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Ökmen, Önder; Leijten, Martijn; Strattona, Theodora; Bosch-Rekveldt, Marian; Bakker, Hans

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Employee perspectives on risk management in a construction company

Önder Ökmen[a], Martijn Leijten[b], Theodora Stratton[a], Marian Bosch-Rekveldt[a] and Hans Bakker[a]

[a]Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, The Netherlands; [b]Faculty of Technology, Policy and Management, Delft University of Technology, Delft, The Netherlands

ABSTRACT

In addition to the tools and techniques available, project risk management also depends on the attitudes of people in an organisation, how the available tools are used, and how the procedures are followed. Therefore, efforts to improve the project risk management capacity of organisations may fail if the diversity of people (characters, traits etc.) involved is neglected. Based on this argument, the aim of this study is to demonstrate that companies can improve project risk management using the perspectives of their key experts. In this context, an approach was proposed based on Q-Methodology and a case study has been conducted in a construction company in the Netherlands. The quantitative output obtained through Q-Methodology application was evaluated in conjunction with the qualitative data gathered from interviews conducted with the managers of different units within the company. As a result of this evaluation, three common perspectives were identified among the respondents under the names of 'Experience and Belief', 'Procedures and Management' and 'Culture and Communication', respectively. Then, a number of recommendations were made to the company. First, customized management approaches that integrate and balance the identified perspectives should be adopted. Second, a mature organisational risk management culture should be promoted. Project charters that specifically target risk management culture in projects can be used for this purpose. Third, risk management should be integrated into other activities, making it a normal part of employees' daily work. Finally, but not exclusively, the employees should be instructed on the use of risk registers and guidance should be put in place on how often they are expected to update the risk registers. This study demonstrates the benefit of considering employee diversity and leveraging perspectives in unlocking the potential of construction companies in terms of project risk management.

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CONTACT Önder Ökmen o.okmen@tudelft.nl Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, The Netherlands.

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Introduction

Risk management, rather than eliminating uncertainty, aims to reduce the negative effects of risks (Maylor 2010; Wu et al. 2017). Project risk management involves the methods, practices and tools utilised to manage risks in projects (Besner and Hobbs 2012). The main processes of project risk management are risk management planning, risk identification, risk analysis (qualitative and/or quantitative), risk response planning, risk response implementation and risk monitoring (Dikmen et al. 2008; PMI (Project Management Institute) 2009; PMI (Project Management Institute) 2021). The risk response strategies to be followed may be accepting, avoiding, reducing, transferring, sharing, retaining or financing the risks (Akintoye and Malcolm 1997; PMI (Project Management Institute) 2009; PMI (Project Management Institute) 2021; Yan et al. 2022; Oke et al. 2023). However, successful risk control requires the proper implementation of these risk response strategies, separately or in combination (Baker, Ponniah, and Smith 1999; Arabi, Eshtehardian, and Shafiei 2022; Oke et al. 2023). In addition, the aforementioned processes of project risk management should be conducted repetitively throughout the projects' lifecycles to increase the likelihood of meeting project objectives (Dikmen et al. 2008; Oke et al. 2023).

Every project is unique and executed under uncertain conditions, thus inevitably requiring the practice of risk management to be successful (PMI (Project Management Institute) 2009; PMI (Project Management Institute) 2021; Jarrah, Jarah, and Altarawneh 2022). This is also valid for construction projects (Ökmen 2016; Alfreahat and Sebestyén 2022). Successfully completing the construction projects and achieving the objectives depends to a great extent on properly managing the project risks (Zwikael and Ahn 2011; PMI (Project Management Institute) 2016; Li, Fang, and Sun 2016; Wu et al. 2017; Masár et al. 2022). A survey conducted among the practitioners in the construction sector revealed that project risk management was needed to minimize losses and to increase profits (Akintoye and Malcolm 1997). Dikmen et al. (2008) defined the risk-driven featured management approaches as among the critical success factors of construction projects. Hoseini, Hertogh, and Bosch-Rekveldt (2019) consider that risk management increases the chance of project success in construction projects. Baloi and Price (2003) envisaged a direct relationship between effective risk management and the achievement of project success criteria, i.e. mainly time, cost and quality. Safety, environmental sustainability, market entry, organisational and stakeholder gains are the other success criteria that researchers have included in this list (Liu and Walker 1998; Atkinson 1999; Chua, Kog, and Loh 1999; Zou, Zhang, and Wang 2007; Lindhard and Larsen 2016; Koops et al. 2017). Risk management is necessary for organisations to achieve their objectives; therefore, new measures or approaches developed to increase the effectiveness of risk management are always in demand. Bryde and Volm (2009) identified poor application of project risk management as contributing to poor performance of construction projects. Though detailed risk management procedures, guidelines and processes have been developed specific to the construction projects, these are still open to improvement and sometimes not implemented consistently even in their current forms (Hoseini, Hertogh, and Bosch-Rekveldt 2019). Furthermore, in recent years, construction projects have become increasingly larger and more complex, and additionally along with developments in digitalization, the need to improve risk management increases (Nieto-Morote and Ruz-Vila 2011; Chenya et al. 2022).

In construction projects, risks are generally perceived as any possible event that could affect the achievement of project objectives. Risks can arise from a variety of sources in construction projects, which can be classified as physical, operational, environmental, construction, design, financial, political, legal, social, contractual, market, and logistics (Elbashbishy et al. 2022). Furthermore, the construction sector carries high risk potential by nature depending on the characteristics of the activities and processes along with environmental and organisational features involved (Akintoye and Malcolm 1997). With the digitalization revolution in areas such as artificial intelligence, cloud computing, internet of things and big data, risk patterns in

construction projects have started to change and accordingly, the need for new expansions in traditional risk management has begun to emerge (Chenya et al. 2022). However, people, their perceptions and the approaches applied still continue to play a prominent role in risk management, and this study handles the topic from the people's perspective.

In addition to the tools and techniques available, project risk management also depends on the attitudes of people in an organisation, how the available tools are used, and how the procedures are followed. Previous studies conducted related to risk perception have provided insights about how different actors in projects perceive the risks and what concerns they assign to the risks and to their potential consequences (Aven 2016). According to Jaafari (2001), risk management is a philosophy, i.e. it does not only relate to the existing quantitative tools and guidelines. However, the philosophical background to this topic is not well defined or understood (Dikmen et al. 2008). One aspect of this philosophy is the way people perceive risk management including what they believe to be important to successfully implement risk management. Each manager might have their own approach to risk (Elke, Blais, and Betz 2002). Existing research associates individuals' approaches with risk through a variety of personal aspects including professional experience, personality, gender and age (Nicholson et al. 2002; Fiolet, Haas, and Hipel 2016). The important point here is that the efforts to provide improvement in organisations' project risk management capacity might fail if the diversity of people (characters, traits etc.) involved is neglected. Based on this argument, the aim of this study is to demonstrate that companies can improve project risk management using the perspectives of their key experts. In this context, an approach based on Q-Methodology was proposed and a case study has been conducted in a construction company in the Netherlands by following this approach.

In project management research, several studies were conducted previously using Q-Methodology to reveal different perspectives on certain subjects such as 'stakeholder engagement in large-scale energy infrastructure projects' (Cuppen et al. 2016), 'stakeholders' influence on road procurements' (Kornevs, Kringos, and Meijer 2016), 'sustainability in project management' (Silvius et al. 2017), 'public acceptance of wind farm proposals' (Ellis, Barry, and Robinson 2007), and 'project success criteria for a project-based organisation and its stakeholders' (Sastoque-Pinilla et al. 2022). However, there is still a research gap in bringing a structured approach to different personal traits related to risk management, determining the perspectives of employees on risk management in project-based organisations, and using the determined perspectives to improve project risk management. This study specifically aims to investigate this issue using Q-Methodology and opens a new discussion on exploring the depths of common human perspectives and creating new approaches, policies and procedures in managing projects by leveraging these perspectives.

The following sections provide a description of the proposed approach, details of the case study conducted and the conclusions, as well as suggestions for future study.

An approach to identifying perspectives and making recommendations

Everyone involved in a particular project or discussion will have their own opinion on any topic. Their views are not right or wrong, but can only be defined subjectively as they originate from their own 'internal frame of reference' (McKeown and Thomas 2009). Q-Methodology allows to examine subjectivity in a systematic way (Brown 1993; Damio 2016; Damar and Sali 2022) and enables analysing the differences and similarities in individuals' viewpoints (Suprapto et al. 2014). This method can be utilised to explore the range of ideas that exist in a population about a particular topic. Furthermore, it can be used in any research area where subjectivity is addressed, including attitude measurement (Stephenson 1965). The method includes activities such as interviewing and asking participants to prioritize and group certain items. The results obtained are quantified by examining the items prioritized most or least by the participants. Q-Methodology also allows qualitative data, such as opinions, to be analysed quantitatively in order to typify

and group the range of opinions. This way, common viewpoints can be identified (Damio 2016; Damar and Sali 2022). Q-Methodology first helps to explore the correlations between the viewpoints across a sample. Then, the individual viewpoints are reduced down to a few factors through the factor analysis. These factors represent the mathematical patterns of common perspectives shared by a group of people (Koops et al. 2017).

In a Q-Methodology application, participants are asked to prioritize a set of statements presented to them based on a specified scale to reflect their views on a particular topic. This process is called Q-sorting; participants are part of what is called P-set, and the set of statements provided to participants is called Q-set (Brown 1993; Exel and Graaf 2005; Damio 2016; Sastoque-Pinilla et al. 2022). The statements have to be ranked from 'strongly disagree' to 'strongly agree' or from 'least important' to 'most important' depending on the sorting question. These rankings are then processed using statistical analysis so that similarities between them are identified. The patterns revealed by statistical analysis are used to describe different views or perspectives on the topic in question (Exel and Graaf 2005; Webler, Danielson, and Tuler 2009; Damar and Sali 2022; Sastoque-Pinilla et al. 2022). These perspectives can be used to identify consensus or contrasts in views, to identify preferences for a particular solution, or to understand conflict among a group (Exel and Graaf 2005; Webler, Danielson, and Tuler 2009). The purpose of the Q-Methodology application is not to determine which variables or statements are most important in general, but to gain insight into why 'statement A' is more important than 'statement B' so that the researcher can identify relevant groups of ideas (Damar and Sali 2022; Sastoque-Pinilla et al. 2022). Figure 1 shows the basic steps of the Q-Methodology.

The schematic process flow of the approach built on Q-Methodology and implemented on a company in this study is given in Figure 2. The steps constituting the approach are listed below and explained subsequently:

- identifying critical success factors of project risk management, determining the 'concourse' (i.e. a broad set of possible statements around a topic)
- reducing the number of critical success factors in the concourse based on a number of specific requirements imposed, determining the 'Q-set' (i.e. the set of statements to be used to perform Q-sorting process among the respondents)
- determining the respondents (participants) of Q-Methodology application, the 'P-set'
- performing Q-sorting process among respondents using the Q-set (i.e. quantitative results)
- conducting interviews with the respondents (i.e. qualitative results)
- jointly evaluating the quantitative and qualitative results
- identifying the perspectives based on this combined evaluation
- making recommendations to improve risk management

Firstly, the respondents who will participate in the Q-Methodology application are determined, the P-set. Simultaneously, critical success factors (CSF) of project risk management are investigated through reviewing relevant literature and appealing to expert opinions. In this way, the 'concourse' is obtained. The concourse is defined as the set of possible statements that could be made around a specific topic (Damio 2016). After obtaining the concourse, the statements that will be used during the Q-sorting process are determined through reducing the number of CSFs in the concourse. Literature study (as the ready-made sampling), reduction of the number of CSFs through specific requirements imposed (as the unstructured sampling) and discussion with experts of risk management within the organisation (naturalistic sampling) are used respectively to reduce the number of CSFs.

Afterwards, Q-sorting is conducted among the respondents (P-set) and subsequently, interviews are performed with respondents on their Q-sorts to fully understand the logic behind their responses. This way, qualitative data is obtained. Then, the Q-sorts of the respondents

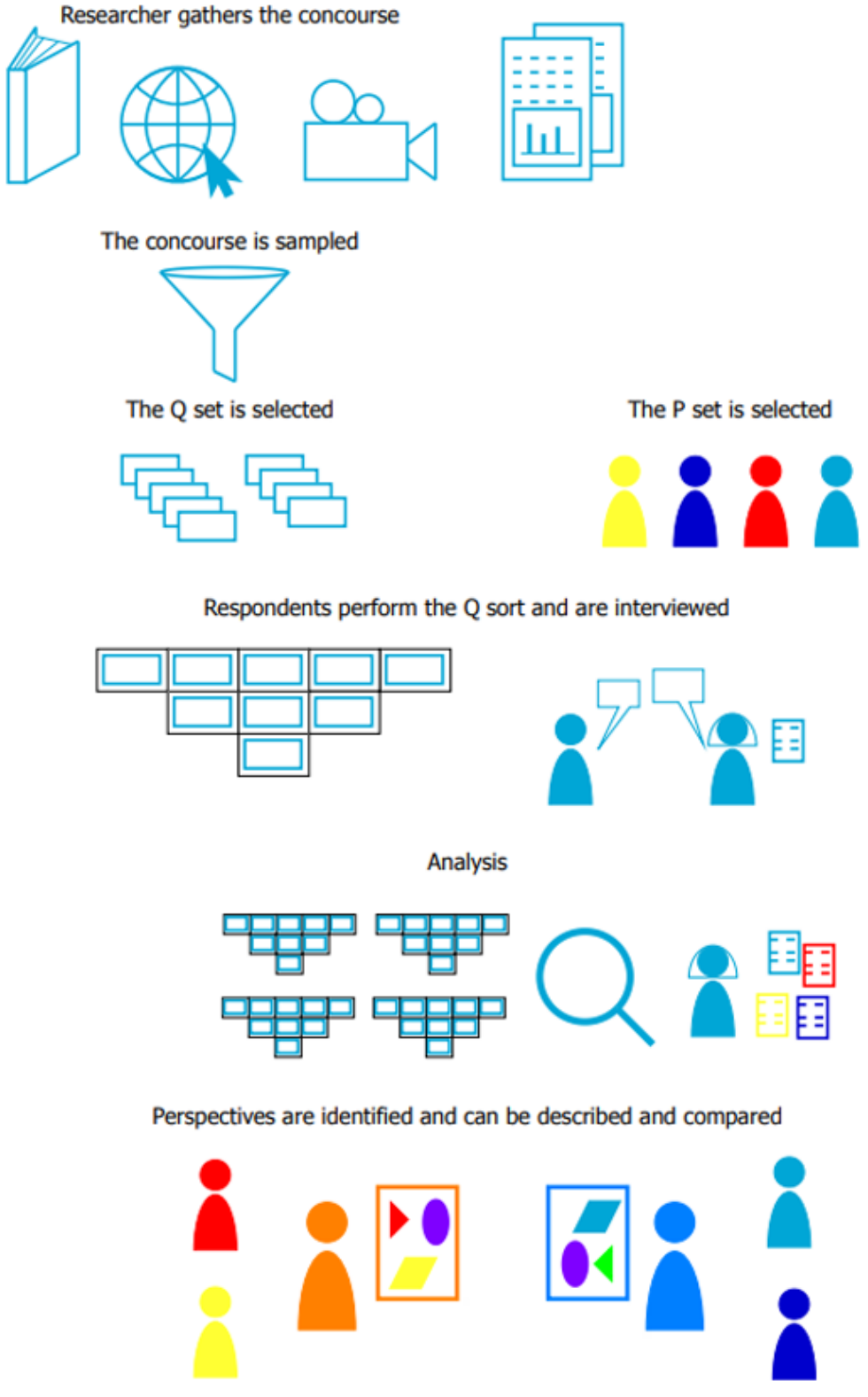

Figure 1. Basic steps of Q-Methodology.

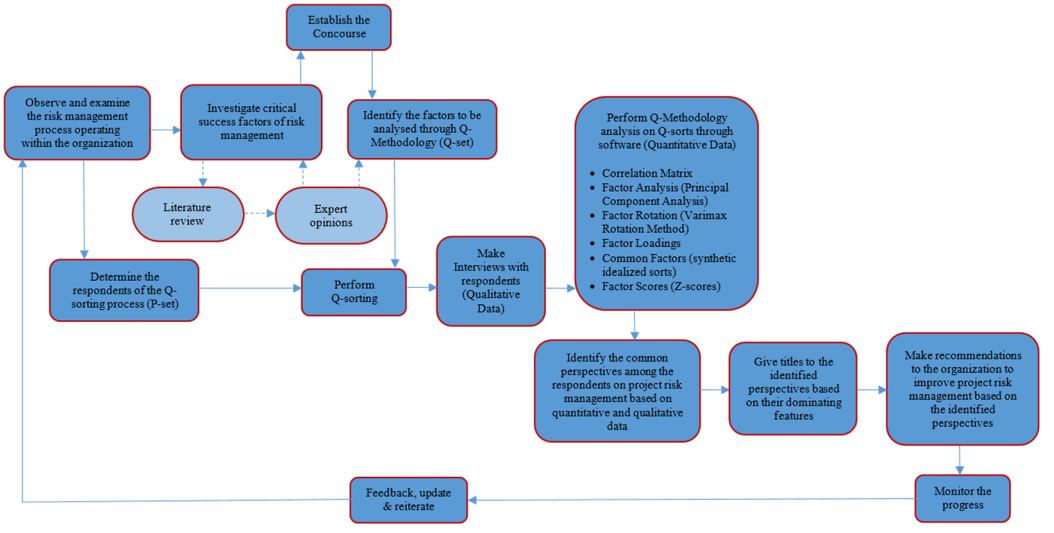

Figure 2. Process flowchart of the proposed approach.

are analyzed using relevant software developed for this purpose and accordingly, the quantitative results are obtained. Finally, perspectives among the participants with regards to project risk management are identified through jointly taking into consideration the idealized Q-sorts (factors) and qualitative data obtained through interviews made. The perspectives identified could also be given names that implicate their general features. Based on these perspectives, recommendations are made to the organisation to improve the way of managing risks in their projects. Then, the progress achieved in this regard through the implementation of these recommendations can be monitored and the whole process is reiterated when required (refer to Figure 2).

Case study

The approach proposed in the previous section and also schematized in Figure 2, was implemented as a case study in a construction company in the Netherlands, which is designated as 'the Company'. The Company is a well-established construction firm in the Netherlands and is one of Europe's largest international contractors. The main focus of this application has been the construction project risks and their management. The data was collected from fifteen managers of the Company in different functional teams categorized as design, execution and support. All the respondents had worked on a major infrastructure construction project realized in the Netherlands referred to as 'the Project', which is a relatively large-scale, complex project. The majority of the respondents also had experience in many different projects apart from the Project. Therefore, in this study, it is assumed that the respondents reflect their knowledge and experience not only from the Project but also from other projects in which they have been involved.

Researching the concourse and determining the Q-set

The literature relating to the construction industry and project risk management was investigated to create the 'concourse'. The research was carried out around the terms like *improving risk management, effective risk management, improving risk management in construction*, and *critical success factors of risk management*. With this way, 78 different CSFs were identified, forming the

'concourse'. The concourse and used sources are included in the 'Supplemental Materials File'. Then, the concourse was refined and shortened to constitute the Q-set. This was achieved in two stages. First, the number of items in the concourse was reduced by implementing the following requirements on the items:

- The item must be explicitly mentioned in a source as a CSF of project risk management.
- The item must be mentioned in a source related to the construction sector.
- The item must be mentioned in at least two sources.

Once the above requirements had been implemented, it was observed that 21 out of 78 items met all the three requirements and six items met only two of them. Therefore, these 27 CSFs in total were transferred to the next stage for review. This process was performed with the help of the expertise of the risk manager of the Project. The list of factors was shown to the risk manager and the intended meaning as well as the relevance of each item was asked for. In accordance with the explanations, it was decided to eliminate five items from the list. At the same time, three items were added to the list of CSFs (Q-set) out of the items in the concourse based on the risk manager's previous experience. Before deciding on the final form of the Q-set, each statement was reviewed, rephrased and shortened to make cards to be used in Q-sorting easy to read. The final Q-set, given in Table 1, contained 25 items in total. The three items added upon the suggestion of the risk manager have been listed at the bottom of Table 1, in the last three lines. Brief descriptions of the statements included in the Q-set can be found in the extended version of Table 1 in the 'Supplemental Materials File'.

Q-sorting and interviewing

The Q-set was presented to the 15 respondents in the form of 25 cards. The respondents consisted of a total of 15 managers who were responsible for different management functions within the Company (5 managers in each function categorized as design, execution and support). The experience levels of them ranged from 5 to 30 years. Except for one participant, all the respondents were Dutch nationals and all of them were male. They were asked to sort the items (statements) in the Q-set considering what they thought important to risk management. In other words, they were asked to rank the statements, taking into account the sorting instruction: '*To carry out project risk management, it is important to have/do…*'.

Figure 3 shows the response chart used during the Q-sorting. As risk management is not the primary function of the respondents, it was decided that the response chart be reasonably wide and include seven columns because it was anticipated that all respondents would have a relatively well-formed view of the topic.

After the respondents completed the Q-sorting, they were asked a number of questions about their level of experience and role. The respondents were also asked whether there were any missing statements in the 25 statements presented to them. They were then asked about the motivation behind the statements they placed at the extreme points of the charts, namely in the columns +3, +2, −2 and −3. Next, participants were asked to reflect on their completed Q-sort charts and summarize their thoughts on what is important to project risk management. Finally, they were asked if they had any comments on the Q-sort activity or interview in general.

Analysing the Q-sorts

The analysis of the data obtained through the Q-sorting process was performed using the PQMethod (PQMethod version 2.35, 2020). This software ensures statistical validity when factor

Table 1. The final Q-set.

No	Statement	Source
1	Integration of risk management with other project management activities	(Jaafari 2001; Schieg 2006; Liu et al. 2007; PMI (Project Management Institute) 2009; Hillson and Simon 2012; Hoseini, Hertogh, and Bosch-Rekveldt 2019).
2	A clear long-term strategy towards risk management in the project organization	(Yaraghi and Langhe 2011; Hillson and Simon 2012).
3	Consider the external environment (market, politics, social issues, macro-economic situation)	(Low, Liu, and He 2009; Yaraghi and Langhe 2011; Hoseini, Hertogh, and Bosch-Rekveldt 2019)
4	Adapt risk management to each project	(Cano and Cruz 2002; Hillson and Simon 2012; Olechowski et al. 2016).
5	Establish clear responsibility of roles for managing risks (RACI-matrix)	(Hillson and Simon 2012; Hoseini, Hertogh, and Bosch-Rekveldt 2019).
6	An understanding and belief in the benefits of risk management from all staff	(PMI (Project Management Institute) 2009; Hoseini, Hertogh, and Bosch-Rekveldt 2019).
7	Provision of adequate resources to support risk management	(Hillson 2009; Yaraghi and Langhe 2011; Hillson and Simon 2012; Hoseini, Hertogh, and Bosch-Rekveldt 2019)
8	Decide the appropriate level of risk management for the project	(PMI (Project Management Institute) 2009; Hoseini, Hertogh, and Bosch-Rekveldt 2019).
9	Top management encouraging and supporting risk management	(Zhang 2007; Hillson 2009; Yaraghi and Langhe 2011; Hoseini, Hertogh, and Bosch-Rekveldt 2019)
10	Clear and honest communication	(Chapman 2001; Schieg 2006; PMI (Project Management Institute) 2009; Yaraghi and Langhe 2011).
11	Shared understanding and acceptance of the key concepts of risk management	(Chapman 2001; Hillson and Simon 2012).
12	Project organization risk culture	(Hillson and Simon 2012; Hoseini, Hertogh, and Bosch-Rekveldt 2019).
13	Project organization team spirit	Yaraghi and Langhe 2011; Hoseini, Hertogh, and Bosch-Rekveldt 2019).
14	All staff showing competence in the application of risk management	(Hillson and Simon 2012; Hoseini, Hertogh, and Bosch-Rekveldt 2019).
15	Continuity of risk management across project stages	(Smith 1999; Liu et al. 2007; Dikmen et al. 2008).
16	Detailed documentation of risks	(Chapman 2001; Yaraghi and Langhe 2011; Hillson and Simon 2012; Hoseini, Hertogh, and Bosch-Rekveldt 2019).
17	Application of a standardized risk management process	(Tang et al. 2007; Zou, Zhang, and Wang 2007; Hillson 2009; Yaraghi and Langhe 2011; Hillson and Simon 2012; Hoseini, Hertogh, and Bosch-Rekveldt 2019).
18	Regular training to enhance risk management skills	(Lyons and Skitmore 2004; Yaraghi and Langhe 2011; Hillson and Simon 2012; Hoseini, Hertogh, and Bosch-Rekveldt 2019).
19	Knowledge sharing relating to risk management	(Neef 2005; Hoseini, Hertogh, and Bosch-Rekveldt 2019).
20	Personal experience, intuition and engineering judgement	(Baker, Ponniah, and Smith 1998; Lyons and Skitmore 2004).
21	Consistently review and update the risk register	(Smith 1999; Rahman and Kumaraswamy 2002; Yaraghi and Langhe 2011; PMI (Project Management Institute) 2016)
22	Capture and use lessons learned	(Schieg 2006; Hoseini, Hertogh, and Bosch-Rekveldt 2019)
23	A risk manager appointed to the project	(Hillson 2009)
24	Risk management purposes in line with project goals	(Hoseini, Hertogh, and Bosch-Rekveldt 2019)
25	Careful management of contracts with subcontractors	(Rahman and Kumaraswamy 2002)

analysis is used to identify particular typologies of viewpoints. Firstly, the correlation matrix, which can be found in the 'Supplemental Materials File', was produced by the software. The highest and lowest correlations obtained between any two Q-sorts was 0.66 and −0.37, respectively. The correlation value (r) ranges between −1 and +1, with +1 showing perfect positive correlation (the Q-sorts of two respondents are identical to one another) and −1 showing perfect negative correlation (the Q-sorts of two respondents are the mirror image of one another).

Next, factor analysis was performed *via* 'Principal Component Analysis'. Factor analysis is a statistical method, which reduces a large number of variables to a smaller number of factors. In a Q-Methodology application, the variables are the Q-sorts performed by the respondents

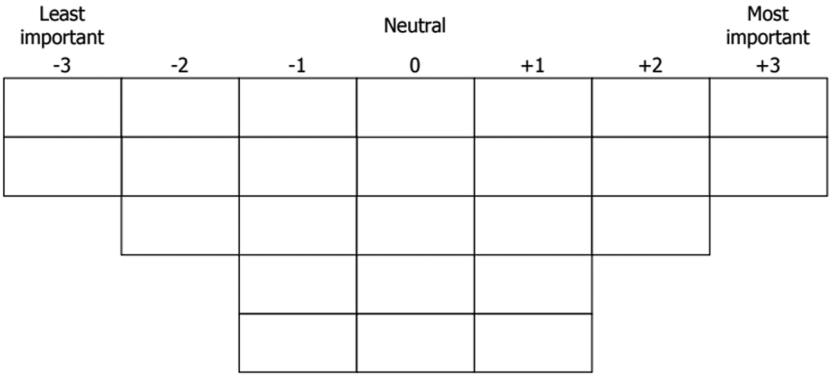

Figure 3. Response chart used by the respondents to sort the 25 statements.

(P-set) and the factors are the shared common perspectives or viewpoints on the examined topic among the respondents. Factor analysis uses the correlation matrix (given in the 'Supplemental Materials File') to examine how many basically different Q-sorts exist. In this way, Q-sorts which have a high positive correlation are grouped together. The 'families' of similar Q-sorts are known as the 'factors' in Q-Methodology. A factor can be defined as a condensed statement of the relationships existing between a group of variables (Kline 1994). However, the factors are also Q-sorts, but can be thought of as 'synthetic' or 'idealized' sorts since they are created by the software rather than by a respondent (Webler, Danielson, and Tuler 2009). These factors or synthetic Q-sorts then allow to identify the common perspectives among the respondents.

After performing the factor analysis, a process called 'factor rotation' was applied a total of six times using the 'Varimax Rotation Method'. The details are given in the 'Supplemental Materials File'. Finally, it was concluded that the '3 factor solution' stands out and is preferable (refer to 'Supplemental Materials File'). Accordingly, the *factors* of the '3 factor solution', along with also taking into consideration the interpretations of the respondents during the interviews, were converted into the *perspectives*, as explained in the following section.

Identifying the perspectives

In order to explore the perspectives, the quantitative output data obtained from the software analysis was combined with the qualitative data obtained through the interviews made with the respondents and all the data collected were evaluated as a whole. To explore the perspectives, give them identity and name them, these factors or synthetic Q-sorts were used.

Firstly, for each factor solution, the characterizing statements i.e. the statements having the five highest and five lowest factor scores (i.e. Z-score values, which will be given in figures and explained in detail for each factor later below) were identified. A statement's factor score can be defined as the normalized weighted average statement score (Z-score) of respondents who define that factor (Exel and Graaf 2005). The factor scores or Z-scores can be used to create an idealized Q-sort for each factor. This is the Q-sort chart which shows how a respondent with a 100% loading onto that factor would choose to rank the statements. The Z-scores can be calculated using the factor loading values. Detailed explanation about Z-scores and their calculation can be found in the 'Supplemental Materials File'.

Some respondents' views might be closer to a certain factor than others'. This means that, in the numerical analysis, their Q-sorts might be closer to a certain factor than others'. The degree of this similarity can be computed into what are called 'factor loadings'. Respondents with a high factor loading, are said to define that factor, which in turn define the perspective

represented by that factor (Webler, Danielson, and Tuler 2009). In other words, the factor loading values between −1 and +1 express the extent to which each Q-sort is associated to each factor or perspective. To avoid a perspective being driven too strongly by one person, it is desirable to have several people with high factor loadings on each perspective. In general, it is important to avoid having a factor or perspective defined by only one person, since it is mathematically impossible to distinguish the social narrative (communality) from the individual perspective (specificity) (Webler, Danielson, and Tuler 2009). The factor loading values obtained in this case study are given in Table 2. A significant factor loading at the 0.01 level is accepted as having a loading value equal to or greater than '2.58 × (1 ÷ √No. of items in Q-set)' (refer to 'Supplemental Materials File'). The threshold value in question has been calculated as close to 0.5 for this case study. Accordingly, the values in the shaded cells on Table 2 close to this value or greater indicate that the corresponding respondent has loaded that particular perspective significantly and therefore represents that perspective more than others. For instance; six, five and three respondents have loaded onto the Perspectives 1, 2 and 3, respectively. The 'respondent 2' did not load significantly onto any of the perspectives and is therefore expressed as a non-loader.

Then, the characterizing statements found seperately for each factor were placed at the extreme ends of the factor's idealized Q-sort charts, i.e. into the columns −3, −2, +2 or +3 of the chart given in Figure 3. This meant that each factor in question rates those statements amongst the most or least important statements. These characterizing statements were discussed for each factor with direct quotes from respondents' motivating their reasoning about how they chose to rank these statements. The statements which received Z-scores closer to 0 (i.e. ranked in columns −1, 0 and +1 of an idealized Q-sort chart) were not taken into account assuming that they are probably not distinguishing. Only the statements that are both characterizing and distinctive were used to describe differing features of the factors, as they were ranked significantly differently for the factor under consideration when compared to other factors. Through examining the most and least important distinctive statements for each factor along with also taking into acccount the interview results, the common view that characterizes each factor was identified and this way, the underlying perspective was revealed for the factor examined. Finally, certain distinctive names have been given to the identified perspectives to give them identity taking into consideration the logic behind the relevant factor.

The Z-scores obtained for the characterizing statements of the three distinct factors identified are shown in Figures 4, 5 and 6 respectively. The '**' indicates a distinguishing statement, which is significant at $p < 0.01$ and '*' indicates a distinguishing statement, which is significant at $p < 0.05$ in these figures. The perspectives detected are explained below:

Table 2. Factor loadings of each respondent onto each perspective of the '3 factor solution'.

		Perspective		
		1	2	3
Respondent	1	0.02	0.27	0.74
	2	0.30	0.17	0.10
	3	0.47	0.39	0.03
	4	0.06	−0.03	0.70
	5	0.50	0.46	0.13
	6	0.19	0.65	−0.45
	7	0.25	0.54	0.34
	8	0.66	0.06	0.13
	9	−0.07	0.77	0.05
	10	0.11	0.82	−0.21
	11	0.31	−0.15	0.61
	12	0.77	−0.45	0.13
	13	0.64	0.38	0.20
	14	0.21	0.61	0.31
	15	0.80	0.08	−0.10
Total		6	5	3

Perspective 1 (Experience and Belief): A total of six respondents, who are the significant loaders of Perspective 1 as shown in Table 2, shared common views pertaining to Perspective 1, accounting for 19% of the variance explained in the dataset. Examining the full picture of the way statements were ordered in this perspective, shown in Figure 4, it can be concluded that this perspective generally ranks so-called 'social skills' high and places less emphasis on more structured processes related to risk management, such as training and having a common understanding of key concepts. In particular, the statements *an understanding and belief in the benefits of risk management from all staff* (statement 6), *clear and honest communication* (statement 10), *project organisation risk culture* (statement 12), and p*ersonal experience, intuition and engineering judgement* (statement 20) can be grouped under this umbrella (refer to Figure 4). These statements mainly emphasize soft skills and rather than the organisational procedures in place, they are mainly related to behaviours, internal thoughts and the interactions between employees. All four of these statements are also somehow immeasurable and intangible. Furthermore, the statements (6) and (20) are representative of a person's mind-set, intuition and belief in the process. These are not easy to change, they cannot be dealt with quickly by simply changing training or organisational procedures, such as simply providing more resources or introducing a new set of guidelines. This perspective considers the more 'institutional' aspects of risk management as less important when the lower ranked statements such as *provision of adequate resources to support risk management* (statement 7), *application of a standardized risk management process* (statement 17) and *regular training to enhance risk management skills* (statement 18) are taken into account. In this regard, Perspective 1 was named as 'Experience and Belief'. This perspective finds it valuable to believe in the individual's personal expertise as well as the benefits of each individual's risk management process. However, other soft skills, such as *clear and honest communication* and *project organisation risk culture*, as well as a *clear long-term strategy for risk management* are also important for this perspective.

Perspective 2 (Procedures and Management): A total of five respondents, who are the significant loaders of Perspective 2 as shown in Table 2, shared common views pertaining to Perspective 2, accounting for 21% of the variance explained in the dataset. Examining the full picture of the way statements were ordered in this perspective, shown in Figure 5, it can be concluded that this perspective puts value on

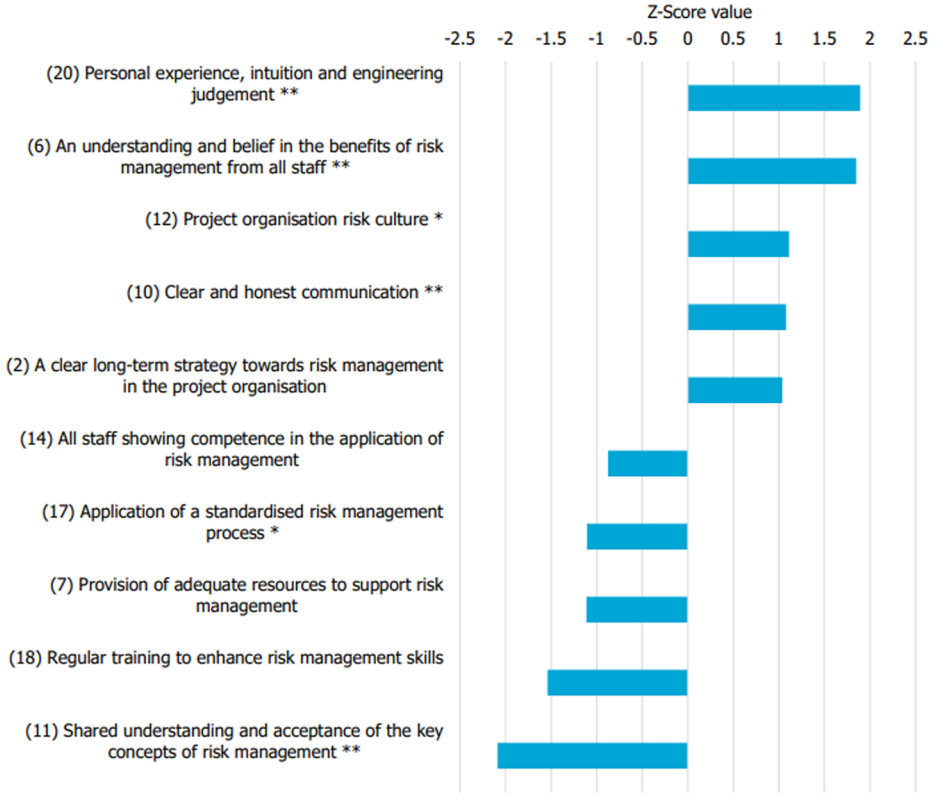

Figure 4. Z-Scores for the characterizing statements of perspective 1 (Experience and Belief).

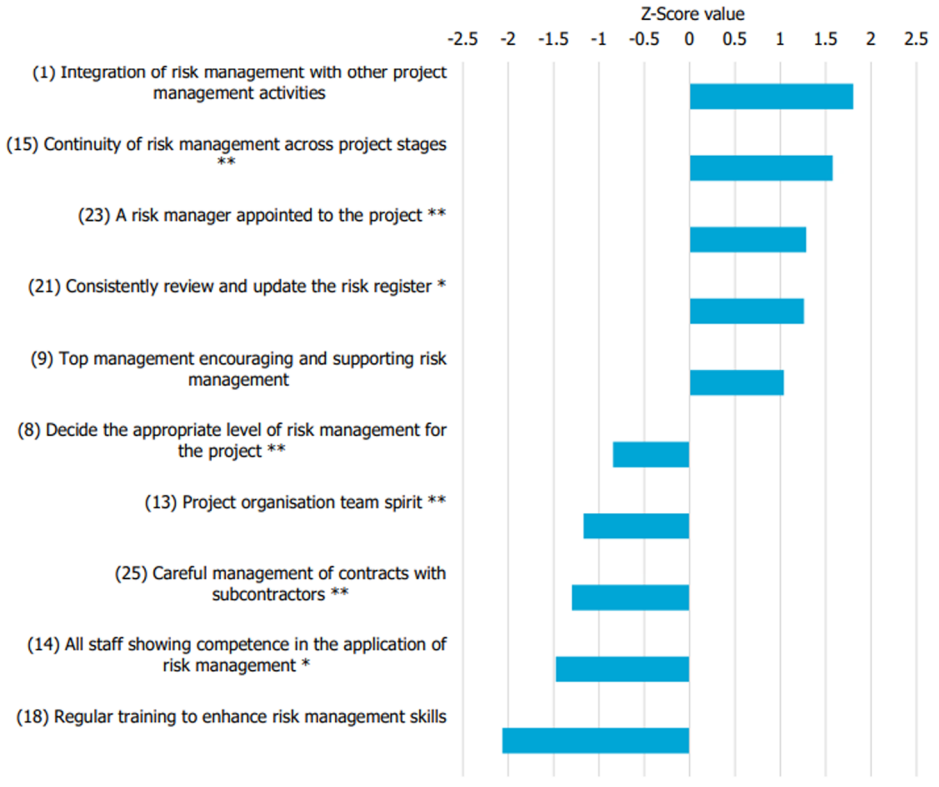

Figure 5. Z Scores for the characterizing statements of perspective 2 (Procedures and Management).

consistency and the role of management (both top management and the risk manager) in conducting risk management. In more clear terms, this perspective suggests that consistency be applied to the risk management process in a wide manner. This argument is based on the statements *integration of risk management with other project management activities* (statement 1), *top management encouraging and supporting risk management* (statement 9), *consistently review and update the risk register* (statement 21), *continuity of risk management across project stages* (statement 15) and *a risk manager appointed to the project* (statement 23). In this context, this perspective values management's role together with the rules and procedures in leading the risk management process. However, it places less importance on collaboration in larger teams, a result that can be captured based on the low ranking given to the statements *project organisation team spirit* (statement 13) and *careful management of contracts with subcontractors* (statement 25). Instead of involving subcontractors in the control of risk management, it prefers to keep it within the main contractor's organisation. Furthermore, it prefers to trust the individual rather than collaborating within larger teams. Accordingly, Perspective 2 was given the name 'Procedures and Management'. In summary, this perspective considers the consistent application of procedures, their integration with other project management activities, and the leadership actions of both the risk manager and top management as the most important aspects of risk management.

Perspective 3 (Culture and Communication): A total of three respondents, who are the significant loaders of Perspective 3 as shown in Table 2, shared common views pertaining to Perspective 3, accounting for 13% of the variance explained in the dataset, i.e. the lowest among all the three perspectives. Respondents under this perspective valued culture and communication the most and evaluated that these two aspects are strongly linked (refer to Figure 6). This perspective ranked the statements *integration of risk management with other project management activities* (statement 1) and *top management encouraging and supporting risk management* (statement 9) high, similar to Perspective 2. However, a negative view on the need for a risk manager is dominant due to the low ranking given to the statement *a risk manager appointed to the project* (statement 23). During interviews, respondents explained that although a proactive risk manager can enhance the culture, the project organisation's risk culture is more important than recruitting a risk manager. Besides, the respondents under this perspective rated the statement

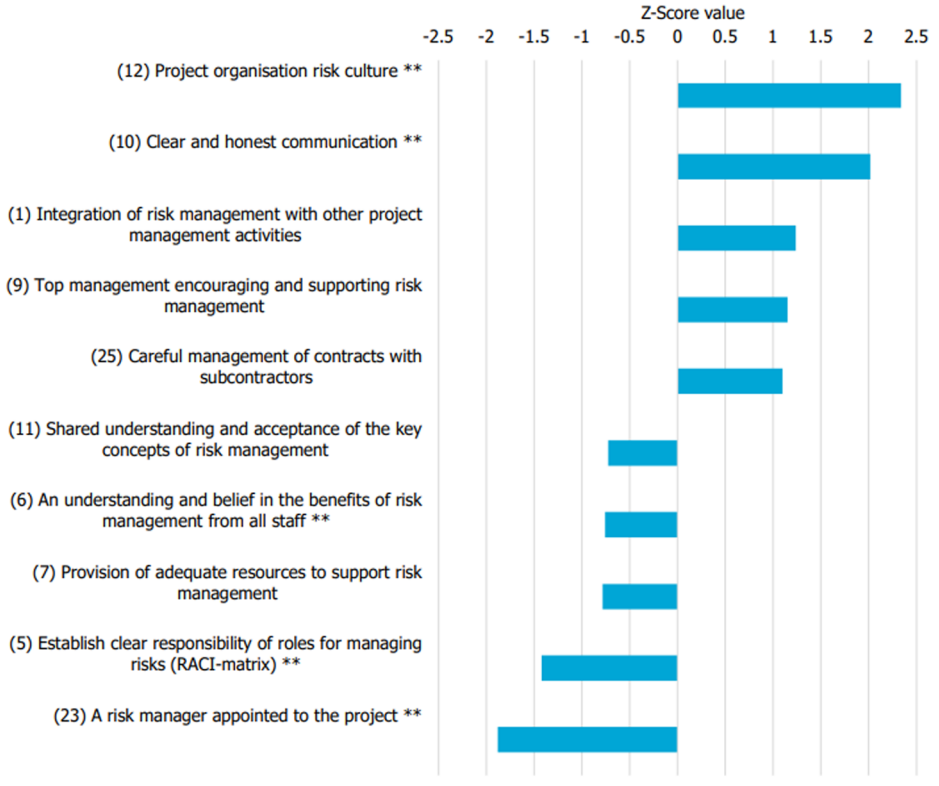

Figure 6. Z Scores for the characterizing statements of perspective 3 (Culture and Communication).

careful management of contracts with subcontractors (statement 25) as important and valued the expert knowledge of subcontractors. However, they ranked the statement (5) e*stablish clear responsibility of roles for management risks (RACI-matrix)* as one of the least important. They explained how communication and culture can be used instead of elaborating procedures because openly discussing problems allows better solutions to be discovered than, for example, dividing and allocating risks using a RACI matrix. Besides, during interviews they have repeatedly stated that the *project organisation risk culture* is the most important inclusive element to support risk management. Obviously, a key feature of a mature *project organisation risk culture* is open and honest communication. In this context, this perspective suggests that other things will benefit if there is a mature organisational risk culture. Depending on this, Perspective 3 was given the name 'Culture and Communication'. In summary, this perspective recognizes the *project organisation risk culture* as the cornerstone of project risk management and respondents in line with Perspective 3 believe that a mature organisational risk culture, supported by clear and honest communication, can enable other processes of risk management to be implemented seamlessly.

Making recommendations to the company

Based on the perspectives, four main recommendations have been made to the Company to improve its project risk management capacity, which are detailed below:

Recommendation 1: *Customized management approaches that integrate and balance the identified perspectives should be adopted.*

The managers having the Perspective 1, named 'Experience and Belief', could be supported by building a risk management culture within the Company, which would be in agreement with

the Perspective 3 named 'Culture and Communication', taking into consideration that the strong focus on experience and belief might make these managers less aware of new and unforeseen risks. On the other hand, the managers having the Perspective 2, named as 'Procedures and Management', see the risk management more as an instrumental, task-orientated effort, for which the Company must have all the tools in place; including specifically designated risk managers in projects. This, however, might also make them more lethargic, as it could lead to a management style of tick-the-box, rather than developing a constant, although tacit awareness. Similarly, a mature risk management culture within the Company, which will be compatible with the Perspective 3, will work also at this point. However, the Perspective 3 includes the features of both, i.e. the Perspectives 1 and 2. In more clear terms, it represents a mixture of instrumental judgments, culture and soft skills, but clearly opposes the existence of a risk manager in an autonomous manner. In this case, it would be consistent to balance the situation by adopting a horizontal management style rather than a strict top-down style. Additionally, since perspectives contain elements that complement and balance each other, in order to benefit as much as possible from the different management approaches they put forward, the Company should focus on trying to create project teams from heterogeneous people.

Recommendation 2: *A mature organisational risk management culture should be promoted.*

During the interviews, a group of respondents emphasized how people associate the organisational risk culture with the risk awareness and how this can help moderate potentially risky behavior and enable even less experienced people to do the right thing with regard to risk management. In addition, they also expressed strong feelings about the need for transparency in communication and explained how this preserves the value of shared information and helps people openly challenge each other's opinions. Taking these points into consideration and in line with the Perspectives 1 and 3, namely 'Experience and Belief' and 'Culture and Communication' respectively, it may be recommended that the Company benefits from project charters that aim to mature the risk management culture specifically in projects. Since the risk culture of the project organisation is experienced and influenced by individuals in the project team and is considered one of the most important factors, it would make sense for the Company to formalize this to some extent also through the project charter. In this way, the risk management culture created in projects can be integrated into the risk management culture created at the organisational level, leading to mutual development. A project charter can be considered as a document that discloses the scope, aims and objectives of a project and serves as a common reference point for which team members could be held accountable. A project charter aiming to develop risk management culture would set out the organisation's expectations and encourage all staff to adhere to the same set of core principles. This can help improve overall risk awareness, integration of new employees, trust within the team, and the risk management process as a whole. In addition, principles such as open and honest communication, support from top management and belief in the benefits of risk management may also be listed in the charter, in accordance with the Perspectives 1, 2 and 3.

Recommendation 3: *Risk management should be integrated into other activities, making it a normal part of employees' daily work.*

During the interviews, a group of respondents emphasized how risk management should be a daily job and how integrating it into other activities helps risk management become a normal part of employees' jobs. Taking these points into consideration and in line with the Perspectives 2 and 3, namely 'Procedures and Management' and 'Culture and Communication' respectively, a recommendation to the Company will be to facilitate this integration as much as possible. Risk management is essentially about design, planning, forecasting, cost analysis, logistics, stakeholder management, contract management, quality assurance and many more activities.

Therefore, for each of these activities, the risk management tasks required for those involved and what needs to be recorded or reported to the risk manager should be clear. It can be assumed that a well-integrated process will provide more opportunities for employees to participate in risk management than if it were treated as a separate entity.

Recommendation 4: *The employees should be instructed on the use of risk registers and guidance should be put in place on how often they are expected to update the risk registers.*

There were respondents who shared some common views during interviews on the risk register. The Project was a large scale project that resulted in a very complex and long risk register. The participants in question have mentioned that they found the risk register overwhelming, that they did not look at the risk register for a while, that they could only think about and deal with a fixed number of risks at any given time, and how some of them were no longer responsible for the risks because the person in charge had left the Company. In this context, it may be recommended that the Company considers how employees are expected to use the risk register and instructs them clearly on what these expectations are. Also, a guidance can be offered on how often people are expected to update their risk register, how to ensure that risks are handed over when the responsible person leaves the Company, and how to better prepare people to cope with a large number of risks. Such initiatives would be in agreement with the Perspectives 2 and 3, namely 'Procedures and Management' and 'Culture and Communication', respectively.

Conclusions and suggestions for future study

Steering an organisation to better project risk management is a challenging process. This is mainly due to the high variety of people (characters, traits etc.) involved in the organisation. The efforts to improve an organisation's project risk management might fail in case this point is neglected. The approach proposed in this regard through this study and built on Q-methodology has been implemented in a construction company in the Netherlands to identify perspectives on project risk management among the company's managers responsible for different functions. In this way, it has been revealed that recommendations can be made to help the company improve their project risk management.

Three perspectives in total were identified. In order to represent and reflect the main arguments they contain, these perspectives were named 'Experience and Belief', 'Procedures and Management' and 'Culture and Communication', respectively. The identified perspectives were not generalized to the rest of the Dutch construction industry because the approach followed has been applied only to a single company. Future research could focus on implementing the approach in different companies to investigate whether similar perspectives are found among the experts in a specific project field. Still, creating awareness for the presence of different perspectives is envisaged to lead to improvement in project risk management in a company. Without generalization, the perspectives identified and recommendations made in the current study could also find application in similar companies in the construction sector. This point is considered to be valuable in terms of the practical applicability of the approach and enlargement of the application area of the findings provided. However, the application of the approach in different companies and research of its contributions is necessary to suggest its usability as a general methodology. This is suggested as a future study.

Previous studies on risk perception have provided information on how different actors in projects perceive risks and what concerns they attach to the risks and their potential impacts. Furthermore, various studies have previously been conducted using Q-Methodology to reveal different perspectives about certain issues in project management such as stakeholder participation, stakeholder impact, sustainability, project success criteria, and public acceptance.

However, it has been observed that there is a gap in determining the perspectives of employees on risk management in project-based organisations using Q-Methodology and benefitting the determined perspectives to improve project risk management. In this context, this study aimed to open a new discussion on exploring common human perspectives and benefitting from these perspectives to establish new approaches, policies and procedures for managing risks.

In this study, Q-Methodology was used to identify the divergence between the perspectives in an organisation. However, there might also be other ways to investigate this. In this respect, the applied approach has the potential to be integrated with different qualitative analysis methods and this can be suggested as a potential topic for future studies. In the current form, which is based on Q-Methodology and interviews made with the respondents, the approach has shown to be able to create value for the company in which the case study was conducted by means of the recommendations put forward based on the perspectives identified. To briefly summarize the recommendations; first, customized management approaches that integrate and balance the identified perspectives should be adopted. Second, a mature organisational risk management culture should be promoted. Project charters that specifically target risk management culture in projects can be used for this purpose. Third, risk management should be integrated into other activities, making it a normal part of employees' daily work. Finally, but not exclusively, the employees should be instructed on the use of risk registers and guidance should be put in place on how often they are expected to update the risk registers.

Disclosure statement

The authors report there are no competing interests to declare.

ORCID

Önder Ökmen http://orcid.org/0000-0003-3102-0277
Martijn Leijten http://orcid.org/0000-0002-3502-944X
Marian Bosch-Rekveldt http://orcid.org/0000-0001-9309-6352
Hans Bakker http://orcid.org/0000-0002-2421-4711

References

Akintoye, A. S., and J. M. Malcolm. 1997. "Risk Analysis and Management in Construction." *International Journal of Project Management* 15 (1): 31–38. https://doi.org/10.1016/S0263-7863(96)00035-X.

Alfreahat, D., and Z. Sebestyén. 2022. "A Construction–Specific Extension to a Standardproject Risk Management Process." *Organization, Technology and Management in Construction: An International Journal* 14 (1): 2666–2674. https://doi.org/10.2478/otmcj-2022-0011.

Arabi, S., E. Eshtehardian, and I. Shafiei. 2022. "Using Bayesian Networks for Selecting Risk-Response Strategies in Construction Projects." *Journal of Construction Engineering and Management* 148 (8): 04022067. https://doi.org/10.1061/(ASCE)CO.1943-7862.0002310.

Atkinson, R. 1999. "Project Management: Cost, Time and Quality, Two Best Guesses and a Phenomenon, Its Time to Accept Other Success Criteria." *International Journal of Project Management* 17 (6): 337–342. https://doi.org/10.1016/S0263-7863(98)00069-6.

Aven, T. 2016. "Risk Assessment and Risk Management: Review of Recent Advances on Their Foundation." *European Journal of Operational Research* 253 (1): 1–13. https://doi.org/10.1016/j.ejor.2015.12.023.

Baker, S., D. Ponniah, and S. Smith. 1998. "Techniques for the Analysis of Risks in Major Projects." *Journal of the Operational Research Society* 49 (6): 567–572. https://doi.org/10.2307/3010665.

Baker, S., D. Ponniah, and S. Smith. 1999. "Risk Response Techniques Employed Currently for Major Projects." *Construction Management and Economics* 17 (2): 205–213. https://doi.org/10.1080/014461999371709.

Baloi, D., and A. D. F. Price. 2003. "Modelling Global Risk Factors Affecting Construction Cost Performance." *International Journal of Project Management* 21 (4): 261–269. https://doi.org/10.1016/S0263-7863(02)00017-0.

Besner, C., and B. Hobbs. 2012. "The Paradox of Risk Management; a Project Management Practice Perspective." *International Journal of Managing Projects in Business* 5 (2): 230–247. https://doi.org/10.1108/17538371211214923.

Brown, S. R. 1993. "A Primer on Q Methodology." *Operant Subjectivity* 16 (3/4): 91–138. https://doi.org/10.15133/j.os.1993.002.

Bryde, D. J., and J. M. Volm. 2009. "Perceptions of Owners in German Construction Projects: Congruence with Project Risk Theory." *Construction Management and Economics* 27 (11): 1059–1071. https://doi.org/10.1080/01446190903222403.

Cano, A. D., and M. P. Cruz. 2002. "Integrated Methodology for Project Risk Management." *Journal of Construction Engineering and Management* 128 (6): 473–485. https://doi.org/10.1061/(ASCE)0733-9364(2002)128:6(473).

Chapman, R. J. 2001. "The Controlling Influences on Effective Risk Identification and Assessment for Construction Design Management." *International Journal of Project Management* 19 (3): 147–160. https://doi.org/10.1016/S0263-7863(99)00070-8.

Chenya, L., E. Aminudin, S. Mohd, and L. S. Yap. 2022. "Intelligent Risk Management in Construction Projects: Systematic Literature Review." *IEEE Access*. 10: 72936–72954. https://doi.org/10.1109/ACCESS.2022.3189157.

Chua, D. K. H., Y.-C. Kog, and P. K. Loh. 1999. "Critical Success Factors for Different Project Objectives." *Journal of Construction Engineering and Management* 125 (3): 142–150. https://doi.org/10.1061/(ASCE)0733-9364(1999)125:3(142).

Cuppen, E., M. Bosch-Rekveldt, E. Pikaar, and D. C. Mehos. 2016. "Stakeholder Engagement in Large-Scale Energy Infrastructure Projects: Revealing Perspectives Using Q Methodology." *International Journal of Project Management* 34 (7): 1347–1359. https://doi.org/10.1016/j.ijproman.2016.01.003.

Damar, E. A., and P. Sali. 2022. "Q Methodology: A Concise Overview." *Methodological Innovations in Research and Academic Writing* 1–17. https://doi.org/10.4018/978-1-7998-8283-1.ch001.

Damio, S. M. 2016. "Q Methodology: An Overview and Steps to Implementation." *Asian Journal of University Education* 12 (1): 105–122.

Dikmen, I., M. T. Birgonul, C. Anac, J. H. M. Tah, and G. Aouad. 2008. "Learning from Risks: A Tool for Post-Project Risk Assessment." *Automation in Construction* 18 (1): 42–50. https://doi.org/10.1016/j.autcon.2008.04.008.

Elbashbishy, T. S., O. A. Hosny, A. F. Waly, and E. M. Dorra. 2022. "Assessing the Impact of Construction Risks on Cost Overruns: A Risk Path Simulation–Driven Approach." *Journal of Management in Engineering* 38 (6): 20221101. https://doi.org/10.1061/(ASCE)ME.1943-5479.0001090.

Elke, U. W., A.-R. Blais, and N. E. Betz. 2002. "A Domain-Specific Risk-Attitude Scale: Measuring Risk Perceptions and Risk Behaviors." *Journal of Behavioral Decision Making* 15 (4): 263–290. https://doi.org/10.1002/bdm.414.

Ellis, G., J. Barry, and C. Robinson. 2007. "Many Ways to Say 'No', Different Ways to Say 'Yes': applying q-Methodology to Understand Public Acceptance of Wind Farm Proposals." *Journal of Environmental Planning and Management* 50 (4): 517–551. https://doi.org/10.1080/09640560701402075.

Exel, J. V., and G. D. Graaf. 2005. "Q methodology: A sneak preview." Accessed October 20, 2021. https://www.researchgate.net/publication/228574836_Q_Methodology_A_Sneak_Preview

Fiolet, J.-C., C. Haas, and K. Hipel. 2016. "Risk-Chasing Behaviour in on-Siteconstruction Decisions." *Construction Management and Economics* 34 (12): 845–858. https://doi.org/10.1080/01446193.2016.1207790.

Hillson, D. 2009. *Managing Risk in Projects*. Burlington: Gower Publishing Co.

Hillson, D., and P. Simon. 2012. *Practical Project Risk Management: The ATOM Methodology*. Oakland: Berrett-Koehler Publishers.

Hoseini, E., M. Hertogh, and M. Bosch-Rekveldt. 2019. "Developing a Generic Risk Maturity Model (GRMM) for Evaluating Risk Management in Construction Projects." *Journal of Risk Research* 24 (7): 889–908. https://doi.org/10.1080/13669877.2019.1646309.

Jaafari, A. 2001. "Management of Risks, Uncertainties and Opportunities on Projects: Time for a Fundamental Shift." *International Journal of Project Management* 19 (2): 89–101. https://doi.org/10.1016/S0263-7863(99)00047-2.

Jarrah, M. A. L., B. Jarah, and I. Altarawneh. 2022. "Toward Successful Project Implementation: Integration between Project Management Processes and Project Risk Management." *Problems and Perspectives in Management* 20 (3): 258–273. https://doi.org/10.21511/ppm.20(3).2022.21.

Kline, P. 1994. *An Easy Guide to Factor Analysis*. Abingdon, UK: Routledge.

Koops, L., C. van Loenhout, M. Bosch-Rekveldt, M. Hertogh, and H. Bakker. 2017. "Different Perspectives of Public Project Managers on Project Success." *Engineering, Construction and Architectural Management* 24 (6): 1294–1318. https://doi.org/10.1108/ECAM-01-2015-0007.

Kornevs, M., N. Kringos, and S. Meijer. 2016. "Perspectives of Stakeholders on Road Procurements: In Search of Procurement Aspects Using Q Methodology." 5th International Engineering Systems Symposium (CESUN 2016), Washington, USA.

Li, N., D. Fang, and Y. Sun. 2016. "Cognitive Psychological Approach for Risk Assessment in Construction Projects." *Journal of Management in Engineering* 32 (2): 04015037. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000397.

Lindhard, S., and J. K. Larsen. 2016. "Identifying the Key Process Factors Affecting Project Performance." *Engineering, Construction and Architectural Management* 23 (5): 657–673. https://doi.org/10.1108/ECAM-08-2015-0123.

Liu, A. M. M., and A. Walker. 1998. "Evaluation of Project Outcomes." *Construction Management and Economics* 16 (2): 209–219. https://doi.org/10.1080/014461998372493.

Liu, J., B. Li, B. Lin, and V. Nguyen. 2007. "Key Issues and Challenges of Risk Management and Insurance in China's Construction Industry." *Industrial Management & Data Systems* 107 (3): 382–396. https://doi.org/10.1108/02635570710734280.

Low, S. P., J. Liu, and S. He. 2009. "External Risk Management Practices of Chinese Construction Firms in Singapore." *KSCE Journal of Civil Engineering* 13 (2): 85–95. https://doi.org/10.1007/s12205-009-0085-9.

Lyons, T., and M. Skitmore. 2004. "Project Risk Management in the Queensland Engineering Construction Industry: A Survey." *International Journal of Project Management* 22 (1): 51–61. https://doi.org/10.1016/S0263-7863(03)00005-X.

Maylor, H. 2010. *Project Management*. London: Prentice Hall.

Masár, M., M. Hudáková, T. Melkovič, and P. Šuleř. 2022. "Global Survey of Current Barriers to Project Risk Management and Their Impact on Projects." *Journal of Business Economics and Management* 23 (5): 1194–1210. https://doi.org/10.3846/jbem.2022.17784.

McKeown, B., and D. Thomas. 2009. *Q Methodology*. California: Sage Publications.

Neef, D. 2005. "Managing Corporate Risk through Better Knowledge Management." *The Learning Organization* 12 (2): 112–124. https://doi.org/10.1108/09696470510583502.

Nicholson, N., M. Fenton-O'Creevy, E. Soane, and P. Willman. 2002. *Risk Propensity and Personality*. London: London Business School, Open University Business School and Said Business School.

Nieto-Morote, A., and F. Ruz-Vila. 2011. "A Fuzzy Approach to Construction Project Risk Assessment." *International Journal of Project Management* 29 (2): 220–231. https://doi.org/10.1016/j.ijproman.2010.02.002.

Oke, A. E., P. E. Adetoro, S. S. Stephen, C. O. Aigbavboa, L. O. Oyewobi, and D. O. Aghimien. 2023. *Risk Management Practices in Construction: A Global View*." Switzerland: Springer Nature, https://doi.org/10.1007/978-3-031-35557-8.

Olechowski, A., J. Oehmen, W. Seering, and M. Ben-Daya. 2016. "The Professionalization of Risk Management: What Role Can the Iso 31000 Risk Management Principles Play?" *International Journal of Project Management* 34 (8): 1568–1578. https://doi.org/10.1016/j.ijproman.2016.08.002.

Ökmen, Ö. 2016. "Risk Assessment for Determining Best Design Alternative in a State-Owned Irrigation Project in Turkey." *KSCE Journal of Civil Engineering* 20 (1): 109–120. https://doi.org/10.1007/s12205-015-0397-x.

PMI (Project Management Institute). 2009. *Practice Standard for Project Risk Management*." Pennsylvania: Project Management Institute.

PMI (Project Management Institute). 2016. *Construction Extension to the PMBOK Guide*." Pennsylvania: Project Management Institute.

PMI (Project Management Institute). 2021. *A Guide to the Project Management Body of Knowledge (PMBOK® Guide - 7th ed)*." Pennsylvania: Project Management Institute.

PQMethod version 2.35. 2020. "The PQMethod Page." Accessed September 30, 2020. http://schmolck.org/qmethod/

Rahman, M. M., and M. M. Kumaraswamy. 2002. "Joint Risk Management through Transactionally Efficient Relational Contracting." *Construction Management and Economics* 20 (1): 45–54. https://doi.org/10.1080/01446190110089682.

Sastoque-Pinilla, Leonardo, Sascha Artelt, Aleksandra Burimova, Norberto Lopez de Lacalle, and Nerea Toledo-Gandarias. 2022. "Project Success Criteria Evaluation for a Project-Based Organization and Its Stakeholders-a Q-Methodology Approach." *Applied Sciences* 12 (21): 11090. https://doi.org/10.3390/app122111090.

Schieg, M. 2006. "Risk Management in Construction Project Management." *Journal of Business Economics and Management* 7 (2): 77–83. https://doi.org/10.1080/16111699.2006.9636126.

Silvius, G., M. Kampinga, S. Paniagua, and H. Mooi. 2017. "Considering Sustainability in Project Management Decision Making; an Investigation Using Q-Methodology." *International Journal of Project Management* 35 (6): 1133–1150. https://doi.org/10.1016/j.ijproman.2017.01.01.

Smith, N. J. 1999. *Managing Risk in Construction Projects*. Oxford: John Wiley and Sons.

Stephenson, W. 1965. "Perspectives in Psychology: XXIII Definition of Opinion, Attitude and Belief." *The Psychological Record* 15 (2): 281–288. https://doi.org/10.1007/BF03393596.

Suprapto, M., L. Koops, A. J. Sohi, and M. Bosch-Rekveldt. 2014. "The application of Q-methodology to gather practitioners' perspectives on collaboration in projects." Accessed September 7, 2020. https://www.researchgate.net/publication/262981035_The_application_of_Qmethodology_to_gather_practitioners'_perspectives_on_collaboration_in_projects

Tang, W., M. Qiang, C. F. Duffield, D. M. Young, and Y. Lu. 2007. "Risk Management in the Chinese Construction Industry." *Journal of Construction Engineering and Management* 133 (12): 944–956. https://doi.org/10.1061/(ASCE)0733-9364(2007)133:12(944).

Webler, T., S. Danielson, and S. Tuler. 2009. "Using Q method to reveal social perspectives in environmental research." Accessed September 25, 2020. https://www.researchgate.net/publication/273697977_Using_Q_Method_to_Reveal_Social_Perspectives_in_Environmental_Research

Wu, Z., T. Nisa, D. Kapletia, and G. Prabhakar. 2017. "Risk Factors for Project Success in the Chinese Construction Industry." *Journal of Manufacturing Technology Management* 28 (7): 850–866. https://doi.org/10.1108/JMTM-02-2017-0027.

Yan, P., J. Liu, X. Zhao, and M. Skitmore. 2022. "Risk Response Incorporating Risk Preferences in International Construction Projects." *Engineering, Construction and Architectural Management* 29 (9): 3499–3519. https://doi.org/10.1108/ECAM-03-2019-0132.

Yaraghi, N., and R. G. Langhe. 2011. "Critical Success Factors for Risk Management Systems." *Journal of Risk Research* 14 (5): 551–581. https://doi.org/10.1080/13669877.2010.547253.

Zhang, H. 2007. "A Redefinition of the Project Risk Process: Using Vulnerability to Open up the Event-Consequence Link." *International Journal of Project Management* 25 (7): 694–701. https://doi.org/10.1016/j.ijproman.2007.02.004.

Zou, P. X. W., G. Zhang, and J. Wang. 2007. "Understanding the Key Risks in Construction Projects in China." *International Journal of Project Management* 25 (6): 601–614. https://doi.org/10.1016/j.ijproman.2007.03.001.

Zwikael, O., and M. Ahn. 2011. "The Effectiveness of Risk Management: An Analysis of Project Risk Planning across Industries and Countries." *Risk Analysis: An Official Publication of the Society for Risk Analysis* 31 (1): 25–37. https://doi.org/10.1111/j.1539-6924.2010.01470.x.