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RESEARCH ARTICLE

Underlying structures of risk response measures among small and medium contractors in South Africa

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Abstract

Although attention has been given to the measures used to respond to risk in the construction industry (CI), there is limited literature that scrutinizes underlying structures of risk response measures (RRMs) especially among small and medium enterprises (SMEs). This study, therefore, presents findings from an exploratory factor analysis (EFA) of RRMs. A positivist paradigm was adopted to collect empirical raw data from 181 conveniently sampled respondents in Gauteng, South Africa (SA), using a structured questionnaire. The results support the extant literature and empirically established the structural composition of risk response by two constructs. The construct with emerged measures was termed trailing measures while the one with popular measures was termed leading measures of risk response. However, the study yielded a two-factor model with all the six items supposed to measure risk response. Based on the results obtained, it seems that risk avoidance and risk mitigation are reliable measures for measuring risk response. This study could thus serve as a reference for the accurate measurement of risk response and for the development of agreed responses for each

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risk, including an appropriate strategy and specific responses to implement the chosen strategy. The study was limited to the CI and to a lesser extent, construction SMEs in Gauteng; hence the findings cannot be generalized to all SMEs in SA.

Keywords:

Exploratory factor analysis, risk response measures, small and medium enterprises, underlying structures.

Introduction

Construction projects are laden with risks despite the factual evidence of its industry's multiform contributions to any country's citizenry, through Gross Domestic Product (GDP), job provision and poverty alleviation (Mafundu and Mafini, 2019; Hove and Banjo, 2018; Naude and Chiweshe, 2017). Regardless of the noted contribution of the CI, the industry is generally considered risk inclined due partly to its long and dynamic processes that are complex and involve several interrelated activities with multi-tasked aspects of its project team and workforce (Nanthuru et al., 2018). These activities are in turn coordinated through management processes that are predisposed to risk; a reoccurring phenomenon in construction that can exert either a positive or a negative impact on project objectives (Szymansk, 2017). Negative risks are unwanted and potentially can cause serious problems and derail the project. An example of negative risks is a lack of material (such as concrete) because of political issues. In this case, strategies are employed to lessen their impacts. Positive risks, on the other hand, are opportunities and are desired by both the Project Manager and stakeholders, and may positively affect the project, such as finishing the project ahead of time. This paper is focused on negative risks.

According to Al-Ajmi and Makinde (2018), construction projects barely ever present themselves as innocuous undertakings. Each project emerges with its own inimitability and risks and therefore necessitates a specific approach and some proficiency in order to achieve its objectives. Nanthuru et al., (2018) believe that it is increasingly difficult to forecast the end results of a project, which means that contractors and other stakeholders cannot ascertain with absolute certainty that a project will be completed within its time and cost estimates. In extreme cases, a time and cost risk can incapacitate the economic outlook of a project, thereby turning a potentially lucrative organization into an unsuccessful company (Hove and Banjo, 2018). The effects thereof may be quantified using many terms: increase cost, time overruns, property damages; injury to people and at times a combination of all of these.

For instance, in SA, The Gautrain project which was only ready two years after its baseline completion date and cost R14 billion over budget (Parrock, 2015). A further example is R2.5 billion contracts for a multi-product pipeline between Durban and Gauteng for Transnet was estimated to cost R23.4 billion and the completion date was almost 3 years late (Guern Le, 2013). This poor performance of the industry highlights the universal quest for techniques, tools, and procedures regarding RM in construction companies. Since the nature of the CI predisposes its projects to uncertainty and risks, Naji and Ali (2017) suggested that there is a need to have continual and detailed management of risks undertaken at all stages of the project life cycle.

Leboea (2017) stated that all enterprises including construction SMEs face challenges in meeting their project planned objectives in the most cost-effective and at the desired quality.

A similar view is held by Zoghi (2017) that though SMEs often face the same risks as large enterprises, they are more exposed to risks than their larger counterparts. De Araujo Lima, Crema and Verbano (2019) emphasized that SMEs need to practice RM much more than large enterprises owing to their resource restraints to respond promptly to potential threats.

RM in construction is the process by which risks are identified and analysed and its main aim is to reduce the impact of risk on project delivery (Nanthuru et al., 2018). Once risk has been identified and analysed, risk response which entails selecting the appropriate method of handling risk, should not be undermined as the performance of the project as well as its success depends on the capability of this stage to overcome uncertainty (de Araujo Lima, Crema, and Verbano, 2019). This stage works on preparing the response to the main risks and appoints the people who are responsible for each response. Consequently, a management system and appropriate measures should be developed to ensure the success of risk response and to reduce the effects of risk (Naji and Ali, 2017). Several tools and methods are available for risk handling in SMEs however, despite the increasing volume of literature on RM in the CI in recent years, research into RM and measures used to respond to risks seems to be scant in the SACI in general and particularly among SMEs. Most of the studies reviewed stages involved in the RM process, prioritized risks through empirical research in order to suggest mitigative measures. A scarcity of studies has been devoted to RRMs used in responding to risks.

The current study focuses on RRMs, which could be used in handling construction risks at project level of SMEs and explore underlying structures of the measures identified from extant literature. The objective of the present paper is, therefore, to determine and analyse the underlying structures of RRMs, as used in the study. By highlighting the structure of these measures, researchers, construction employers and industry professionals will have information which may serve as a base for the development of agreed responses for each risk, including an appropriate strategy and specific responses to implement the chosen strategy

Literature review

CONSTRUCTION SMEs IN SOUTH AFRICA

The definition of SMEs based on the number of employees differs across nations (Organisation for Economic Co-operation and Development (OECD), 2017). In the European Union (EU), SMEs are defined as those enterprises with less than 250 employees for medium-sized enterprises. Some countries set a limit of 200 employees. In the United States of America (USA), a medium-sized enterprise is a firm with 500 or fewer employees. Small-sized enterprises, on the other hand, are those firms with fewer than 50 employees while micro-enterprises employ up to 10 employees in the USA and EU. The magnitude of annual revenues is also used as a determinant in defining SMEs (El Madani, 2018). In the EU, enterprises with annual revenue of not more than 50 million Euro are considered medium-sized enterprises, those with revenue equal to or fewer than 10 million Euro are considered small-sized enterprises while enterprises with annual revenue fewer or equal to 10 million Euro are considered micro-enterprises.

The SA definition of SMEs in the CI in terms of the number of employees and annual turnover differ slightly from those of the EU and the USA. The industry typically consists of dissimilar sizes of companies that is, micro, very small, small, medium and large contractors (National Small business Act amended in 2004). These contractors can be differentiated from one another by their annual turnover, capacity, and extent of their fixed assets. Medium-sized contractors are referred to by the National Small Business Act (2004) as those contractors having between 50 and 200 full-time employees, with an average total annual turnover ranging from ZAR6m to ZAR26m and a total gross asset value (fixed property) ranging from ZAR1m to ZAR5m. As for small contractors, they are defined as enterprises employing less than 50 full-time employees, having an average total annual amount turnover fewer than ZAR6m[2] with a total gross asset value (fixed property) of less than ZAR1m. This study employed this definition given that previous studies (Muzondo and McCutcheon, 2018; Wentzel, Smallwood and Emuze, 2016) in SA have employed it.

SMEs play an important role in the SA economy and therefore the government has focused on the development of the SME sector to promote economic growth (Muzondo and McCutcheon, 2018). According to the Small Enterprise Development Agency (SEDA, 2018), the SME sector is the largest provider of employment in the country, particularly in the creation of new jobs. SMEs make up 97% of all SA firms; as a result, they contribute 35% of GDP and employ 55% of the country's labour force (ibid). The SME construction sector is equally important to the SA economy as that of SMEs in general. StatsSA (2018) reported that 78.5% of firms in the SACI are SMEs and the industry employed 1 395 000 people (formal and informal sectors), accounting for 9, 6% on average of GDP between 2008 and 2016. However, these enterprises are viewed as high-risk enterprises as their entry and exit levels in the market are high. It is estimated that 70% of construction SMEs fail in their first year of existence (Leboea, 2017; Construction Industry Development Board (CIDB), 2017).

The factors that contribute to the high failure rate of construction SMEs are numerous and diverse. Some studies (Bushe, 2019; Leboea, 2017) mention compliance with legislation, resource scarcity, rapidly changing technology, lack of management skills, financial knowledge, and lack of management commitment. Others (Rungani and Potgieter, 2018; Rungani and Potgieter, 2018) highlight factors such as managerial incompetence, lack of managerial experience, inadequate planning, and poor financial control. However, Mafundu and Mafini (2019) found that in SA, SMEs lack the skills to implement RM and are generally inadequately equipped to deliver projects successfully. De Araujo, Crema and Verbano (2019) found that SMEs tend to use a "reactive, informal or seemingly unstructured, and intuitive approach" to manage risk when compared to large firms. However, the management of risk is critical to project success and it is the task of RM to manage a project's exposure to risk (Nawaz, et al., 2019). Effective risk responses are vital if organizations are to make RM work in reducing risk exposure for their projects.

RISK RESPONSE MEASURES (RRMs)

There are different ways in which risk can be managed. Nanthuru et al., (2018) suggested that employing a set of measures provides a greater indication of project performance than concentrating on a sole measure. RRMs are measures that are employed to eradicate, minimize or transfer risk to an appropriate specialist in the event risk materializes (Zoghi, 2017). Several measures have been used in literature. For instance, Tanojo, Hidayat and Azis, (2018) found that risk mitigation, risk avoidance, and risk acceptance were mostly used by contractors. Alashwal and Al-Sabahi (2018) evinced three prevailing RRMs in the order of risk avoidance, risk transfer, and risk mitigation while Szymansk (2017) recommended two measures: avoid risk, transfer, or retain it. Further research (Abazid and Hard, 2018; Leboea, 2017) identified three approaches: risk retention, risk reduction, and risk transfer. Regardless of the vagueness in the number and rating of RRMs in literature, there is a consensus of a specific combination of the measures that will constitute risk response at project level of construction SMEs. Based on this sentiment, the following were identified and summarized as RRMs.

RISK AVOIDANCE

According to Tanojo, Hidayat and Azis, (2018), risk avoidance means a decision not to partake in a high-risk activity/exposure or to refrain from any risk event-related action to totally eradicate the predicted exposure. However, some researchers (Fateminia, Seresht and Fayek, 2019; Okate and Kakade, 2019; Tembo-Silungwe and Khatle, 2017) argued that risk avoidance in construction is not generally recognized to be impractical as it may lead to projects not going ahead. For example, a contractor not placing a bid or the owner not proceeding with project funding are two examples of eliminating the risks.

RISK MITIGATION

Alashwal and Al-Sabahi (2018) indicated that risk mitigation is a holistic approach to reducing risks by addressing both risk severity and probability. The authors categorized risk mitigation into risk prevention and risk reduction. The first category aims at reducing the possibility of a loss occurring while the second is directed at reducing the severity of a loss. According to Tanojo, Hidayat and Azis, (2018), one of the ways to mitigate construction risks is to add expenditures that can be an advantage in the long run. In some projects, experts in the field of RM may be appointed. Risk can also be mitigated by sharing with the parties well equipped in dealing with risk (Okate and Kakade, 2019). In this way, risk-sharing can be an option by working with other parties to the project.

RISK RETENTION

Here risks remain present in the project. They are treated and financed by the company in charge of performing the work. Risks are retained by two methods namely: "active" and 'passive" (Fayek and Lourenzutti, 2018). The first method (self-insurance) is a deliberate management strategy after a constant assessment of the probable losses and costs of substitute ways of handling risks. The second method (non-insurance) usually occurs because of ignorance, negligence, or lack of decision. For instance, risk has not been identified and therefore dealing with the consequences must be borne by the company undertaking the project.

RISK TRANSFER

This is essentially trying to protect the company by transferring responsibility for claims, losses, and damages to the other party. Tembo-Silungwe and Khatle (2017) argued that transferring risk does not eliminate it; the threat still exists however, it is owned and treated by the party well placed to deal with it effectively. In the CI, this type of response strategy is applicable to a subcontractor or a contract between the general contractor and the client, depending on the risk's nature. One example is the purchase of an insurance policy, by which a specified risk of loss is passed from the policyholder to the insurer.

RISK FINANCING

Risk financing is the determination of how an organization will pay for loss events in the most effective and least costly way possible (Fayek and Lourenzutti, 2018). It involves the identification of risks and monitoring the effectiveness of the financing technique that is chosen. Three aspects of risk financing are considered (Fateminia, Seresht and Fayek, 2019): retention of risk under a self-funding plan, a combination of internal and external funding (shared funding), and transfer funding/external funding, where the cost of risk is transferred to a third party through e.g. commercial insurance.

PREPARE AND IMPLEMENT THE RISK ACTION PLAN

It is intended to optimize project performance (Leboea, 2017). However, Tembo-Silungwe and Khatle (2017) argued that like any other plan, it must be appropriately implemented to be successful and achieve optimal project performance. Supporting this statement, Tanojo, Hidayat and Azis, (2018) suggested that the process of implementing the risk plan should consist of first getting set up to carry out the plan, and then actually implement the various elements of the plan.

The above-mentioned are common in RM literature and used in construction as RRMs after potential risks have been identified. They were therefore adopted as the measures of risk response in the current study.

CLASSIFICATION OF RISKS

Risk classification is a significant step in the RM process, as it attempts to structure the various risks affecting construction projects. Various classifications have been suggested in literature. Al-Ajmi and Makinde (2018) presented a list of risk factors extracted from several sources: financial risks, construction risks, and design risks. In another view, the source of risks was used as a basis for their categorization as physical risks, personal risk, technical risk, safety risks, design risks, political and regulatory risks, financial risks, and contractual risks (Nawaz et al., 2019). According to Szymansk (2017), risks in construction are in the categories of risks retainable by contractors, consultants, and clients.

Although risks can be classified differently, Nawaz et al., (2019) argued that the motivation for choosing a classification must serve the purpose of research. Since the aim of the main study was to establish the influence of RM practices on project success, it was therefore important to identify the risks that can significantly influence project success. In the current study, success with respect to delivery of a building project could be referred to as the completion of a building within budgeted cost, scheduled time, at the required quality and without H&S issues. Al-Ajmi and Makinde (2018) hold the view that there is more to successful project outcome than just focusing on the triple dimensions time, cost and quality. Consequently, risks were classified in the study based on their impact on cost, time, quality, and H&S requirements, substantiating Rehacek (2017). They were therefore termed as time-related risk, cost-related risks, quality-related risks, and H&S related risks.

Research method

QUESTIONNAIRE DESIGN

A positivist research design was adopted using a structured questionnaire which was developed from an extensive literature review, expert consultation, advice from two supervisors, a methodology expert, and a professional statistician for ease of data analysis. Numerous sources including, theses and dissertations, academic and professional journals, books, and government reports were consulted. The questionnaire posed questions on respondents' extent of the use of RRMs, using a closed-ended 5-point Likert scale-type questions. The scale was: 1=To no extent, 2= A low extent, 3= A moderate extent, 4=A large extent, 5=A very large extent. The identified measures related precisely to those measures which could be used in responding to risks in construction. To achieve content validity, the questionnaire was piloted with 15 personnel who were knowledgeable of the RM practices they have been using for the management of their project risks.

The structure of the final questionnaire consisted of five sections with a covering letter which explained the purpose of the study. Sections 1 to 4 reported respectively on basic information about the respondent and the company, project risks, obstacles to RM implementation, and RM practices. Section 5 consisted of questions related to RM factors and the performance outcome of projects.

POPULATION AND DATA COLLECTION

The study was conducted in Gauteng (South Africa). Convenience sampling method was used to identify and select respondents who were operating at management level of the enterprise. Respondents to the study included owners, quantity surveyors, project and construction managers, working for established construction SMEs registered with the CIDB register of contractors. In the context of this study, SMEs refer to firms that are graded between 1 and 6 on the CIDB register. The sample size was based on the estimated population provided in the CIDB website which was 661. The sample size was determined using the general *Rule of Thumb*.

Out of the 225 questionnaires circulated using drop and collect method, 187 returned and 181 were deemed usable for the empirical analysis, representing approximately 80% response rate. This response rate is considered high and could have been because of the method used to collect data in the current study which has also yielded a high response rate in previous studies (Naude and Chiweshe, 2017; Sifumba et al., 2017) conducted on construction SMEs in SA.

DATA ANALYSIS

The Statistical Package for the Social Science (SPSS) version 23 was used to analyse empirical data, computing descriptive and inferential analyses. The reliability of RRMs was assessed using Cronbach alpha with 0.70 a generally agreed-upon lower limit (Hair et al., 2018). However, a lenient cut-off value of 0.60 is common in exploratory research and values closer to 1 suggest good reliability (Zaiontz, 2014). The current study adopted a threshold of 0.60. Reliability was achieved, signifying that the instrument was reliable.

Since the study's aim was to determine the structures underlying RRMs and given that EFA provides the empirical basis for assessing the structure of variables through data reduction, it was therefore possible using factor loadings to identify representative variables of RRMs from the six variables deemed to measure risk response. The representative variables established through EFA would explain the structures underlying RRMs. Prior to testing the factorability of data, the suitability of the data, factor extraction, factor rotation, and interpretation were assessed. The suitability of the data was achieved by checking the sample size requirement of 150+ (Pallant, 2016). The sample size for the current study was 181 which was considered greater than the recommended size. Bartlett's test of sphericity ($p \leq 0.05$, signifies statistical significance) and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (index ranges from 0 to 1, with KMO≥0.60 for good factor analysis) were also generated to help assess the suitability of the data. Factor extraction was assessed using the Kaiser's criterion and Scree test. Oblimin with Kaiser Normalisation rotation techniques were used as the extraction and rotation methods, satisfying factor rotation and interpretation of the theorized variables. Missing data were excluded using listwise deletion. Outliers were identified by checking the scatterplot which revealed data points that are out on their own and away from the main cluster of points. These were removed from the data set.

Convergent validity of RRMs was tested by determining whether the scores of items in one scale correlate with the scores on the other scales and converge or load together on a single construct (Hair, et al., 2018). Factor loadings of values ranging between 0.40 and 0.45 are considered significant for a sample size of 150 and 200 respectively (ibid.). The sample size of the current study is 181 and a cut-off value of 0.40 was adopted. No factor loading was less than 0.40 (Table 3) which would have been considered insignificant (ibid). Thus, convergent validity was supported. Next, discriminant validity was assessed by examining the variable correlation matrix (Table 1). Hair et al., (ibid.) suggested that the correlation between the variables should not exceed 0.70. The item intercorrelations for all the variables in the construct attained correlations below 0.70, indicating that discriminant validity was demonstrated.

Results of analysis

DESCRIPTIVE STATISTICS

Among the respondents, 30.90% were owners, 22.10% were owner-managers, 17.10% were project managers, and 15.50% were managers. Other positions such as quantity surveyors and civil engineers were represented by 14.40%, indicating the various types of professions represented in the industry. 22.90% of the respondents had matriculation, 2.80% had no qualification and 14.50% had attended basic schooling. The remaining 59.80% had graduated with a post-secondary school qualification (1.70% had a Doctorate degree, 6.10% had a Master's degree, 15.10% had an Honours/BTech/BSc degree, 16.20% had a Higher National Diploma/Diploma and 20.70% had another certificate). The percentage of respondents with post-secondary school qualification implies that the respondents are qualified to respond to the questions.

In terms of years of experience in construction and type of contractor, it was found that 18.10% of respondents had construction experience between 1-5 years, 28.90% had experience between 6-10 years, 30.80% had experience between 11-20 years, 16.80% had experience between 21-35 years, while only 5.40% had over 36 years of experience in construction. The year bracket 11-20 (30.80 %) predominate construction experience, followed by 6-10 (28.90%) and 21-35 (16.80%). This demonstrates that the respondents have spent a considerable number of years in the CI and are therefore familiar with RM practices. 38.20% of these contractors were Sub-contractors, 32% were General contractors and 29.80% were either Civil contractors (6.70%), Specialist contractors (18%) or Home building contractors (5.10%). These results indicate the involvement of SMEs in various types of business and that the sub-contractors either operated for the main contractor or were sole trade contractors.

EXPLORATORY FACTOR ANALYSIS (EFA) RESULTS

The 6 variables deemed to measure risk response (RP1, RP2, RP3, RP4, RP5, and RP6) were subjected to EFA. The data set was first verified for its suitability for factor analysis.

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KMO value was 0.796, exceeding the threshold of 0.60 suggested by Pallant (2016). This result indicates that the correlation pattern between variables is compact. Bartlett's test of sphericity reached statistical significance at $p=0.000$ (<0.05), suggesting that the correlation matrixes of the variables are not identity matrixes. Hence, the data of the study is suitable for factor analysis. The factorability of data for analysis was further supported by inspecting the correlation matrix (Table 1) which revealed the presence of many coefficients above 0.30, ranging from 0.344 to 0.492. It is shown that the six variables correlated with at least one other item.

Table 1 Correlation matrix

		RP1	RP2	RP3	RP4	RP5	RP6
Correlation	RP1	1.000	-0.083	0.201	0.011	-0.171	**0.344**
	RP2	-0.083	1.000	0.051	0.255	**0.377**	-0.005
	RP3	0.201	0.051	1.000	**0.492**	0.076	**0.436**
	RP4	0.011	0.255	**0.492**	1.000	0.189	0.227
	RP5	-0.171	**0.377**	0.076	0.189	1.000	**0.354**
	RP6	**0.344**	-0.005	**0.436**	0.227	**0.354**	1.000

Note: Coefficients above 0.30 are bolded.

Legend: RP1 (identify risk treatment options by avoiding risk); **RP2** (identify risk treatment options by mitigating risk); **RP3:** (identify risk treatment options by retaining risk); **RP4:** (identify risk treatment options by transferring risk); **RP5:** (identify risk treatment options by financing risk); **RP6:** (prepare and implement risk action plan).

Kaiser's criterion was thereafter used to determine the percentage variance accounted for by each of the 6 components/items. The percentage variability explained by each of the components is presented in Table 2. It is shown that only 2 components/items recorded eigenvalues above 1 (2.041 and 1.451), explaining 34.02% and 24.18% of the variance respectively and accounting for 58.20%. The results of the scree plot (Figure 1) which revealed a clear break after the second component also supported the decision to retain the first two components. The two components explained a total of 58.20% of the variance (see cumulative % column). This suggests that the two components together explain most of the variability in the six original variables and consequently are clearly a good and simpler substitute for all six variables.

Table 2 Percentage variance explained by the risk response measures

Component/Item	Eigenvalue	% of explained Variance	Cumulative %
1- RP1	**2.041**	**34.021**	**34.021**
2- RP2	**1.451**	**24.177**	**58.198**
3- RP3	.962	16.037	74.235
4- RP4	.784	13.067	87.302
5- RP5	.442	7.365	94.667
6- RP6	.320	5.333	100.000

Figure 1 Output from the scree plot for risk response

Oblimin with Kaiser Normalisation rotation method was subsequently performed in order to aid in the interpretation of the two components and to reveal their item-loadings. The rotated solution disclosed the presence of simple structure, both components showing several strong loadings with four items loading above 0.30 on component 1, and three items loading on component 2 (Pattern coefficients column). The number of items loading of each component exceeded 3, the recommended minimum number of items on a component (Pallant, 2016). This result further supported the decision to retain only two components. Moreover, communalities of the variables revealed significant loadings with all values exceeding the threshold of 0.50 (Hair et al., 2018) signifying that the variables meet acceptable levels of explanation. The results are presented in Table 3.

Table 3 Pattern and Structure Matrix for EFA

Item	Pattern coefficients		Structure coefficients		Communalities
	Component 1	Component 2	Component 1	Component 2	
RP3	**0.791**	0.101	**0.742**	-0.292	0.565
RP6	**0.783**	-0.085	**0.727**	-0.302	0.567
RP5	**0.579**	-0.479	**0.696**	0.127	0.636
RP4	**0.549**	**0.446**	0.276	**0.699**	0.500
RP1	-0.172	**0.758**	0.368	**0.657**	0.604
RP2	-0.006	**0.753**	0.516	**0.582**	0.620

Note: major loadings for each item are bolded.

The interpretation of the two components revealed that positive measures clumped together, and negative measures did the same, in line with positive and negative schedule scales used in extant literature (Pallant, 2016.). The two components were then adopted as the empirical constructs. Therefore, the first component (pattern coefficients column, Table 3) with negative items was named trailing measures, while the second component with positive items was named leading measures. It should, however, be noted that one item (RP4) loaded strongly on both components and since this variable has been overwhelmingly cited in previous studies (Tanojo, Hidayat and Azis, 2018; Sifumba, et al., 2017; Szymansk, 2017) as prevailing measure of risk response, it was considered as part of leading measures. Consequently, a two-factor model derived from the factorial analysis, as shown in Figure 2.

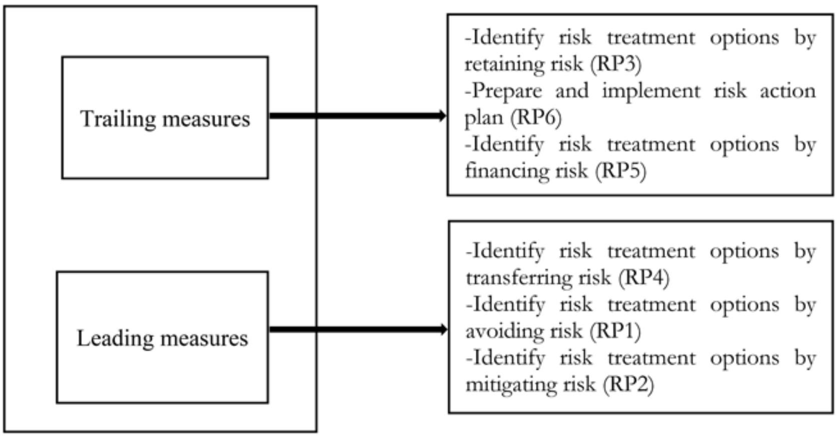

Figure 2 Two-factor model for risk response measures

Discussion of the results

In connection with construction risk responses for managing risk, mostly used response strategies as evinced by extant literature, are leading measures that provide information that prompt actions an organization or project can take to manage risks whereas trailing measures provide information about an event that has already happened (Tanojo, Hidayat and Azis, 2018). For instance, a company will adopt mitigating measures for a risk occurring or reduce its impact. Distinguishing and using both types of measures provide a more reliable and accurate measurement of risk response effectiveness (Mwangi and Ngugi, 2018). The fact that the structure of the 6 measures deemed to measure risk response were all explained by risk avoidance and risk mitigation suggests that these leading measures (as of the current study) attract considerable attention among construction SMEs in Gauteng.

A possible reason for SMEs considering risk avoidance is that there is a risk of unsuccessful completion of certain projects in part due to the issue of H&S risks which may hamper successful completion of projects. As stated by Tanojo, Hidayat and Azis (2018), though not all risks can be avoided but by avoiding certain risks, some benefits may be forfeited. Furthermore, in many firms, some projects have been difficult to carry out due to some clients having to refuse to allow for occupational H&S in the contingency fund. Fateminia, Seresht and Fayek (2019) argued that a project without an H&S plan has the potential to cause many costly problems because compliance by all parties on the project may not be a priority. This also indicates that SME respondents are not very versatile with the strategies they employ in responding to risk hence, another reason for believing that risk should be avoided.

Risk mitigation is also used by SMEs as a management strategy to reduce risk severity and the likelihood or consequences of a risk event. This may suggest that SMEs are well equipped with knowledgeable and experienced personnel capable of handling risk by mitigating the impact of its occurrence. Sifumba et al., (2017) found that construction SMEs in SA are utilizing the latest computational tools such as Monte Carlo Simulation and Expert system for analysing risks and therefore can mitigate risks by themselves. The current findings support recent studies by Tanojo, Hidayat and Azis, (2018) and Alashwal and Al-Sabahi (2018) where risk response and action planning were empirically measured by risk avoidance, risk mitigation, and risk transfer. It was revealed that when companies try to avoid risks, they do so either by not bidding for a job or by bidding at a very high price.

Equal consideration should also be given to trailing measures such as risk transfer (based on its factor structure) and risk retention although they seem unpopular among SMEs. In the studies conducted by Sifumba et al., (2017) and Rehacek (2017) these were favoured in the order of risk transfer, risk retention, and risk avoidance. A possible reason is that although SMEs recognize that risk should be transferred to another party, the situation where a general or prime contractor tries to transfer all risks may point the least incentive towards innovation. Leboea (2017) found that this situation leads to low productivity, poor quality, and project delays. Moreover, it is not unusual for an engineer or architect, for instance, to transfer risks to another party, habitually a sub-consultant, which the engineer/architect also insures against. This can result in the engineer/architect paying for the insurance coverage twice in the form of increased costs of goods or services. There is also a possibility of incomplete risk transfer (Tanojo, Hidayat and Azis, 2018), where depleted insurance or insolvency of the transferee or an unfavourable interpretation by a court can leave the engineer/architect liable for a risk which is expected to be covered by someone else.

It is no surprise that risk financing and risk retention were rated as trailing measures to respond to risks. According to Fayek and Lourenzutti (2018), risk financing and retention are employed based on the contractor's financial strength, the attitude of management toward risk, and overall risk management programme. A contractor with an overall strong balance sheet provides the contractor with the ability to fund more of its risk exposures without experiencing adverse financial impact. Consequently, financially strong contractors can assume larger amounts of risk. Furthermore, Fateminia, Seresht and Fayek (2019) stated that the level of retained risk should correspond with the philosophy of the construction firm's top management. However, some managers are risk-averse while others are risk-takers. For this reason, many SMEs prefer to insure heavily rather than retain significant amounts of risk.

Risk retention is often appropriate when the cost of insuring against a potential risk outweighs the financial burden the risk itself would impose (Fayek and Lourenzutti, 2018). For example, it is usually unreasonable to buy insurance for a small risk knowing that it is not always palpable whether it is better to buy insurance or retain risk. A company might lose money because it bought insurance, or it might lose money because it did not buy insurance. Insurance companies use advanced statistical analyses to guide their decisions, but SMEs lack resources. As a result, sometimes retaining risk is just a guessing game as observed by Sifumba et al., (2017).

Prepare and implement a risk action plan is usually not free. Each response could involve an expenditure of additional time and/or cost (Tembo-Silungwe and Khatle, 2017). Clearly, it is important that the organization be prepared to spend the required time, money or effort in responding to the identified risks, otherwise, the process will be ineffective. An important part of a risk-aware culture is the acceptance that it is better to incur the definite known cost now in order to avoid the possibility of a variable or unknown cost in the future. However, this finding is not surprising given the plethora of studies (Bushe, 2019; Rungani and Potgieter, 2018; Leboea, 2017) that have highlighted the multitude of factors hampering effective RM in SMEs and financial constraints which, unlike their larger counterparts, prevent them for instance from paying higher premiums and consequently, restraining their ability to negotiate with the insurance company providing a greater degree of flexibility in risk financing alternatives.

Although the current findings suggest that trailing measures of risk response may be cumbersome to measure, Tanojo, Hidayat and Azis (2018), Alashwal and Al-Sabahi (2018), and Abazid and Hard (2018) suggested that a combination of leading and trailing measures result in an effective project RM and therefore overall performance.

Conclusion

The objective of the study was to establish the factor structure of RRMs at project level of construction SMEs. Risk response was found to be measured by two components. The two components had positive and negative risk response measures. As a result, they were named leading and trailing measures, accordingly. Leading measures provide information that prompt actions an organization or project can take to manage a risk whereas trailing measures provide information about an event that has already happened. Trailing and leading measures should, consequently, be adopted to appraise and effectively manage project risks.

The current study may serve as a base for the development of agreed responses for each risk, including an appropriate strategy (avoid, mitigate, transfer, or retain risk) and specific responses to implement the chosen strategy. Such risk response strategies could be beneficial to stakeholders involved in RM, enabling informed decision making regarding enhancing RM and consequently maximizing project performance.

Finally, the structure of RRMs established in this paper offers a framework for developing effective risk responses and maximizing the benefits to be attained through proactive RM. The findings indicate that the study will contribute to the related body of knowledge. However, further studies may be undertaken in SA which will cover the whole country. An overall generic RM model can be developed which would help SMEs to correctly identify and classify the risk elements as being either controllable or uncontrollable, measure their impacts and probabilities of occurrence. The model could help decide whether to avoid risk completely, retain it and/or try to reduce its impact by taking defensive measures; or transfer it to a party well equipped to manage it. Such a model is expected to result in improved profitability and competitiveness for SMEs.

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