 7 8 9 10
Managing variations and changes to the contract

1	2	3	4	5	6	7	8	9	10

Being aware of potential risks and problems prior to the contract signing

1	2	3	4	5	6	7	8	9	10

Coordinating subcontractors' work interfaces to avoid disruption and inefficiency

1	2	3	4	5	6	7	8	9	10

Ability for an over-all picture of the project

1	2	3	4	5	6	7	8	9	10

Identifying of potential risks to avoid problems

1	2	3	4	5	6	7	8	9	10

Thinking ahead in order to predict problems

1	2	3	4	5	6	7	8	9	10

Taking precautions to be able to resolve problems quickly

1	2	3	4	5	6	7	8	9	10

TABLE 1 CONCEPTIONS OF PM- TICK THE BOX QUESTIONS

Thank you for participating in this research project!

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A.11. Interview Protocol

THE BUSINESS SCHOOL OF THE EDINBURGH NAPIER UNIVERSITY

DBA - Interview Design

Examination of project management techniques applied by German construction project managers executing projects abroad

A redefinition of professional skills through the experiences of expert's prospective

DBA delegate	Manuel Schrapers
Matriculation Number	40127898
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List of abbreviations

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PA.....*Probability analysis*
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PMBOK.....*Project Management Body of Knowledge*
PMP.....*Project Management Professional*
PRINCE.....*Projects in Controlled Environment*
WBS.....*Work breakdown structure*

1 Aim and objectives of the study

The researcher is exploring the lived practical experiences of construction project management professionals to enhance the ongoing professional development. In accordance with the experiences of the participants, the researcher scrutinises the best practices, methods and tools which are commonly used. Various advantages and shortcomings of particular methods have also been analysed along with the review of skills, critical factors, tools and methods which might require further academic attention.

2 Structure of the study

To collect qualitative data of best practices and methods in international construction management, the researcher conducted semi-structured interviews with a sample project managers and project professionals that are in charge of construction projects abroad (Drever 2003; Louise Barriball, While 1994). Embedded in the semi-structured guideline for the interviews are questions that aim for the identification and examination of the respondents preferred project management methods and techniques. A questionnaire is prepared to obtain supplementary information about the respondents, their professional and educational background as well as their particular project content and environment.

3 Method and design of the data collection

The scholar has chosen an inductive and explorative research approach to investigate the applied project management methods and techniques to facilitate the respondents' experiences, recollections, interpretations and evaluations associated with the applicability of project management techniques (Scholes 1980).

The researcher considers first-hand experiences as most important to this research. In general, face-to-face interviews are more desired than interviews carried out via the telephone; however, due to the tight calendars of many interviewees phone conferences are considered as a valuable alternative. The interviews are not being audio taped; the transcript is being prepared based on the notes taken during the interview and the responses to the submitted questionnaire. The interview protocols are based upon the Long Interview Technique (McCracken 1988).

The researcher will conduct semi-structured interviews in order to maintain a certain structure while allowing spontaneous responses and interactions during the interviews. Semi-structured interviews have the potential to overcome the risk of poor response and to provide a guidance to execute the interviews. Moreover, semi-structured interviews provide the possibility to explore attitudes, values, biases or beliefs of the respondents and to ask additional questions to better understand or validate the answers given. A personal interview, in addition, presents a higher likelihood that most questions are answered (Louise Bamball, Alison While 1994).

Prior to the semi-structured interview a set of questions is being submitted as a discussion guideline. The questions are related to the project manager's applied PM methods, techniques, previously conducted projects and personal information such as the current position and the project manager's perception of project management.

One of the major concerns of the researcher, while preparing the guideline and questionnaire for the interviews, is the risk of false replies or non-respondents that can distort the results of the survey. In case the response rate is low or particular questions remain unanswered there is the possibility that reliable conclusions can hardly be drawn. Hence, it is the goal of the researcher to create a suitable guidance for the

semi-structured interview that provides key questions related to the main research matters, that provides enough flexibility to have a conversation rather a clinical interview and that aims to obtain quantitative information about the projects itself the project managers are responsible of (Chen, Partington 2006).

4 Participants consent

By participating in this research project the interviewee confirms that:

- He has read this information sheet about the study
- He has had the opportunity to ask questions and discuss this study
- He has received satisfactory answers to all his questions associated with this study
- He has received enough information about this study
- He has understood that his research data is being used for this research project in anonymous from. No detailed information about his identity is being collected and retained. The records of this study will be kept strictly confidential and his identity is not being disclosed in the material that is published.
- He has understood that he is free to withdraw or refuse, without giving a reason, from this study at any time until the final thesis is being prepared and submitted
- He has understood that his research data may be used for further research projects in anonymous form
- He has understood that he will not receive any payments or reimbursements for participating in this study
- He agrees into taking part in this research project

5 The interview

The interview explores the personal information about the respondent and the projects the respondent is/has been in charge of, the type, location and particular characteristics of the construction projects (e.g. public, private, industrial building, etc.), the applied project management techniques and the correlating advantages and shortcomings as well as the limitations or drawbacks experienced with the methods, tools and techniques applied at the international job sites.

5.1 Answers given in the interview

Age

49

Gender

Male

Education/ Degree

Diploma Engineer

Years of work experience

25

Biggest project responsibility (by project volume and time)

Single project volume of €10o Million and construction period of 2,5 years

Previous Work Experience

The respondent used to work most of his professional life for his current employer; a large-size international construction company. Nevertheless, intermittently he has also used to work for a project management enterprise.

What positions have you held at your previous employers?

-

What were your major achievements and accomplishments?

The respondent stated that this question is to be answered not too easily. Indeed, he feels a certain pride if projects, above all with a difficult project environment what is often the case with international projects, are executed and realized successfully.

What is the company's background and branch of industry?

The employer is one of Germany's leading construction companies with over 13,000 employees and an annual construction turnover of over € 3.1 billion.

What is the company's size (employees and turnover)?

-

What is the major task of your current position?

Managing of international construction projects

What means project management work to you?

When talking about project management one must not forget about the significance of the project, but equally important are the social competence of the project manager, a

good communication in the project team and a comprehensive preplanning, too. The project manager is the one who has to lump everything together. To do so the project manager must have a very wide-ranging personality and a good emotional competence. Above all with foreign projects certain flexibility is also necessary, nevertheless, the German kind of the project management is often very stiff and technocratic, and this kind of the project management is not always fruitful and aim-leading abroad. Abroad one must be able to get involved with the local mentality, as well as have flexibility and working experience in foreign countries.

Do you believe project management is important to the project success?

-

What entails a competent project manager in your prospective?

The project manager must be open-minded and be able to adapt himself to the local demands and circumstances. For this he must be in the possession of the appropriate mentality, but be adaptable and pliable as well. Nevertheless the qualification of a successful project manager is the successful execution of the project within in the budget, in the estimated time, according to the expected quality and to the satisfaction of the developer.

On what do you spend the most time of your work?

-

How did you acquire your PM skills?

-

Which methods, methodologies or certifications do you use or possess and which project management tools do you use?

The participant is not in the possession of additional certifications, like PRINCE, IPMA or PMP certification.

The participant nevertheless uses critical path methods and Gantt bar charts for the time planning and time control of the building projects. Work breakdown structure is also a common tool, as well as cash flow analysis.

Special decision making techniques, such as the ABC analysis or cost benefit analysis, are rather not applied by the interviewee and particular risk assessment tools, like LCCA or ETA, are less relevant.

The interviewee has noticed that risk identification and risk assessment is certainly been done for the projects, however, rather generically according to the project environment, building project contents and possible problem factors by means of experience value and Mind Maps.

In addition to the discussed tools the interviewee uses lean management tools for the planning and control of building processes as well as programmes for building site reports and deficiency management. Moreover, the employer of the interviewee offers an internet-based planning platform.

Beside the named computer software, like MS Project or other MS Office programmes, the interviewee uses a programme called Asta Powerproject that is used for construction planning and time scheduling, akin to Primavera.

For the preparation of bids and the project preliminary planning the interviewee uses the software RIB iTWO which is a construction management software that also integrates CAD and planning data, volume estimation, cost calculation and construction process simulation.

For foreign building projects FIDIC contracts are often used, like the VOB contracts within Germany. For the preparation and interpretation of contracts received there are no prescribed check lists or similar tools. Rather relevant clauses pertaining to due dates and costs are analysed possible project risks are been identified.

However, when preparing international building contracts it looks differently. The interviewee's employer uses given formats for subcontractor's contracts and only the technical conditions of the contract and attachments are been adapted according to the project. Therefore, there are predefined and standardized subcontractor's contracts, planner's contracts and supply agreements which are complemented only with the technical conditions of the contract and attachments.

The interviewee has explained the planning of works based on an example of a bridge construction. Before the commencement of the construction works the time planning is been carried out that is a very important step to guarantee the well-arranged construction process planning. Afterwards everything relevant for the building site is planned, like for example crane arrangements or formwork preparation (formwork systems and installation sequence). In general there are always returning subjects for the construction preparation, however, to most of the methods and procedures for the planning of works there are no standard.

Supervision of works is been conducted by crafts-related check lists for the examination and documentation.

Procurement management is been arranged in line with an appointment plan that stipulates the single crafts to be awarded. The sequence of the tendering and awarding process is as follows:

1. Preparing the tender documents

2. Preparation of a bidder's list

3. Distribution of the tender documents by the means of the internet-based company tender software

4. Receiving of bids, assessment and preselection

5. Technical clarification meetings contract negotiations

6. Assignment and contract signature

In general subcontractor's proposals are obtained before an offer is delivered to the client. Nevertheless, this is not always possibly due to the tight submission deadlines. In such cases the company relies on experience values and reference projects in the respective region or country.

Project communication takes place through an internet-based project repository which substitutes personal emails and serves for the communication as well as documentation.

The project reporting occurs regularly, internally through financial statements, monthly achievement statements as well as budget and cost control.

The reporting towards the customers occurs according to customer expectations and project needs, by means of project reports with presentation of the construction progression, cost control and project forecast. These reports are usually prepared monthly, or according to customer demands. As another measure of the reporting as well as documentation are regular site or project meetings carried out, usually each 1 to 2 weeks.

Human resource management occurs merely through the coordination of the employees on site.

The interviewee obtains his project employees from the different departments of the company based on his planning needs. Once the employees from the central and specialized departments have been assigned the project manager is responsible for the coordination within the project.

Often the project staff doesn't know each other and local employees as well as expatriates, in spite of the cultural differences, need to be brought together in order to efficiently work together.

Project quality management is been established through the company's own quality management manual and a building site inspection plan. Furthermore, the enterprise is certificated in quality management (German Institute for Standardization EN ISO 9001:2008).

5.2. Conceptions of construction project management

In order to identify the preferred conception of project management[77] of the respondents, the researcher is handing over the following tick the box questions together with the prior described questions referred to the personal background and project experience.

The main question the respondent has to ask himself in order to answer the questionnaire is: **"How important is this task to my work"** and tick the corresponding box ranging from 1 (not at all) to 10 (utmost importance).

	Importance to participant	**Additional explanation given by participants**	**Supposed participant's conception of project management**		
			1. Planning and controlling	2. Organizing and coordinating	3. Predicting and managing potential problems
			62	**70**	59
Planning of work	10		10		
Approving subcontractors' programme and methods	7		7		
Controlling the work process	10				
Understanding the construction process and detailed requirement	10				
Understanding particularly the 'H & S' legislation	5		5		
Understanding the work interfaces and subcontractors' work interactions	10			10	
Knowing the construction industry	3				3
Being aware of the history and future development of the construction industry	3				
Communicating with project members by regular meetings	10		10		
Controlling the implementation of the work and keep the plan updated	10		10		

[77] Project management as planning and controlling; Project management as organizing and coordinating, Project management as predicting and managing potential problems Chen, Partington 2006)

Motivating to assist in organizing and coordinating work on site	10			10	
Allocate work tasks to team members	10		10		
Controlling and supporting people in their work and with their tasks	10		10		
Ability to teamwork	10			10	
Building a team and creating a spirit of mutual support, trust and openness	10			10	
Motivating and empowering the team members	10				10
Supporting (in-house) team members with their career development	8				8
Being aware of the contract and any potential loopholes	10			10	
Managing variations and changes to the contract	10			10	
Being aware of potential risks and problems prior to the contract signing	10				10
Coordinating subcontractors' work interfaces to avoid disruption and inefficiency	10			10	
Ability for an over-all picture of the project	10				10
Identifying of potential risks to avoid problems	8				8
Thinking ahead in order to predict problems	10				10
Taking precautions to be able to resolve problems quickly	4				

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A.12. Overview of demographic information of participants

Overview of demographic information of participants

	Interviewee 1	**Interviewee 2**	**Interviewee 3**	**Interviewee 4**	**Interviewee 5**	**Interviewee 6**	**Interviewee 7**	**Interviewee 8**	**Interviewee 9**
Age	37	39	59		45	59	49	59	54
Work experience	7	13	44	15	17	27	25	26	**34**
Areas of work experience	Building material industry and mining	Project management of hotel building projects and factory projects for the electronics and automobile industry	Management of plant construction in the fast-moving consumer good market and other consumables	Architectural planning, project management and controlling	Managing projects for international construction company	Project management and environmental service consultancy	Project management consultancy	Architectural planning, management consultancy, industrial planning, project management of fabrication plants for current employer	Floating structures, reinforced structures for railway stations, maritime structures
Gender	male	male	male	male	male	male	male	male	male
Project responsibility in million €	17	22	800	200	4	40	100	40	120
Education	Bachelor of Science Civil Engineering, Master of Science Renewable Energy	Architect with Diploma	Professional project manager with Diploma, mechanical engineer, motorcar mechanic	Doctor and Diploma Engineer	Civil Engineer with Diploma	Doctorate in mechanical engineering	Diploma Engineer	Diploma Architect	Licensed master builder

	Interviewee 1	**Interviewee 2**	**Interviewee 3**	**Interviewee 4**	**Interviewee 5**	**Interviewee 6**	**Interviewee 7**	**Interviewee 8**	**Interviewee 9**
Certifications	No certification	No certification	No certification	PMP certification	No certification	No certification	No certification	No certification	No certification
Size of employer	500	70000	Self-employed	4000	5000	Self-employed	15000	Self-employed	Self-employed

TABLE A-10 OVERVIEW OF DEMOGRAPHIC INFORMATION OF PARTICIPANTS

A.13. Emerging interview themes (an extract from NVivo)

Name	Sources	Refer-ences	Created	Cre-ated by	Changed
GENERAL INFORMATION	0	0	11.04.2016	MS	11.04.2016
Age	9	9	11.04.2016	MS	06.06.2016
Biggest project responsibility	9	9	11.04.2016	MS	06.06.2016
Company's background	7	7	11.04.2016	MS	06.06.2016
Company's Size (Number of Employ-ees)	6	6	11.04.2016	MS	06.06.2016
Education	9	9	11.04.2016	MS	06.06.2016
Gender	9	9	11.04.2016	MS	06.06.2016
Major achievements	7	7	11.04.2016	MS	06.06.2016
Major task	6	6	04.06.2016	MS	06.06.2016
Previous positions	6	6	11.04.2016	MS	06.06.2016
Previous work experience	8	8	11.04.2016	MS	06.06.2016
Years of work experience	9	9	11.04.2016	MS	06.06.2016
PROJECT MANAGEMENT	0	0	11.04.2016	MS	11.04.2016
Competent project manager	8	8	11.04.2016	MS	06.06.2016
How acquired skills	6	6	11.04.2016	MS	06.06.2016
Importance of project management	4	4	11.04.2016	MS	06.06.2016
Most time of work	4	4	11.04.2016	MS	06.06.2016
What means project management	8	8	11.04.2016	MS	06.06.2016
PROJECT MANAGEMENT METHODS AND THEMES	0	0	11.04.2016	MS	04.06.2016
Approval and release procedure	3	3	04.06.2016	MS	06.06.2016
Big data in construction projects	2	2	12.04.2016	MS	06.06.2016
Certification	9	9	11.04.2016	MS	06.06.2016
Change Management	2	2	04.06.2016	MS	06.06.2016
Commission execution plan	0	0	12.04.2016	MS	04.06.2016
Communication	3	4	06.06.2016	MS	06.06.2016
Contract management	5	6	12.04.2016	MS	06.06.2016
Cost management	5	8	11.04.2016	MS	06.06.2016
Culture	1	1	06.06.2016	MS	06.06.2016
Decision making	4	5	11.04.2016	MS	06.06.2016
Health and Safety	4	4	12.04.2016	MS	06.06.2016
In-House Methods	4	4	04.06.2016	MS	06.06.2016
Lean management	1	1	06.06.2016	MS	06.06.2016
PM Tools	6	7	11.04.2016	MS	06.06.2016

Name	Sources	Refer-ences	Created	Cre-ated by	Changed
Procurement management	2	2	06.06.2016	MS	06.06.2016
Progress Controlling	3	3	04.06.2016	MS	06.06.2016
Project management general	1	1	06.06.2016	MS	06.06.2016
Project planning	6	7	12.04.2016	MS	06.06.2016
Promoters of successful PM	1	1	11.04.2016	MS	04.06.2016
Quality	3	4	06.06.2016	MS	06.06.2016
Quotation preparation	4	5	06.06.2016	MS	06.06.2016
Reporting	5	7	12.04.2016	MS	06.06.2016
Resource Planning	0	0	11.04.2016	MS	04.06.2016
Risk management	7	8	11.04.2016	MS	06.06.2016
Software	7	7	11.04.2016	MS	06.06.2016
Standards and Guidelines	1	1	11.04.2016	MS	04.06.2016
Supervision	2	3	06.06.2016	MS	06.06.2016
Team and Staff	3	4	12.04.2016	MS	06.06.2016
Time scheduling	6	7	11.04.2016	MS	06.06.2016
Work breakdown structure	1	1	11.04.2016	MS	06.06.2016

TABLE A-11 EMERGING INTERVIEW THEMES (AN EXTRACT FROM NVIVO)

A.14. Certifications offered in the United States

Certifications offered in the United States		
	Offered by	*Designed for*
Certified Associate in Project Management (CAPM)	Project Management Institute (PMI)[78]	Project team members, project managers and construction career entrants
Project Management Professional (PMP)	PMI	CAPM holders and other professionals who want to increase proficiency in project management
Program Management Professional (PgMP)	PMI	CAPM and PMP holders and other professionals who want to demonstrate project and large-program management skills
PMI Scheduling Professional (PMI-SP)	PMI	Professionals who develop and maintain project schedules
PMI Risk Management Professional (PMI-RMP)	PMI	Professionals responsible for the anticipation, prevention and management of project risks
PMI Certified Organizational Project Management Model (OPM3) Assessor	PMI	For assessors to improve their project management maturity and capability
PMI Certified Organizational Project Management Model (OPM3) Consultant	PMI	For consultants to improve their project management maturity and capability
Certified Construction Manager (CCM)	Construction Management Association of America (CMAA)	Construction managers intending to enhance their knowledge in project, cost, time, contract, quality, safety and risk management as well as their professional practice
Engineering Management Certification Fundamentals (EMCF) and Engineering Management Certification Professional (EMCP)	Engineering Management Certification International (EMCI)	Engineers who want to became certified professionals in engineering management, not only limited to project management
International Certifications		
	Offered by	*Designed for*
IPMA Level A-D	International Project Management Association (IPMA)[79]	All types of project management entrants and professionals

TABLE A-12 PROJECT MANAGEMENT CERTIFICATIONS

[78] www.pmi.org

[79] www.ipma.ch

A.15. Definitions of the scales of the leadership dimensions by Dulewicz

"A*.1. Intellectual competence*

1. Critical analysis and judgment: the leader gathers relevant information from a wide range of sources, probing the facts, identifying advantages and disadvantages. Sound judgements and decisions making, awareness of the impact of any assumptions made.

2. Vision and imagination: the leader is imaginative and innovative. He or she has a clear vision of the future and foresee the impact of changes on implementation issues and business realities.

3. Strategic perspective: the leader is aware of the wider issues and broader implications. He or she balances short and long-term considerations and identifies opportunities and threats.

A.2. Managerial competences

4. Resource management: *the leader organizes resources and co-ordinates them efficiently and effectively. He or she establishes clear objectives and converts long term goals into action plans.*

5. Engaging communication: *the leader engages others and wins their support through communication tailored for each audience. He or she is approachable and accessible.*

6. Empowering: *the leader gives direct reports autonomy and encourages them to take on challenges, to solve problems and develop their own accountability.*

7. Developing: the leader encourages others to take on ever more-demanding tasks, roles and accountabilities. He or she develops others' competencies and invests time and effort in coaching them.

8. Achieving: the leader shows an unwavering determination to achieve objectives and implement decisions.

A.3. Emotional competencies

9. Self-awareness: *the leader is aware of his or her own feelings and able to recognize and control them.*

10. Emotional resilience: *the leader is able to maintain consistent performance in a range of situations. He or she retains focus on a course of action or the need to obtain certain results in the face of personal challenge or criticism.*

11. Intuitiveness: *the leader arrives at clear decisions and is able to drive their implementation in the face of incomplete or ambiguous information by using both rational and 'emotional' perceptions.*

12. Interpersonal sensitivity: the leader is aware of, and takes account of, the needs and perceptions of others in arriving at decisions and proposing solutions to problems and challenges.

13. Influence: *the leader can persuade others to change a viewpoint based on the understanding of their position and the recognition of the need to listen to this perspective and provide a rationale for change.*

14. Motivation: *the leader has drive and energy to achieve clear results and make an impact.*

15. Conscientiousness: *the leader displays clear commitment to a course of action in the face of challenge and matches 'words and deeds' in encouraging others to support the chosen direction*." (Dulewicz and Higgs, 2005)

A.16. PM topics of interviews (MindMap)

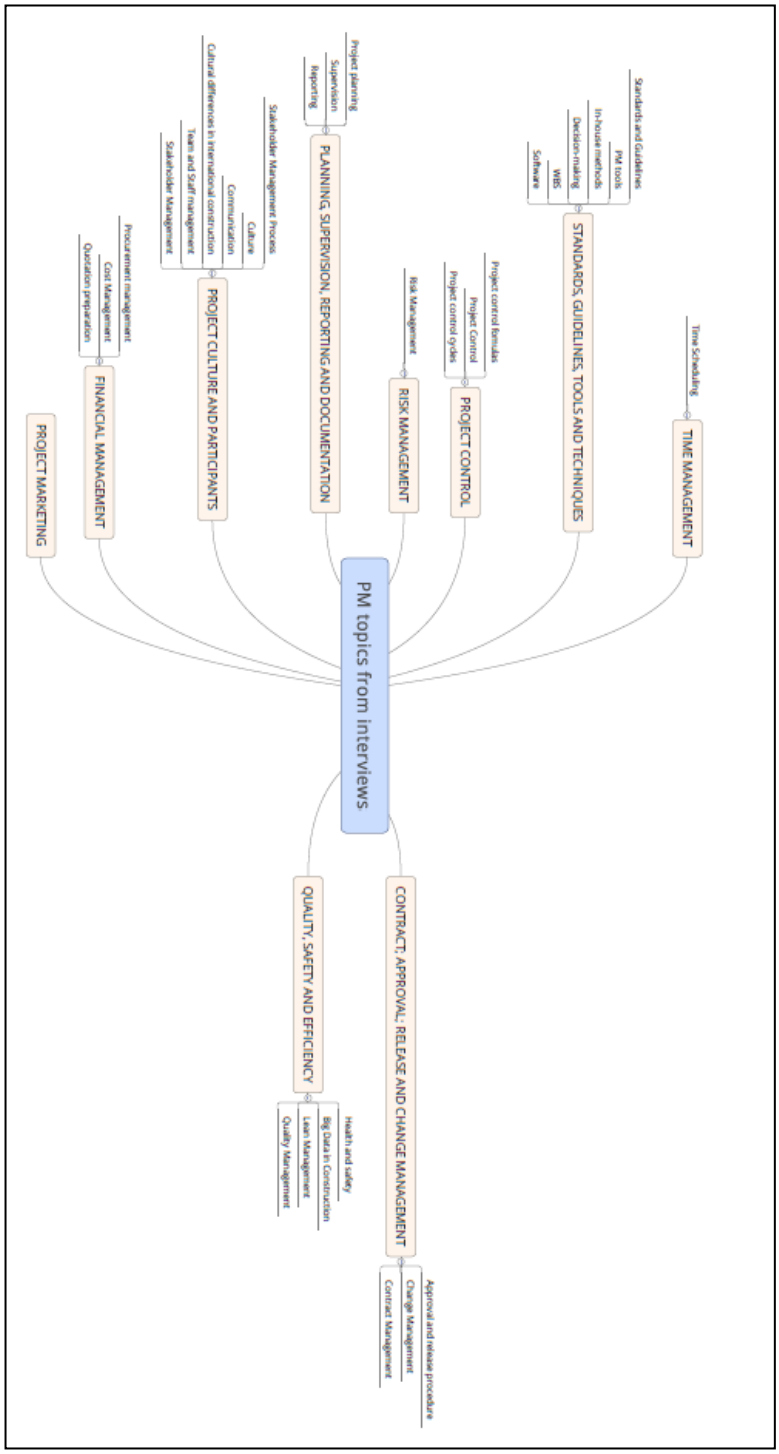

FIG. A-3 PM TOPICS OF INTERVIEWS

Sample WBS – Function oriented

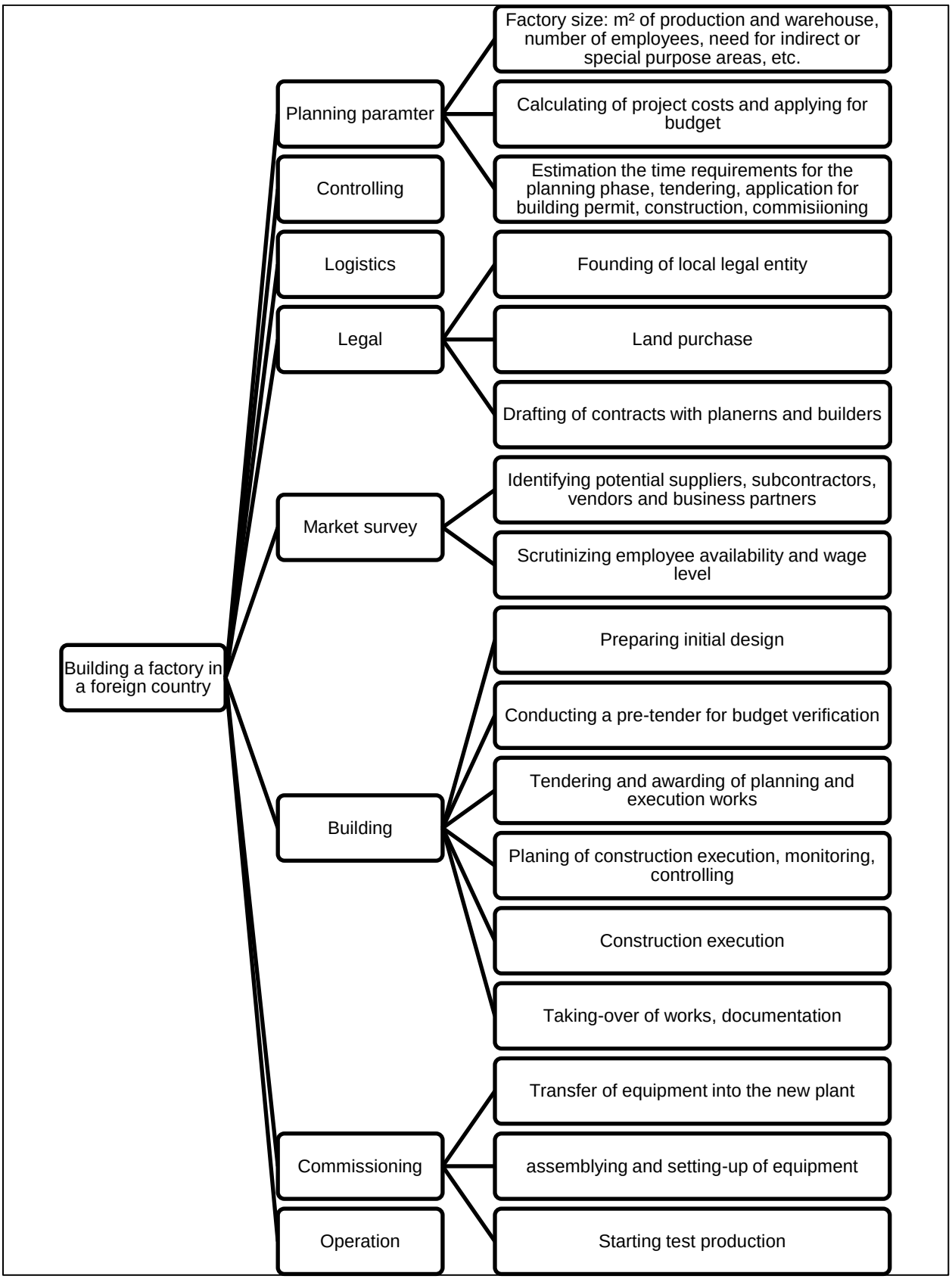

TABLE A-13 SAMPLE WBS – FUNCTION ORIENTED

A.17. Exemplary stakeholder identification of a building project

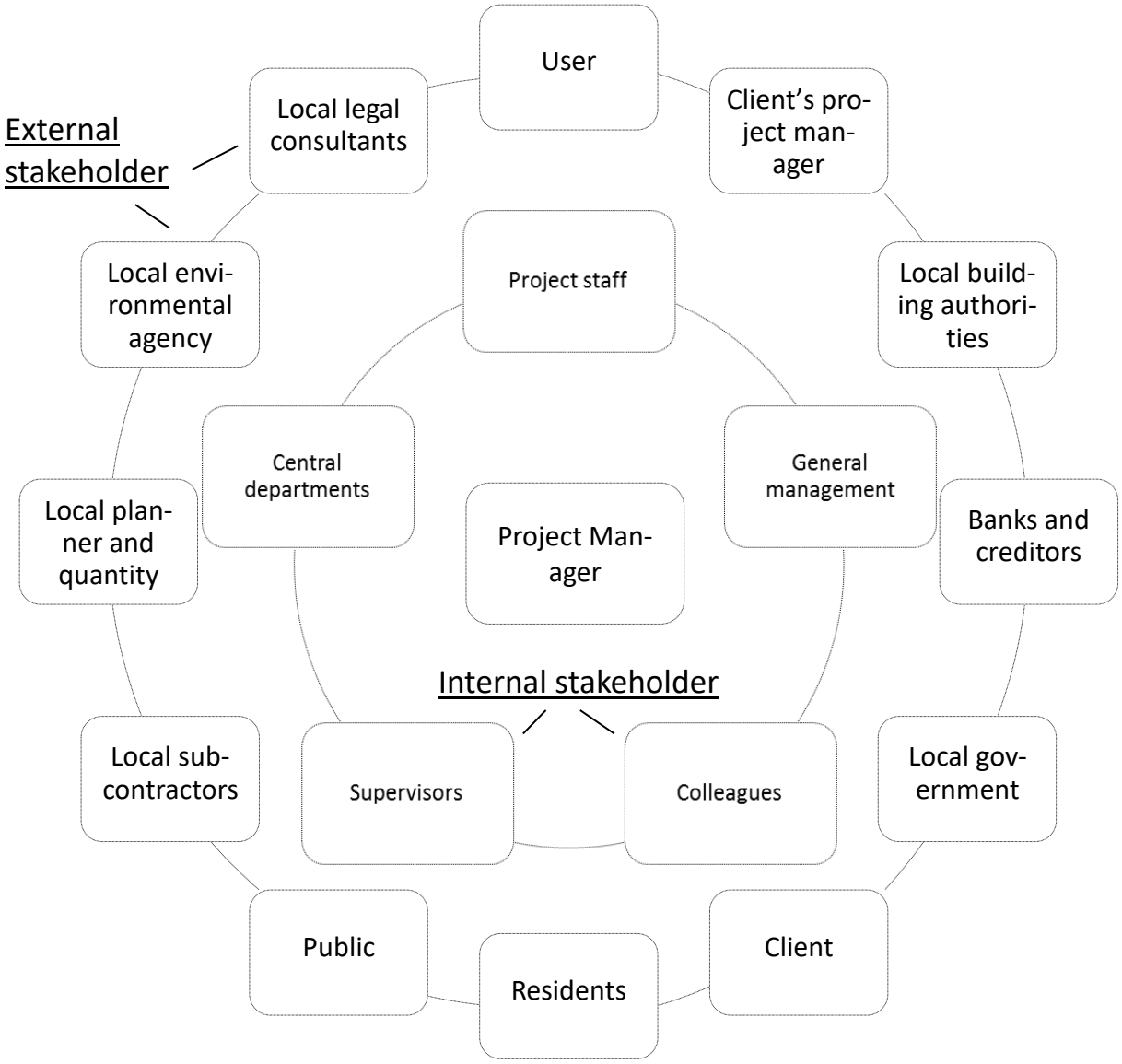

FIG. A-4 EXEMPLARY STAKEHOLDER IDENTIFICATION OF A BUILDING PROJECT

Stakeholder	Interest/ Goal	Expectation on project manager	Degree of importance	Degree of support
General Management	Profitability, reference projects, market penetration	Appropriate economic planning, adherence to budget, time, quality and contract	+ + +	+ + +
Banks	Full credit repayment	Timely transfer of instalments	+ +	+
Residents	No disturbances, noise annoyance or pollution	Reduce construction noise, limit working hours, avoided additional anger	+ +	-

TABLE A-14 EXEMPLARY STAKEHOLDER MATRIX

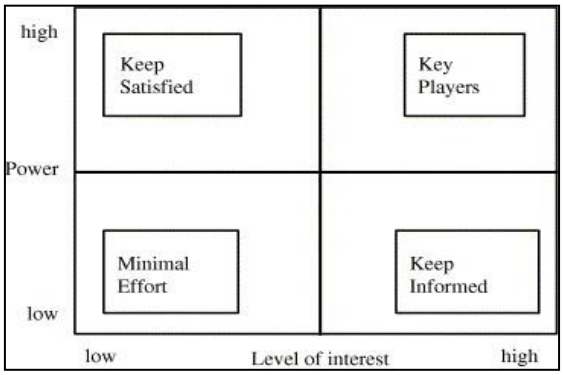

FIG. A-5 STAKEHOLDER MAPPING, THE POWER AND INTEREST MATRIX (OLANDER AND LANDIN, 2005)

A.18. Risk identification by origin according

Risk identification by origin
Technological risks (planning and execution risk, quality risk, changes in the terms of reference)
Processing technology risks
Organisational risks
Schedule risks
Financial and cost risks
Contractual risks
Legal Risks
Environmental risks
Political Risks
Sociological risks
Supply risks
Major problem areas in international construction projects
General political risks
Monetary and exchange rate risks, export of dividends
Tax risks
Infrastructure risks
Delayed payment- and default risks
Supply risks
Contract implementation risks
Delay and default risks and additional costs
Cultural risks
Customer risks
Financial project risks
Calculation and quotation risk
Credit risk
Interest rate risk
Cost variances due to higher volumes and lower efficiency
Cash flow and return or investment risk
Payment uncertainty and risk of payment retention

Risks of liability claims abroad (disproportionate costs incurred in liability abroad)
Risk categorization by function
Sales and costing
Legal and contractual department
Purchasing (also management of subcontractors)
Project preparation and planning
Manufacturing and assembly
Accounting and billing
Technical and commercial project management
Finance Department
Risks of each project phase[80]
Project idea
Feasibility study
Market investigation
Defining the project requirements and parameters
Preliminary designing, architectural planning
Tendering and bidding phase
Negotiation phase
Contracts
Detailed planning
Subcontracting (trader risk)
Construction and completion (failure to complete or delay)
Acceptance and handover
Commissioning
Warranty

TABLE A-15 RISK IDENTIFICATION BY ORIGIN ACCORDING (VOIGT, 2010)

[80] In order to identify, categorize and visualize possible project risks Hilson suggests preparing a flow chart of the project and allocating the anticipated risks to each project phase and to the individual project tasks David Hillson, "Using a Risk Breakdown Structure in project management," *Journal of Facilities Management* 2, no. 1 (2003)..

A.19. Risk Breakdown Structure of Building Projects

External risks
Legal risks
• Lack of knowledge of local law and execution of contracts according local law • Local regulations • Required permits, certificates and clients/official approvals • Certainty of the current laws • Unknown construction related standards • Working time regulations • Labour law • Individual liability of project members and project manager • Travel and visa regulations • Access to and reliability of guaranties (advance payment, performance bond, etc.) • Purchasing and ownership risks Possibility and execution of temporary imports of equipment
Political risks[81]
• Impending elections • Risk of riots or war • Government shifts
Economic risks
• Price escalation of goods and materials in target country • Exchange rate fluctuation • New or altered taxes • Financing conditions of project office • Hindrances or limitation of profit exportation to home country

[81] Xiaopeng identified and analysed the variables having influence on the political risk level in international construction projects Deng Xiaopeng and Low S. Pheng, "Understanding the critical variables affecting the level of political risks in international construction projects," *KSCE Journal of Civil Engineering* 17, no. 5 (2013).. The top ten variables contributing to the political risk level and resulting from the survey are:

- Degree of government stability
- Project desirability to the host country
- Policy uncertainty
- Racism and xenophobia
- Unfavourable attitude towards foreign business
- Strong relationship with governments
- Adverse legal rulings
- Misconduct of contractors
- Currency instability
- Level of public opposition to the project
-

- Required local added value
- Inflation

Social and intercultural risks

- Lack of understanding between expatriates and local stakeholders
- Inappropriate education, training and work experience (especially in technical and academic demanding jobs)
- General cultural differences and insurmountable cultural barriers
- Seasonal working
- Strikes, unions, different holidays and working time due to culture or religion
- Local staff in project team has different goals than the company (e.g. prolongation of the project to be longer employed, gain of reputation to start working for local client or project partner in future)

Natural risks

- Rainy season, harsh winters, hot summers
- Earthquakes
- Floods

Stakeholder risks

- Missing cooperation or competition among stakeholders
- Not all stakeholders are following the same project goal
- Lack of support by important stakeholders
- Deficient incorporation of key stakeholders into the project
- Deficient project marketing

Country risks

- Bribery
- Bureaucracy
- Regulations and laws
- Government and political stability
- Reliability of legal system
- Economic stability
- Conflicts, wars and terrorism
- Project experience in the country
- International relations of project country
- Attitude towards foreign companies
- General poor macroeconomic conditions

• Contract enforcement risks in case of breaches, violations; guarantee and liability risks by applicable local law
Geographic risks
• Geographical distances • Time differences • Travel time to project (response time in case of emergency)
Internal risks
Management risks
• Unrealistic project goals (financially, timely, too few resources, too little management support, too long decision making process, etc.) • Organization shortcomings (no internal international human capacity like lawyers specialized in international law, internationally experienced project managers and key staff) • Missing or insufficient H&S programme • Poor or ineffective communication and reporting system across all project stake-holder in various countries; No proper on-site organization; Support and provision of resources by parent company
Design risks
• Local design requirements not taken into consideration, missing investigation • Changes in design when adapting the initial design from home country to project country • Incompleteness or inaccuracy of design • Missing documentation • Environmental regulations; Delay of design preparation; Delayed building permits
Construction and project realization risks
• Feasibility of the project under the international circumstances • Expertise and experience of project manager/ contractor in target country and in specific construction sector • Underestimation of the intercultural influences • Missing individual cultural training of expatriates • Technical and financial capabilities of local subcontractors • Budget and time targets • Technical and managerial complexity of the project • Vagueness of construction techniques and methods in project country • Claims

- Change of scope, change of order of works

Human risks

- Other level of productivity than expected (and assumed for time calculation)
- Motivation and commitment of all project members to meet cist, time and quality targets
- High fluctuation
- Required but not anticipated incentives to obtain and retain local staff

Delivery, technical and logistics risks

- Availability of technology and materials
- Local code of practice
- High import duties for imported goods and equipment
- Lack of adequate subcontractors and local suppliers, bad workmanship of subcontractors
- Reliability of equipment

Contractual risks

- Choosing the right type of contract (bid contract, design and build, turnkey, material delivery, etc.)
- Unrealistic financial or time targets
- New and unknown relations and positions (e.g. contractors representative or quantity surveyor)
- Chain of control and organization chart (who has authority and is entitled to make decisions)
- General vagueness of contract conditions
- Contract clauses concerning country risks

Client risks

- Demanded design changes (without price, time or contract adaptation)
- Inappropriate documentation of communication
- Not evidenced changes or change requests
- Claims
- Payment conditions, delayed release or withhold of payments
- Acceptance procedure and taking-over of works
- Client's experience and emphasize on low construction costs/ high construction quality
- Clients contribution (release and acceptance procedures)

• Technical and managerial skills of client
Other local and global risks
• Labour risks (availability, training level, salary, fluctuation, reliability, holidays, working hours, etc.) • Site risks • General financial risks (shortage of funds, delayed payments, non-anticipated expenditures, etc.) • Exchange rate risks, transfer risks • Timeframe risks (wrong time assumptions, delays, extra work, critical path and buffer time, etc.) • Liability risks, risks from delays, price risks/ Insurability

TABLE A-16 RISK BREAKDOWN STRUCTURE OF BUILDING PROJECTS

A.20. Typical mistakes in building management

Table A-17 shows some typical mistakes in building management (according to project phases) as proposed by Seefeldt (Seefeldt, 2003):

Project planning
Inadequate requirement analysis
Inadequate definition of project objectives
Lack of proper feasibility analysis
No risk analysis and stakeholder analysis
Too low budget and too tight deadlines
Poor clarification of project financing
Inadequate definition of roles and hierarchies within the project team
Poor communication of project goals and building contents; false expectations of project participants
Tendering phase
Inadequate specifications, layouts and drawings
Inadequate, unsystematic and inconsistent selection of inquiries and offers
Insufficient integration of the project construction management and technical experts in the bid preparation
Inadequate risk analysis
Too few alternative offers
Contract negotiations
Too short building time assumed
Insufficient planning time
No decision on designating individual time limits and consequences for non-compliance
Insufficient documentation of the outcomes of negotiations
Construction project preparation
Poor management of authorities
Too late or insufficient permit application
No clear division of responsibilities of the stakeholders and parties
Inadequate coordination of the construction preparation
Inadequate planning of appointments, deadlines, work packages and finishing details
Inaccurate construction planning
Building realization and control

Poor economic and timely control of projects
Poor coordination of subcontractors and suppliers
Poor communication and documentation in the project
Insufficient avoiding or enforcing of claims
Lack of post calculation and follow-up of construction

TABLE A-17 TYPICAL MISTAKES IN BUILDING MANAGEMENT