PRODUCTION & MANUFACTURING | RESEARCH ARTICLE

Knowledge transfer in institutionalised supplier development and operational performance: the mediating role of absorptive capacity

Shem Sikombe1* and Maxwell Phiri1

Abstract: Organisations are increasingly relying on supplier development as a supply chain strategy to improve organisational performance through knowledge transfer. Prior research suggests that effective knowledge transfer requires absorptive capacity, allowing organisations to identify, assimilate and convert external knowledge into commercial value. The purpose of this paper is twofold. Firstly, to examine the effectiveness of knowledge transfer in institutionalised supplier development and, secondly, to examine the mediating effect of absorptive capacity on the relationship between knowledge transfer and operational performance. We used multiple hierarchical regression and mediation analyses using a bootstrapping procedure to analyse 171 responses from self-administered questionnaires from stratified randomly selected small and medium-sized local contractors in Zambia’s construction industry. Findings reveal that knowledge transfer has a positive influence on the operational performance of local contractors. The study also found that knowledge transfer improves absorptive capacity, which

ABOUT THE AUTHOR

Shem Sikombe has over ten years of teaching, administrative and research experience at the university level. His research interest is in procurement and Supply Chain Management, Operations Management, Project Management and SME oriented Public Procurement policies, which have been published in acclaimed international journals. Maxwell A. Phiri has over 32 years of industrial and academic experience. His research interest is in marketing, organisational strategy, supply chain management and entrepreneurship. His research works have been published in both local and international journals.

Sikombe has been working on the PhD project at the University of KwaZulu-Natal under the tutelage of Prof. Phiri. The project purpose is to understand how government supplier development initiatives through various public procurement laws and policies translate into operational performance improvements in the construction industry. It is envisaged that the project will provide valuable policy direction in enhancing the local contracting capacity in Zambia and similar contexts.

PUBLIC INTEREST STATEMENT

One of Zambia’s massive infrastructure development objectives is to ensure a sustainable local construction capacity by encouraging knowledge transfer through institutionalised supplier development initiatives. The study focuses on the construction industry considered economically strategic, yet with weak absorptive capacity and knowledge transfer losses, owing to the transient nature of organisations. The study demonstrates that knowledge transfer alone is not sufficient to improve the operational performance of local contractors without sufficient absorptive capacity. Absorptive capacity may enable local contractors to obtain external knowledge from institutionalised supplier development initiatives, which can be integrated with existing knowledge to improve operational performance. The public interest of the study is that absorptive capacity should be essential when engaging local contractors in institutionalised supplier development initiatives. Before participating in the initiatives, assessing local contractors’ prior knowledge in the industry, external environment, and learning ability should be a prerequisite for all local contractors to ensure effective knowledge transfer.
significantly improves operational performance. The study shows that some of the dimensions of absorptive capacity do not significantly mediate the relationship. However, the relationship between knowledge transfer and the operational performance of local contractors is mediated by overall absorptive capacity. The paper contributes to understanding the role of absorption capacity in knowledge transfer and performance in the construction industry. Besides, the findings confirm that the effect of absorption capacity as a whole is more significant than its dimensions. Policy and managerial implications of the study findings have also been advanced.

**Subjects:** Building and Construction; Construction Economics; Construction Business Management; Information / Knowledge Management

**Keywords:** Knowledge transfer; supplier development; operational performance; small and medium-sized contractors; absorptive capacity; construction industry

1. **Introduction**
Supplier development is increasingly being recognised as a supply chain strategy that can improve a supplier's performance and, as a result, meet the buyer's short and long term supply needs (Chen et al., 2018). Supplier development covers a broad range of activities, which include training, technical assistance, supplier evaluation, investing resources in the supplier organisation, and the sharing of equipment and information, in order to improve supplier performance (Arroyo-López et al., 2012; Chen et al., 2018; Modi & Mabert, 2007). In the private sector, investigations have shown that supplier development positively influences knowledge transfer (KT) and, subsequently, performance improvement of the buyer (Modi & Mabert, 2007; Gosling et al., 2015). Szulanski (1996, p. 28) defines KT as a “dyadic exchanges of organisational knowledge between a source and a recipient unit.” In supplier development, KT is conceptualised as the process through which one organisation, usually a supplier, is influenced by the knowledge of another experienced organisation (a buyer) through access to and acquisition of external knowledge (Squire et al., 2009). Thus, it is the exchange of organisation knowledge, skills and experiences between the buyer and supplier (Zhao, 2013), which, in turn, is used by the parties to improve their performance. More recently, however, some studies have questioned whether this is the case for construction projects financed by the public sector due to contextual differences (Gosling et al., 2015). This is because construction projects, like other project-based organisations, are inherently temporary, complex and significantly rely on cross-functional teams (Ali et al., 2018).

For example, several institutionalised supplier development initiatives have been implemented in Zambia’s construction industry. Institutionalised supplier development is the type of supplier development initiative coordinated by central and state-owned enterprises through public procurement policies targeted at small and medium-sized (SME) contractors (GRZ, 2014). Local contractors’ can access public procurement opportunities through institutionalised supplier development initiatives such as reservation and preferential schemes, access to finance, subcontracting and training (Flynn, 2018; Marion, 2007; Ministry of Commerce Trade and Industry, 2018, 2018). The SME oriented public procurement policies aim to stimulate KT to local contractors from large foreign contractors to build their capacity (Hawkins et al., 2018; Loader, 2017). In their earlier studies, Sikombe and Phiri (2019) argue that buyer-supplier collaborations such as supplier development create a conducive environment for KT from the more experienced and relatively large organisation to SMEs, with relatively small knowledge stocks. However, despite the critical role that SME oriented public procurement policies play in stimulating KT, the effect of institutionalised supplier development initiatives on KT remains under-researched (Grandia & Meehan, 2017), particularly in the construction industry such as Zambia. This is echoed by a report of the Communications, Transport, Works and Supply Committee of the National Assembly of Zambia found that lack of empirical research in the construction industry adversely affected policy interventions for stimulating KT to SME local contractors (GRZ, 2014).
In addition to KT’s influence on supplier performance outcomes, Arráiz et al. (2013) recognise that absorptive capacity is also a crucial factor shaping institutionalised supplier development initiatives’ success. Although initially developed in the context of research and development (R & D), absorption capacity (AC) has the potential to help further understand how KT in supplier development leads to improved operational performance, as recent studies have shown (Azadegan, 2011; Saenz et al., 2013). Research has shown that AC, the ability of an organisation to acquire, assimilate, transform and exploit external knowledge in R & D and supply chains collaborations, have a direct positive impact on organisational performance outcomes (Cohen & Levinthal, 1990; Ebers & Maurer, 2014; Todorova & Durisin, 2007; Zhang & Lyles, 2018). Similarly, Balle et al. (2020) argue that AC is a critical ingredient that influences an organisational capacity through access to strategic resources which may not be found within the organisational boundaries. Recently, in their study of buyer engagement on green product innovation in Pakistan, Awang et al. (2021) reiterate the vital role of AC in knowledge acquisition, assimilation and subsequently, achievement of green product innovation. In the project-based organisational setting, Ali et al. (2018) echo similar findings that knowledge sharing is a significant antecedent for improving the AC and project performance.

1.1. Research gap

Chaudhary and Batra (2018) argue that despite recognising the importance of KT and AC, particularly in large organisations, there is still a paucity of research to understand the mechanisms through which AC influences operational performance in the context of SMEs. Hitherto majority of studies have analysed AC from the perspective of large corporations using proxies such as R & D expenditure or the number of patents that are unlikely to fully account for the multidimensional complexities of AC (Chaudhary & Batra, 2018; Duan et al., 2020; Ebers & Maurer, 2014; Manley et al., 2014). The present article extends the discourse on AC in institutionalised supplier development using SME local contractors. In addition, the current study applies a multidimensional construct of AC, namely knowledge acquisition, assimilation, transformation and application (Flatt, Greve, et al., 2011; Nagati & Rebollo, 2012). Besides, there is limited knowledge of how the dimensions of AC individually and jointly influence the KT and operational performance of SME local contractors in the construction industry, such as in Zambia.

Furthermore, SME local contractors provide a unique but unequivocally exciting context for understanding the influence of AC on the relationship between KT and operational performance against their “smallness” liabilities. Local contractors operate in the knowledge-intensive construction industry, characterised by project-based organisations and KT losses between organisations (Dang et al., 2018; Manley et al., 2014; Smyth & Duryan, 2020). It is worth noting that despite the proliferation of project-based organisations, knowledge management in project-based organisations is still underdeveloped (Ali et al., 2018), and the industry faces many challenges (Ren et al., 2018). This field remains under-researched. For example, Zia (2020) acknowledges that SME project-based organisations are less advanced in knowledge management activities because of underdeveloped knowledge management processes and systems. In these organisations, knowledge management activities are usually informal without well-designed information and communication systems. Furthermore, project-based organisations in the construction industry are knowledge-intensive (Dang et al., 2018), coupled with high employee mobility, thus, adversely affecting institutional memory (Smyth & Duryan, 2020). These peculiar construction industry challenges make studies related to KT worth exploring to contribute to systematic knowledge management in the sector.

Furthermore, despite the increase in government support, to SME contractors in form of institutionalised supplier development, the interactions between large construction organisations and SME local contractors do not emphasise KT (Smyth & Duryan, 2020). Therefore, some questions remain unanswered regarding the efficacy of institutionalised supplier development initiatives in developing a sustainable construction capacity for SME contractors in the absence of capacity building through KT (Cheelo & Liebenthal, 2020). It remains unclear whether there is KT in the interactions between large contractors and SME contractors. Furthermore, evidence is scarce on whether this interaction leads to performance improvements.
In addition, research is consistent that SMEs are increasingly relying on the expertise of large supply chain partners to improve their performance. This transfer requires AC, which allows an organisation to explore external knowledge and convert it into value for the company (Ali et al., 2018; Saenz et al., 2013). This aspect of AC remains underexplored for SME construction companies.

Therefore, understanding the influence of AC on the relationship between KT and operational performance of SME local contractors will provide essential insights into the under-researched area of institutionalised supplier initiatives in the construction industry from a developing country context, Zambia. In order to address the preceding gaps, the study is guided by the following specific research questions:

- **RQ1:** What is the effect of KT on the operational performance of local contractors?
- **RQ2:** What is the effect of KT on the AC of local contractors?
- **RQ3:** How does AC mediate the relationship between KT and the operational performance of local contractors?

The rest of the article is organised as follows: Section 2 presents the literature review on knowledge transfer in supplier development, absorptive capacity, and operational performance. Section 3 outlines the theory and hypotheses development, followed by the methods in section 4. Section 5 presents the results, followed by a discussion of findings and concluding remarks in section 6.

## 2. Literature review

### 2.1. KT in supplier development

Effective management of knowledge is a core competence that gives an organisation some competitive edge (Grant, 1996) because such competencies are held in the organisation's intellectual capital, employees, and systems (Balle et al., 2020; Spekman et al., 2002). Arguably these competencies are not equally distributed in all organisations because some organisations are better at utilising the competencies to develop their capabilities and outsmart other players. Therefore, the uneven distribution of knowledge underscores the importance of collaborations such as supplier development to facilitate KT. Furthermore, it is also challenging and costly for individual organisations to create all the knowledge it needs internally and therefore further necessitate the need for supplier development to acquire and exploit knowledge in a relationship (Nagati & Rebolledo, 2012). The importance of KT in supplier development is a recognition that organisations no longer rely solely on internal idiosyncrasies but are increasingly leveraging knowledge from other players within the supply network (Kotabe et al., 2003). Some organisations are better learners, and therefore more experienced; hence can extend learning beyond the organisation boundary so that other members can benefit from the KT (Spekman et al., 2002). For example, Scutto et al. (2017) underscore the importance of collaborations as a driver of external or internal knowledge flow that can be leveraged for open innovation.

Despite substantial research on KT in large organizations, there is still limited research in supplier development, emphasising SME collaborations. Chen et al. (2015) conducted an extensive systematic review of supplier development classification and found that most supplier development activities were predicated on knowledge management. Supplier development activities encompass various means of KT from the buying organisation to the supplier (Wagner, 2010). Similarly, Chen et al. (2018) add that supplier development increases the stock of new knowledge in the suppliers’ repository, which ultimately improves its performance and capability. However, these studies have not addressed the interplay between KT, AC and operational performance in supplier development. In sum, despite limited research on KT in supplier development, studies recognise the importance of knowledge as a strategic resource (Grant, 1996) and highlight the role of supplier development in facilitating KT (Wagner, 2010).
2.2. Absorptive capacity

AC is a fundamental learning process used by an organisation to acquire, assimilate, transform and exploit knowledge for performance improvement (Ali et al., 2018; Balle et al., 2020; Lane et al., 2006; Zahra & George, 2002; Zhang & Lyles, 2018). For local contractors to recognise and acquire valuable knowledge, assimilate, transform, and exploit it for performance improvement, they must have sufficient AC (Arroyo-López et al., 2012). The importance of AC as an organisational capability cannot be overemphasised; for example, organisations exposed to the same levels of external knowledge flows may perform differently because of the different levels of AC (Denford & Ferriss, 2018; Escribano et al., 2009). Therefore, acquiring sufficient AC entails navigating the challenges of resources and other operating constraints for the SME local contractors to focus on learning.

Furthermore, Lane et al. (2006) recommend extending the empirical studies on AC beyond strategic alliances and R & D contexts. For instance, Azadegan (2011) contributes to the AC discourse in the buyer-supplier relationship by empirically demonstrating that AC improves suppliers’ operational innovation in intensive tasks compared to less intensive tasks. Soenz et al. (2013) add to the discussion by evaluating the mediating role of AC on organisational compatibility and performance within the buyer-supplier relationship. Finally, Wuryaningrat (2017) reiterates that AC improves knowledge sharing and innovation outcomes. When an organisation develops sufficient AC, it improves its ability to acquire, assimilate, transform and apply knowledge for performance improvements (Liao et al., 2007).

2.3. Operational performance

Operational performance refers to the performance related to the productive and measurable output of an organisations’ internal operation, such as productivity, product quality, cost of operations, delivery, flexibility, innovation and customer satisfaction (Kotabe et al., 2003; Nagati & Rebolledo, 2012). For instance, in procurement and supply chain management, operational performance outcomes relate to delivery, quality, cost, customer satisfaction, and innovation (Rebolledo et al., 2009; Soenz et al., 2013). Specific supplier performance metrics are emphasised in the construction industry, such as project schedule, budget, quality, and technical project objectives (Lawson et al., 2015). Furthermore, health and safety, financial, quality, design, management, and project close-out are key performance indicators in the construction industry (Gosling et al., 2015). Typically, unlike other industries where supplier performance evaluation is carried out regularly, supplier performance evaluation is usually undertaken at the end of the project in the construction industry. There is some consensus in the literature that KT is linked to improved performance (Ali et al., 2018; Balle et al., 2020; Denford & Ferriss, 2018; Giampaoli et al., 2017; Smyth & Duryan, 2020). However, debate remains as to whether the relationship is direct or mediated by other variables. In the current article, we argue that the local contractor ability to utilise knowledge from institutionalised supplier development through AC improves their operational performance.

3. Theory and hypotheses development

3.1. Knowledge-based view theory

The knowledge-based view theory conceptualises an organisation as an institution of knowledge integration from individuals in order to transform knowledge into commercial value (Grant, 1996; Zia, 2020). Knowledge is regarded as a critical resource that resides in specialised individuals, which an organisation can leverage for value creation. The primary assumption of the knowledge-based view is that organisational resources and capability advantages are leveraged through access to knowledge from the internal or external environment (Denford, 2013; Scuotto et al., 2017). Therefore, external KT challenges can be attributed to different KT abilities between parties in the buyer-supplier relationship. Furthermore, Blome et al. (2014) argue that KT can influence performance and innovation through supply chain flexibility. Other scholars acknowledge that AC is the differentiating factor in KT (Denford & Ferriss, 2018). Theoretical support for the claim that KT
has a positive influence on supplier performance through AC within supplier development is well-founded, as shown in Figure 1.

3.2. Hypotheses

3.2.1. Linking KT to operational performance and AC

The knowledge-based view has identified knowledge as a strategic resource that should lead to positive competitive performance outcomes (Grant, 1996). Zhang and Lyles (2018) further argue that knowledge is a critical resource, and the capabilities in knowledge absorption and application have persisting effects on operational performance improvements. In the context of supplier development, many studies highlight the effect of supplier development on KT and supplier performance improvement (Wagner & Krause, 2009; Rebolledo et al., 2009; Gosling et al., 2015). For example, Modi and Mabert (2007) assert that KT leads to continuous improvement in the supply chain, resulting in performance outcomes such as cost reduction, improved quality and productivity. Furthermore, Saenz et al. (2013) argue that selecting supply chain partners must consider organisational compatibility on their own and the AC as an essential facilitator of KT and operational improvement. Research has consistently converged on the argument that KT leads to improved performance through the effective application (Chen et al., 2018; Liao et al., 2007). Therefore, the study extending these arguments and posits that:

\( H_1: \) KT has a positive influence on the operational performance of local contractors.

\( H_2: \) KT has a positive influence on the AC of local contractors.

3.2.2. Linking AC to operational performance

Zhang and Lyles (2018) report that AC is positively associated with performance and capabilities improvement, including innovation. However, few organisations fully exploit the knowledge beyond their organisational boundary mainly because of limited AC (Rebolledo et al., 2009; Todorova & Durisin, 2007). Chen and Chang (2012) narrow the performance indicator of AC to operational levels as improvements in product quality, productivity, and profitability. This is also echoed by Saenz et al. (2013), who argue that, in the buyer-supplier relationship, AC outcomes also improve operational efficiency, flexibility and reliability in addition to innovation outcomes. In addition, Flatten, Greve, et al. (2011) acknowledge the importance of AC in generating savings, particularly in product development. The argument is that if an organisation acquires correct knowledge of customer preferences through well-developed potential AC, it should generate savings through realised AC by matching products to customer preferences. Szulanski (1996) and Ali et al. (2018) also argue that organisations may face enormous challenges in exploiting knowledge from the external business environment without AC. Therefore, the study further posits that:

\( H_3: \) AC has a positive influence on the operational performance of local contractors.

3.2.3. Mediating influence of AC

We argue in the current article that the effectiveness of KT is significantly improved when the supplier possesses sufficient AC. This argument is advanced by most studies that KT increases the AC of the recipient organisation, which facilitates the acquisition, assimilation and exploitation of knowledge (Ali et al., 2018; Lane et al., 2006). For instance, Francalanci and Morabito (2008) argue that the integration of information systems only leads to more excellent organisational performance through AC. Furthermore, extant literature indicates that KT influences AC by enhancing the efficiency and effectiveness of knowledge acquisition from the external environment and, subsequently, knowledge exploitation (Ali et al., 2018; Cohen & Levinthal, 1990; Lane et al., 2006; Todorova & Durisin, 2007; Zahra & George, 2002). For instance, Saenz et al. (2013) argue that
Control variables:
(a) Company age
(b) Number of employees

Contractor operational performance

Contractor absorptive capacity

Knowledge transfer

H1
H2
H3

Figure 1. Conceptual model.
the relationship between supplier development, AC and performance is not direct. Ali et al. (2018) argue that knowledge sharing can only be successfully transformed into performance improvement through AC. Volberda et al. (2010) add that AC mediates the relationship between speed, frequency and scale of innovation in R & D activities. However, a limited understanding of KT and performance improvement through AC in the context of institutionalised supplier development still exists. Based on the preceding arguments, the study hypothesises that:

\[ H_4: \text{AC mediates the relationship between KT and the operational performance of small local contractors.} \]

4. Methods

4.1. Research context

The construction industry is very critical to the economy of Zambia. The various infrastructure projects currently being implemented have a combined budget of approximately $8 billion (GRZ, 2014; Road Development Agency, 2016) and are, therefore, very strategic to the government of the Republic of Zambia. One of the secondary objectives of these projects is to ensure the capacity building of SME local contractors through KT from institutionalised supplier development initiatives. SMEs comprise over 90 per cent of local contractors in Zambia, yet they command less than 30 per cent of the market share (Cheelo & Liebenthal, 2020). However, at present, it is difficult to establish the efficacy of institutionalised supplier development initiatives in terms of KT and subsequently how to prioritise them amid limited competing public resources in the absence of empirical evidence.

4.2. Sampling and data collection

The population for the current article consists of the registered contractors from 2017 to 2019 by the National Council for Construction, and the sampling frame consists of 1649 contractors from Lusaka and Copperbelt provinces, which represent about 57 per cent of all registered contractors in Zambia (National Council for Construction, 2019). Furthermore, Lusaka is the capital city of Zambia, where all government head offices are located. On the other hand, Copperbelt province is considered the country’s economic hub because of the concentration of mining activities. Thus, the two selected provinces have the highest concentration of economic and construction activities in Zambia and are fairly representative of the construction industry in Zambia.

Furthermore, the National Council for Construction registers different contractors in the Zambian construction industry; only four (4) categories (B, C, R and ME) which form the core construction activities, have been considered. These are general building construction and housing (B), general civil engineering (C), general road and earthworks (R) and mechanical engineering works (ME). In addition, the NCC ranks contractors into a six-tier grading system (grades 1, 2, 3, 4, 5 and 6). The grade of a contractor represents the level of technical and financial competence of a particular organisation. Grade 1 is the highest, while grade 6 is the lowest. Only grade 3 to 6 contractors were considered because they are the main target for institutionalised supplier development programmes. Therefore, the population for this study was 1,649 registered contractors in grades 3 to 6 only and a sample of 605. Stratified sampling was used for each grade, and samples from each stratum were selected using simple random sampling. The researchers undertook the survey, and questionnaires were delivered to respondents’ physical addresses (obtained from the national council for construction register) with the help of 8 research assistants between February 2020 to May 2020.

4.3. Factor analysis

We assessed the internal consistency and unidimensionality of all the multi-item constructs by means of exploratory factor analysis with varimax rotation using SPSS vol. 23. All items demonstrated high loadings exceeding the 0.4 cut-off point on the intended factors (Field, 2009; Joseph et al., 2014).
The results show that the Kaiser–Meyer–Olkin verified the measure of sampling adequacy for the analysis; KMO = .870 was far above the acceptable minimum limit of 0.5 (Field, 2009; Joseph et al., 2014). Moreover, Bartlett’s test of sphericity $\chi^2 (406) = 3606.102, p < .001$ indicates that the correlation matrix is not an identity matrix; therefore, the dataset was suitable for factor analysis. Additionally, an initial analysis was run to obtain eigenvalues for each component in the data, which were compared with the scree plot inflexions. The varimax rotation produced a clear structure of factor loadings on a particular component, and factors with loadings above 0.4 were retained as recommended (Hair et al., 2014). Six components were retained, which had eigenvalues over Kaiser’s criterion of 1 and, in combination, explained 71.855 per cent of the variance.

Table 1 shows that cluster on the same components suggests that component 1 is knowledge transformation, with variance explained of 35.106 per cent; component 2, operational performance with variance explained of 13.052 per cent; component 3 is KT with variance explained of 8.161 per cent. Furthermore, component 4 is knowledge application with variance explained of 6.796 per cent; component 5 is knowledge acquisition with variance explained of 5.247 per cent. Finally, component 6 is the knowledge assimilation with variance explained of 3.493 per cent.

Furthermore, reliability analyses were conducted using Cronbach’s Alpha to evaluate the unidimensionality of a set of scale items on the returned factors from the factor analysis, and all the reliability coefficients were within the accepted levels of 0.7 (Field, 2009; Hair et al., 2014), with the exception of the assimilation construct which was 0.678 but still acceptable (Hair et al., 2014).

4.4. Measures
The data collection was based on a standardised questionnaire with established scales in the field. Respondents were asked to indicate the extent of KT from institutionalised supplier development on road construction, project management, road maintenance, supervision skills, designing structures and occupational health and safety. The items were adapted from previously validated studies as summarised in Table 2.

4.5. Common method variance and Nonresponse bias
In order to minimise common method variance, some interventions and tests were conducted before and after data collection. Prior to data collection, the questionnaire was designed so that the independent and dependent variables were placed at two extreme ends of the questionnaire with intermediate variables in between. This helped to diminish the effects of consistency motifs (Flynn et al., 2018; Podsakoff et al., 2003). Furthermore, after data collection, the recommended Harman’s one-factor test was conducted to evaluate the possibility of common method variance (Podsakoff et al., 2003; Tehseen et al., 2017). Examination of unrotated factor loadings indicated that factor 1 (knowledge transformation) accounted for only 35.106 per cent of the variance from the cumulative percentage of 71.855 per cent. Therefore, no single factor dominated the variance explained in the data, and common method variance was not a problem in the current study (Podsakoff et al., 2003).

Nonresponse bias is an error that occurs when the information obtained from the respondents differ from that obtained from non-participants due to significant demographic and socioeconomic differences (Collier & Bienstock, 2007). Nonresponse bias can threaten the external validity of research findings. Several methods exist for estimating nonresponse bias. For example, Lindner et al. (2001) recommend that early and late respondents can be used to test for the nonresponse bias in the absence of the actual nonrespondents. Therefore, a paired t-test of a group of the early 30 respondents and a group of the late 30 respondents was conducted. The t-test did not indicate any statistically significant differences between the early and late respondents, as summarised in Table 3 below. The result suggests that nonresponse bias was not a problem in the current research (Armstrong and Overton, 1977).
| Transformation (α = .898)                        | Component                                                                 | Eigenvalues | Variance explained |
|-----------------------------------------------|---------------------------------------------------------------------------|-------------|--------------------|
| Our employees have the ability to structure and use collected knowledge. | 0.856 | 10.181 | 35.106             |
| Our employees have the ability to absorb new knowledge as well as to prepare it for further purposes. | 0.812 | 9.124 | 27.286             |
| Our employees successfully link existing knowledge with new insights. | 0.765 | 7.390 | 22.526             |
| Our employees are able to apply new knowledge in their construction work. | 0.7 | 5.602 | 18.328             |
| Employees in my company are willing to accept changes that came as a result of the lessons learnt in a particular construction project | 0.634 | 3.960 | 13.133             |
| My company is able to take advantage of new knowledge and apply it to other construction projects. | 0.599 | 3.547 | 11.829             |
| My company is able to apply knowledge to cope with changing competitive conditions in the construction industry. | 0.565 | 3.331 | 10.503             |
| Operational performance (α = .929)            | My company is able to meet budgeted cost targets. | 0.851 | 6.925 | 21.861             |
| My company is able to deliver projects to quality standards. | 0.814 | 6.584 | 19.753             |
| My company has improved its project costing compared to three years ago | 0.801 | 6.410 | 19.232             |
| My company is able to meet project technical objectives. | 0.792 | 5.903 | 17.710             |
| My company is able to meet schedule targets. | 0.789 | 5.788 | 17.364             |
| My company is able to comply with health and safety standards. | 0.788 | 5.773 | 17.310             |
| Component                                                                 | Eigenvalues | Variance explained |
|--------------------------------------------------------------------------|-------------|--------------------|
| Knowledge transfer (α = .924)                                            |             |                    |
| My company has acquired important knowledge in supervision skills.       | 0.889       | 2.367              | 8.161             |
| My company has acquired important knowledge in project management.       | 0.854       |                    |                   |
| My company has acquired important knowledge in road maintenance.         | 0.847       |                    |                   |
| My company has acquired important knowledge in road construction.        | 0.845       |                    |                   |
| My company has acquired important knowledge in designing structures.     | 0.833       |                    |                   |
| My company has acquired important knowledge in occupational health and safety. | 0.755       |                    |                   |
| Exploitation/application (α = .742)                                      |             |                    |
| The main contractor and my company make joint decisions on the project   | 0.828       | 1.971              | 6.796             |
| My company is using knowledge from the main contractor or reserved projects to solve new construction problems. | 0.687       |                    |                   |
| The main contractor’s and my company’s employees interact frequently.    | 0.608       |                    |                   |
| We share changes in project requirements with the main contractor based on the preferences of our client | 0.575       |                    |                   |

(Continued)
4.6. Control variables

The research acknowledges additional influences on the operational performance of local contractors and therefore includes company age and the number of employees (size) as control variables in the model. Company age (as measured by the number of years from the founding date until February 2020) may influence the ability of the contractor to perform better, as older companies are expected to be more experienced in handling diverse projects and rely on institutional memory. The number of employees, a proxy measure of company size, was used (as rated by the number of employees on a 4-point scale, e.g., 1: below 25; 2: 26 to 50; 3: 51–75 and 4: above 76 employees). Company size may affect company operational performance, as larger companies have the opportunity to leverage scarce resources (Flatten, Greve, et al., 2011; Ebers & Maurer, 2014).

5. Data analysis and results

5.1. Response rate and demographic information

A total of 605 questionnaires were distributed, comprising 305 in Lusaka province and 300 in Copperbelt province. A total of 176 questionnaires were retained from both Lusaka and Copperbelt provinces. Five of the questionnaires were not complete, as vital information was missing and were therefore discarded. This represents an overall response rate of 28.3%. The response rate of 171 comprises 89 (52%) from Lusaka and 82 (48%) from the Copperbelt provinces. Demographic information revealed that the average year of operation of the companies surveyed was 8.3 years, and 39.8% were owners. Furthermore, 43.9% comprised CEO/Director/Senior Manager and 26.4 in other categories such as company secretary.
Table 2. Construct measures

| Measures | Definitions | References |
|----------|-------------|------------|
| KT       | KT involves the organisation’s ability to acquire knowledge from the external environment and sharing it internally to improve its operations through the application of knowledge for commercial value. This can be achieved through, among other things, supplier development, where a buying organisation with vast experience and knowledge, transfers knowledge to a less experienced supplier organisation to improve its performance | Nagati and Rebolledo (2012); Gosling et al. (2015) |
| AC       | AC is a four-dimensional construct comprising of knowledge acquisition, assimilation, transformation, and exploitation/application as follows: | Davila et al. (2019); Flatten, Englen et al. (2011); Saenz et al. (2013) |
| KAC      | Knowledge acquisition involves recognising and comprehending external relevant information from a variety of sources, such as supplier development initiatives. | Davila et al. (2019); Flatten, Englen et al. (2011); Saenz et al. (2013) |
| KAS      | Knowledge assimilation involves the conversion and interpretation of acquired information and the development of a suitable internal organisational context to facilitate knowledge sharing internally | Saenz et al. (2013) |
| KTR      | Knowledge transformation combines new and prior knowledge to develop and refine organisational routines that facilitate knowledge conversion and internalisation | Davila et al. (2019); Flatten, Englen et al. (2011); |
| KAP      | Knowledge application involves the application of knowledge to create commercial value. Knowledge exploitation involves the application of knowledge for new product development, innovative practices, and the execution of projects that could not have been carried out in the past | Saenz et al. (2013) |
| PERF     | Operational performance refers to the performance related to the productive and measurable output of an organisation’s internal operation, such as productivity, product quality, cost of operations, delivery, flexibility, innovation, and customer satisfaction. Project performance outcomes focus on the project schedule, budget, quality and technical project objectives. | Modi and Mabert (2007); Gosling et al. (2015); Lawson et al. (2015) |

KT-knowledge transfer; AC-absorptive capacity; KAC-knowledge acquisition; KAS-knowledge assimilation; KTR-knowledge transformation, KAP-knowledge application, and PERF-operational performance
Table 3. Paired samples test

|       | Paired Differences |          |          |          | t   | df | Sig. (2-tailed) |
|-------|--------------------|----------|----------|----------|-----|----|----------------|
|       | Mean               | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference |     |    |                |
|       |                    |           |           | Lower    | Upper|    |                |
| Pair 1 | KT_E—KT_L         | .0556    | 1.26577  | .23110   | -.41709 | .52820 | .240 | 29 | .812 |
| Pair 2 | ACQ_E—ACQ_L       | -.37778  | 1.14381  | .08083   | -.80488 | .04933 | -1.809 | 29 | .081 |
| Pair 3 | AS_E—AS_L         | -.34444  | 1.10201  | .0120    | -.75594 | .06705 | -1.712 | 29 | .098 |
| Pair 4 | TR_E—TR_L         | -.30952  | 1.10024  | .0088    | -.72036 | .10131 | -1.541 | 29 | .134 |
| Pair 5 | APP_E—APP_L       | -.46667  | 1.25212  | .22861   | -.93422 | .00088 | -2.041 | 29 | .050 |

Note: KT_E: denote early responses on KT and KT_L, late responses on KT, respectively.
5.2. Correlation analyses

Table 4 presents descriptive statistics and correlation analyses. KT, AC dimensions (knowledge acquisition, assimilation, transformation and application) and operational performance were positively correlated, ranging from .176, p < .05 to .266, p < .001. Furthermore, operational performance was significantly correlated with all the independent variables ranging from .292 to .560, p < .001. In general, the correlation results suggest a strong relationship between variables in the relationship between KT, AC and operational performance.

5.3. Hierarchical regression analysis

Table 5 shows that the control variable (company age and the number of employees), independent variables (KT, knowledge acquisition, assimilation, transformation and application) were modelled against the dependent variable, operational performance. Furthermore, collinearity statistics indicate that multicollinearity was not a problem in the data because the variance inflation factors (VIF) for all the variables were less than 10 (Field, 2009; Hair et al., 2014).

To test the following hypotheses:

**H₂:** KT has a positive influence on the operational performance of local contractors

**H₃:** AC has a positive influence on the operational performance of local contractors

The three model hierarchical regression analysis was conducted as indicated in Table 5.

Model 1 shows the base model with control variables company age and the number of employees as predictors of operational performance. Model 1 was not statistically significant (F (2,168) = 1.974; p = .241) and explained 1.7% of variance in operational performance. However, the number of employees was significant (B = .130, SE = .065, p < .05).

Model 2 has three predictor variables (company age, number of employees and KT). The model showed a significant improvement over model 1. The total variance explained in model 2 as a whole was 9.9 % (F (3, 163) = 6.129; p < .01). The introduction of the above variables explained an additional 7.6% of the variance (R square change = .076) in operational performance. In model 2, one out of three variables were statistically significant, KT recording the highest value (B = .209, SE = .056; p < .001).

Model 3 has seven predictor variables (company age, number of employees and KT, knowledge acquisition, assimilation, transformation and application). The model showed a significant improvement over model 2. The total variance explained by model 3 as a whole was 37.1 % (F (3, 163) = 13.709; p < .001). The introduction of the above variables explained an additional 27.1% of the variance (R square change = .271) in operational performance. In model 3, two out of seven variables were statistically significant, Knowledge transformation recording a highest value (B = .472, SE = .097; p < .001) followed KT (B = .100, SE = .049; p < .05). The results support the two hypotheses that KT and AC (through the transformational dimension) positively influence the operational performance of local contractors.

5.4. Mediation using bootstrapping procedure

There has been a proliferation of mediation analysis using bootstrapping procedure in the recent past due to some inherent limitations in the previous studies using causal steps outlined in Baron and Kenny's classic work (Baron & Kenny, 1986). However, Baron and Kenny (1986) mediation analysis suffers from some shortcomings. Firstly, the procedure by Baron and Kenny (1986) does not address the significance of ab directly; instead, it applies a series of separate significance tests not directly involving ab. Second, their procedure suffers from low statistical power in most situations because of the requirement that both the a and b coefficients be
|                          | Mean | SD     | 1      | 2    | 3    | 4    | 5    | 6    | 7    |
|--------------------------|------|--------|--------|------|------|------|------|------|------|
| Company age              | 8.32164 | 5.753418 |        |      |      |      |      |      |      |
| No of employees          | 1.50292 | 0.890302 | .174*  |      |      |      |      |      |      |
| Knowledge acquisition    | 3.9084 | 0.76358 | -.066  | .031 |      |      |      |      |      |
| Knowledge assimilation   | 3.8908 | 0.70185 | -.115  | .151* | .395**|      |      |      |      |
| Knowledge transformation | 4.0886 | 0.65045 | -.302  | .043 | .523**| .562**|      |      |      |
| Knowledge application    | 3.5819 | 0.78909 | .015   | .144 | .462**| .530**| .483**|      |      |
| Knowledge transfer       | 3.4279 | 1.0031  | -.050  | .109 | .176* | .203**| .253**| .266**|      |
| Operational Performance  | 4.1793 | 0.75277 | -.004  | .148 | .355**| .431**| .560**| .394**| .292**|

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).
statistically significant. Third, the concept of partial and full mediation has been repudiated in recent studies. For example, Hayes (2018) critiques the degree of mediation (full or partial) because partial or complete mediation is defined only when a researcher has determined that the total effect is significantly different from zero. Rucker et al. (2011) caution against the simplistic approach of complete or partial mediation because complete mediation implies that M completely mediates the effect of X on Y and nothing whatsoever about the existence or absence of other possible mediators of X's effect. Mackinnon et al. (2007) question the practicality of a single mediator to be fully explained by an independent variable to a dependent variable relation.

Bootstrapping procedure requires only two conditions; first, there is an effect to be mediated, that is, c ≠ 0 and second, that the indirect effect is statistically significant in the direction predicted by the mediation hypothesis. Therefore, the bootstrapping procedure for mediation analysis is more robust, as recent studies indicate (Hayes, 2018; Preacher & Kelley, 2011). Consequently, based on the same line of thought, bootstrapping procedure for mediation analysis is applied in the current research study.

Furthermore, when using the bootstrapping procedure, the indirect effects are significant if the bootstrap confidence interval is statistically different from zero. If the interval for the indirect effect is statistically significant, it entails that the confidence interval range does not include zero. However, the test is not statistically significant if the confidence interval straddles zero for the indirect effect (Hayes, 2018; Preacher & Kelley, 2011). Williams and Mackinnon (2008) argue that bootstrap confidence intervals are a better approach to inference when the original data is available for analysis. This is because there are no assumptions about the shape of the ab sampling distribution. Additionally, bootstrap confidence intervals tend to be more potent than competing methods, such as the normal theory approach. Mediation analysis was used to test the following direct and indirect hypotheses.

**H2: KT has a positive influence on the AC of local contractors.**

**H4: AC mediates the relationship between KT and the operational performance of small local contractors.**

In order to test for the direct and indirect effects of KT and AC on the operational performance of local contractors, a 95% bootstrap confidence interval procedure with 5,000 bootstrap samples was applied using the percentile method in PROCESS Macro volume 3.4.1 (Hayes, 2018). When using this procedure, indirect effects are significant if the bootstrap confidence interval is statistically different from zero; if the confidence interval range does not include zero (Hayes, 2018; Preacher & Kelley, 2011). Below is a summary of the output from the SPSS PROCESS Macro procedure for the mediating effect of AC on the relationship between KT and operational performance.

Table 6 shows the hypothesised relationship, that KT has a positive and significant influence on the AC of local contractors; K-transf → Acquisition (α1) b = .134, 95% CI [.021, .248], t = 2.331, p < .05; K-transf → Assimilation (α2) b = .142, 95% CI [.038, .246], t = 2.698, p < .01; K-transf → Transformation (α3) b = .164, 95% CI [.069, .259], t = 3.394, p < .001 and K-transf → Application (α4) b = .209, 95% CI [.094, .324], t = 3.584, p < .001. Additionally, Table 6 shows that the relationship between AC dimensions and operational performance is only statistically significant for the Transformation construct, b=6.460, 95% CI [.261, .651], t=4.761, p<.001.

Furthermore, the hypothesised relationship that AC mediates the relationship between KT and operational performance of local contractors produced varied results for the AC multidimensional
## Table 5. Summary of hierarchical multiple regression

|                           | Model 1 | Model 2 | Model 3 | Collinearity statistics |
|---------------------------|---------|---------|---------|-------------------------|
|                           | B      | SE     | B      | SE            | VIF | Tolerance |
| **Control variables**     |        |        |        |               |     |           |
| Company age               | -.004  | .010   | -.001  | .010          | .006| .008      | .937  | 1.067      |
| Number of employees       | .130   | .065   | .102   | .064          | .068| .055      | .925  | 1.081      |
| **Independent variables** |        |        |        |               |     |           |
| Knowledge transfer        |        |        |        |               |     |           |
|                           | .209***| .056   | .100*  | .049          | .901| 1.110     |
| Knowledge acquisition     |        |        |        |               |     |           |
|                           | .041   | .075   | .667   |               |     |           |
| Knowledge assimilation    |        |        |        |               |     |           |
|                           | .124   | .088   | .579   |               |     |           |
| Knowledge transformation  |        |        |        |               |     |           |
|                           | .472***| .097   | .552   |               |     |           |
| Knowledge application     |        |        |        |               |     |           |
|                           | .066   | .076   | .604   |               |     |           |
| **R**                     | .152   | .315   | .609   |               |     |           |
| **R Square**              | .023   | .099   | .371   |               |     |           |
| **Adjusted R Square**     | .011   | .083   | .344   |               |     |           |
| **R Square Change**       | .023   | .076   | .271   |               |     |           |
| **F**                     | 1.974  | 6.129**| 13.709***|             |     |           |
| **F Change**              | 1.974  | 14.125***| 17.57***|             |     |           |
constructs. For example, K-transf → Acquisition → Perform (ab)1 (ab1 = .0048, 95% CI [-.0225 to .0420]; K-transf → Assimilation → Perform (ab)2 (ab2 = .0184, 95% CI [-.0080 to .0589]; and K-transf → Acquisition → Perform (ab)3 (ab3 = .0168, 95% CI [-.0148 to .0552) the indirect effects were not statistically different from zero and therefore, were not statistically significant. The results indicate that the following AC dimensions, knowledge acquisition, assimilation, and application, do not significantly mediate the relationship between KT and the operational performance of local contractors.

However, for the K-transf → Transformation → Perform (ab)4 (ab4 = .0754, 95% CI [.0166 to .1595] and K-transf → Abosrptive → Perform (ab)total (abtotal = .1154, 95% CI [.0352 to .2206] the indirect effects were statistically different from zero and, therefore, statistically significant. The results indicate that knowledge transformation and overall AC significantly mediate the relationship between KT and the operational performance of local contractors. Overall, the effect of KT on performance diminished when we controlled for the effects of the mediator AC (K-transf→Perform (c) b = .220, t = 3.970, p < .001 compared to K-transf→Perform (c’) b = .104, t = 2.119, p < .05) (Rucker et al., 2011). The results support the hypothesis that AC mediates the relationship between KT and the operational performance of local contractors. The following section discusses the findings.

6. Discussion and concluding remarks

6.1. Discussion
Premised on the knowledge-based view theory, the current article fills an important gap in the literature and the construction industry by empirically testing the relationship between KT, AC and operational performance. The article clarifies that KT has a positive influence on the operational performance of local contractors. This finding echoes similar findings within the supply chain management, which argue that KT from supplier development activities such as training of suppliers’ personnel results in skills and performance improvement of the supplier (Modi & Mabert, 2007; Arráz et al., 2013; Gosling et al., 2015; L. Chen et al., 2018). Furthermore, the study extends the arguments in the existing literature that there is a positive association between AC and performance.

Second, by including the mediating role of AC, the current article shows that individual dimensions of AC do not significantly mediate the relationship, except for the knowledge transformation construct. Knowledge transformation involves constructing new routines leading to the development of new products and processes once new knowledge is assimilated and disseminated throughout the organisation. For example, Zahra and George (2002) assert that knowledge transformation includes the ability of an organisation to reform its routines with a view to the subsequent application of knowledge. As a result, this AC construct is highly visible.

Third, the total AC mediates the relationships between KT and the operational performance of local contractors. The results are consistent with the research findings of Arroyo-López et al., 2012) and Ebers and Maurer (2014) that the effect of AC as a whole is more significant than its dimensions. Furthermore, since the effect of KT on operational performance dissipate when the total AC is included in the conceptual framework, the result entails that KT alone is not sufficient to improve the operational performance of local contractors. The result is consistent with Ali et al. (2018) finding that knowledge sharing alone does not significantly impact the operational performance but rather improves the AC, facilitating knowledge acquisition, assimilation, transformation and application. AC, in turn, leads to operational performance improvement. Similarly, Balie et al. (2020) argue that knowledge sharing, if correctly leveraged, makes it easier to identify the value of new knowledge, which in turn improves AC and, subsequently, performance improvement.

6.2. Theoretical and practical contributions
The main theoretical contribution of the study is that the research findings clarify limited knowledge of how the AC dimensions individually and jointly influence the relationship between KT and
operational performance improvement (Ebers & Maurer, 2014). Another significant contribution is the confirmation that, overall, AC influences the relationship between KT and operational performance more than its dimensions (Arroyo-López et al., 2012; Duan et al., 2020; Ebers & Maurer, 2014). The research study contributes to the knowledge-based view theory by demonstrating that the effect of KT on operational performance diminishes when AC is added to the conceptual framework.

The practical contribution of that study is that KT alone is not sufficient to improve the operational performance of local contractors in the construction industry. The study has demonstrated that AC may enable local contractors to obtain external knowledge from institutionalised supplier development initiatives, such as the 20 per cent subcontracting policy and training, which should
be integrated with existing knowledge to improve their operational performance. The findings emphasise the need to look beyond just investing in institutionalised supplier development initiatives as knowledge-generating activities and ensure that the recipients of knowledge have sufficient AC to acquire, assimilate, transform, and apply the knowledge for performance improvement. Moreover, the results demonstrate that AC impacts positively on operational performance improvements; this means that the future engagement of local contractors in institutionalised supplier development must pay attention to their AC. This finding is corroborated by findings in similar studies that suggest that KT improves AC, which in turn improves the performance of an organisation (Duan et al., 2020; Liao et al., 2007; Saenz et al., 2013; Wuryaningrat, 2017; Zhao et al., 2015).

6.3. Conclusions
The article sought to examine the effect of KT on operational performance and AC. Further, the article sought to investigate the mediating role of AC on the relationship between KT and operational performance. The article has demonstrated that KT is a vital aspect of knowledge management; however, on its own, it does not significantly impact contractor operational performance. Therefore, KT improves the AC levels of local contractors, which in turn leads to operational performance improvements. This has been empirically demonstrated in a project-based organisation, such as in the study of Ali et al. (2018) who examined the impact of knowledge governance, knowledge sharing and absorptive capacity on project performance in the context of project-based organisations. This article points out that AC is an important consideration when engaging local contractors in institutionalised supplier development programmes. Assessing local contractors’ AC before participating in institutionalised supplier development programmes should be a prerequisite for all local contractors. This will ensure high chances of KT and operational performance improvements instead of the current practice where everyone can participate as long as they are duly registered local contractors (Lane et al., 2006).

AC can be improved through contractor training tailored to construction-related knowledge and competencies to reduce the SME contractor’s prior and new knowledge. Training is a critical type of institutionalised supplier development which the main contractor can facilitate as part of KT. The buying organisation (main contractor) acts as a “teacher” to the supplier, or “student,” who is the recipient of knowledge for performance improvement (Kim et al., 2015). In this context, the buying organisation initiates KT to the supplier to improve its performance. Organisations have widely used training as vehicles for KT, from buying organisations, which are relatively large with well-developed knowledge management systems, to the small organisation seeking knowledge for performance improvement.

The findings contribute to the importance of AC in KT, which can be extended to construction projects that share relatively similar characteristics with IT projects. Previously, AC has been studied extensively from the large organisation perspective; the current findings suggest that AC can play a critical role in KT involving SME contractors. The findings entail that it is essential to assess the AC of SME local contractors before engaging them in institutionalised supplier development initiatives. Assessing contractor’s AC may include preliminary mandatory training and assessment before participating in institutionalised supplier development initiatives.

6.3.1. Limitations of the study
Despite the contributions made in the current article, it is not void of limitations that provide exciting future research avenues. The current article conducted a cross-sectional survey; therefore, it cannot establish causality among variables over time. Causality and changes among variables over time can only be established through a longitudinal study. Since AC evolve, future research can consider a longitudinal study to observe its evolution over time. Future studies should keenly observe the impact of AC on KT and operational performance over time.
Furthermore, this article collected data through a questionnaire on KT, AC and operational performance focusing on SME local contractors in the construction industry in Zambia. The article highlights an essential caveat that findings may not be generalised to large contractors in the industry, especially in developed countries, because of significant contextual differences. In order to increase the external validity of this article, future research studies should extend the sampling framework to cover various large and SME contractors to broaden the research context.

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Author details
Shem Sikombe1
E-mail: shem.sikombe@cbu.ac.zm
Maxwell Phiri1
1 School of Management, Information Technology & Governance at the University of KwaZulu-Natal, Westville Campus, Durban, South Africa.

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