

External dynamic exasperations on the adoption of enterprise application architecture for supply chain management



Author:
Kingston X.T. Lamola¹ 

Affiliation:
¹Department of Business Management, Faculty of Management and Law, University of Limpopo, Polokwane, South Africa

Corresponding author:
Kingston Lamola,
kingston.lamola@ul.ac.za

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Background: Given the effervescent nature of external dynamic exasperations (EDEs) and uncertainties, this article enterprise application architecture (EAA) evaluates the probable effect on actual adoption of enterprise application architecture for supply chain management (SCM). Actual adoption (AA) of EAA is a major need for small and medium, hence the legal frameworks are there to ensure compliance on complex legal and regulatory constraints, a lack of external financing, low technological capacity, relative advantage, hardware systems and software systems compatibility.

Objective: The central objective of this article is to establish whether EDEs affect the AA of EAA for SCM in SMEs, as well as supply chain success factors with five models used to identify the statistics gaps, which could be constructive for descriptive and correlational research studies.

Method: A quantitative approach under correlational research is considered to investigate the relationships between variables without interventions and manipulations from the researcher.

Results: To increase the reliability of measures, each variable was tested for data reliability and validity through Cronbach's alpha and Kolmogorov-Smirnov test, chronologically. The results indicate that EDEs have a direct impact on the AA of EAA as encrypted in Analysis of Variance (ANOVA), Pearson's coefficient and linear regression.

Conclusion: The study revealed that EDEs have positive impact on the AA of EAA.

Contribution: Consequently, this study makes a prominent contribution to research on the benefits of AA of EAA by signifying the effectuation theory by maintaining control on possibilities with foreseeable outcomes; then EDEs will be history.

Keywords: effectuation theory; enterprise application architecture; external dynamic exasperations; hardware systems compatibility; supply chain management; software systems compatibility.

Introduction

The dominance of application software systems is perceived as a global phenomenon used for online purchases and has a drastic impact on the end users, particularly in small- and micro enterprises (SMEs). The current literature demonstrates meticulous evidence with sub-sections that tend to be profound with external dynamic exasperations (EDEs). For the most part, on an approximate measure, some SMEs apply inadequate strength, weakness, opportunity and threats (SWOT) analysis on their internal and external weight following the Fourth Industrial Revolution (4IR) as a strategic planning technique. Through a thorough grasp of EDEs on complicated legal and regulatory restrictions, a lack of external finance, low technological capacity (LTC), and relative advantage (RA), businesses and companies can practice optimal production. Nevertheless, supply chain (SC) activities grow sensationally. Recent developments in the field of enterprise application architecture (EAA) have led to a renewed interest in business fast-forward series that stimulates SMEs. The advancements are through business builders and diagnostics, business planning and participant interactive sense-making of results, finance infrastructure and refinement of existing practices, organisation design and development, governance, processes and technology, and execution as well as measurement (Vodacom 2020). As an intersection point of exchange, the concepts of SC, logistics and integration include SC management, logistics management and integration (Badenhorst-Weiss, Van Biljon & Ambe 2018). When harnessing the adoption of EAA,

supply chain management (SCM) depends on a common denominator for all SMEs in the chain, in conjunction with distribution channels (Kukkuk 2021).

Supply chain management assists in the execution for information sharing from distribution channels that include manufacturers, wholesalers, retailers and customers. This means that it is in the order processing and distribution for durable materials, semi-durable materials and non-durable materials at an economically viable price (Vdovin 2017; Wisner, Tan & Leong 2012). The challenges emerging from EDEs are debatable and undertaken as a correlational research subject within the field of SCM. In general terms, EDEs pose threats and opportunities emerging from both market and macro business environments, with a variety of underlying forces such as market fluctuations, finance, and credit regulatory systems, impacts from severe climatic conditions, changes in technological infrastructure and advancements, as well as changing trends (Ray 2019; Skoko, Ceric & Hawks 2008). The mode of accessing financial requirements through government business enterprises on SMEs comes with complex legal constraints for measuring and monitoring the legal aspects of an entity, government legal authorities and statutory regulators that reflect on laws' complexities to adhere to set standards (Mzekandaba 2018a ; Ruhl & Katz 2015). Contrastingly, it is very difficult to hide away from regulatory constraints in EDEs affecting the adoption of EAA for SCM in SMEs. In the same vein, Spacey (2019) writes that the regulatory constraints have been scrutinised by compelling SMEs to compete for executing SCM strategies based on different financial year periods, assets, liquid assets, resources, quality, regulatory compliance, and interests of stakeholders, organisational culture and risk tolerance. Conservatively, Boyd (2021) alludes that traditional SCM processes have subscribed to the system that focuses on acquiring or gathering raw materials, manufacturing, distributing and exchanging output for a monetary value to final users. Modern developments in the field of information technology (IT) have led to a renewed interest in a blockchain that modernises its SC, and procurement processes, and is perceived as the next digital revolution to enhance privacy protections on digital information in a cryptographically secured manner (Choy 2021). To this extent, the method has only been applied to standardise SCM by adopting up-to-date technologies and strategies, which are to be incorporated within SMEs. Tank (2020) reports that some stimulus on SCM strategies headed the interest in the adoption of EAA.

The study adopted the theory of effectuation that distinguishes five principles, such as bird-in-hand principle, affordable loss principle, lemonade principle, patchwork principle and airplane pilot principle (Sarasvathy 2001b). Furthermore, the study offers some important insights into SMEs with logic of thinking, discovered through scientific research, used by expert entrepreneurs to build successful ventures. The article followed a meta-analysis with a systematic review of a focused research topic that provides a quantitative estimate for the effect of a treatment intervention

or exposure. This article seeks to explore EDEs by analysing the literature on complex legal and regulatory constraints, lack of external financing, LTC, RA, hardware and software systems compatibility (SSC). In the literature on SCM success factors, the relative importance on AA of EAA has been subject to considerable debate on five models: continuous flow model (Kruger, Ramphal & Maritz 2013), agile model (Myerson 2014), fast chain model (Parikh 2022), flexible model (Fletcher et al. 2020) and efficient model (Rielly 2022). This study proposes a meta-analysis review for literature review contribution on EDEs. This is about building computational models of the legal system, its complexity and its systemic risks. One might argue that, even accepting the foregoing, the complexity of law is extraneous to the challenge of designing legal measures to achieve policy goals (Ruhl & Katz 2015). Review of external financing options was categorised in three approaches: firstly, allocations and reallocations of International Monetary Fund (IMF) on special drawing rights (SDRs); secondly, expansion of multilateral financing and mobilisation of private finance multilateral financing and thirdly, debt relief for SMEs who are eligible for a temporary suspension of debt service payments owed to their official bilateral creditors (Sembene 2021). Detailed examination of EDEs by Del Carpio and Miralles (2018) showed that using the absorptive capacity as a driver of technological and non-technological innovation capacity within SMEs considered a key component in their success and in the extension of their SCM activities. Choudhury and Karahanna (2008) demonstrated that the relative advantage of electronic channels and their influence of each dimension. In this study, actual adoption (AA) of EAA will vary across the different stages of the purchasing process for SCM. Idyllically, compatibility testing is a software type that checks if one's software can be operated on various hardware, systems, network environments, applications, or mobile devices without defaults and zero defects (Bagthaliya 2021). Due to software and hardware developments, the AA of EAA encounters compatibility challenges that become more compact for server administrators often must choose whether to 'spin up' a new operating system or move the roles or duties to another server (Bradley 2021).

Problem description

External dynamic exasperations are a classic problem in the AA of EAA, as they include scaling business and changing environment, maximising return on investment, security control against cyber threats, user friendly interface, engaging and training staff, storing large amount of data, time and costs, upgrading software, maintenance and third-party system integration (Ortiz & Wizard 2022). Doshi (2022) identifies several advantages such as business intelligence, business continuity planning, enterprise content management, enterprise messaging systems, human resources and finance management, payment process system, enterprise resource planning and customer relationship management. Foremost, from the researchers' indulgent, there is no study that has instantaneously determined the relationship between EDFs and the AA of EAA

within SMEs and SCM context. The sole purpose of a research gap in this study is to summarise EDEs with existing, hidden and/or primitive narratives. The EDEs revolve on complex legal and regulatory constraints, a lack of external financing, LTC, RA, hardware systems compatibility and SSC. The problem hypothetical question is: 'how will EDEs affect the AA of EAA for SCM within SMEs?' As such, the theory of effectuation details two reasoning: (1) managerial casual thinking alluding that the future is neither found nor predicted, but made based on focus controllable EDEs, (2) entrepreneurial effectual thinking aided for imagining a possible new-end using a given set of production means (Do Santos 2014). On that annotation, this study seeks to provide a comprehensive approach to the concepts of EDEs and the AA of EAA. Thus, it adopts SCM success factors. External dynamic exasperations are uncontrollable factors arising from market and macro business environments and are the root cause of innovation aversion, rational risk aversion and information sourcing. The technology adoption lifecycle is a description of customer behaviour related to the EAA's AA, often broken down into innovators, early adopters, early majority, late majority and laggards. Alternatively, SMEs could consider good innovation practices, for example, disruptive innovations, incremental innovations, radical innovations and paradigm-shifting innovations.

Research objective

The objective of this research is to determine whether EDEs affect the AA of EAA for SCM within SMEs. With the quantitative method, the relationships between EDEs and the AA of the EAA are established. Also, test their absolute variability, which means that the speed of data values can only be measured relative to their own arithmetic mean. The positive slope in linear regression indicates a positive move towards the AA of EAA.

Research hypothesis

The study presents the hypothesis: H_a : EDEs affect the AA of EAA for SCM in SMEs.

Theoretical review: The theory of effectuation

The study adopted the theory of effectuation developed by Prof. Saras Sarasvathy in the early 2000s at an Indian Business School, as a professor researching strategy, entrepreneurship and business ethics (Sarasvathy 2001a). This theory is often considered a process theory because it enlightens the process that entrepreneurs practice to create new endeavours. However, much uncertainty still exists about the relationship between expert entrepreneurs' psychological mindsets towards EDEs and how they go about providing solutions. In the history of SME development, the theory of effectuation has been thought of as a fundamental factor in making decisions about resource accessibility and availability, algorithms and performing standards that could assist SMEs to adopt EAA for SCM (Sarasvathy 2001b). Critics such as Kitching and Rouse (2020) point out that theory requires reflection on issues of social

ontology and conceptualisation of structural and cultural influences on processes of venture creation. Also, Arend, Sarooghi and Burkemper (2016) reject the theory of effectuation based on two narratives. Firstly, it neither refutes the widely accepted criticism that an implementation failed to acknowledge or build on earlier work, nor does it show exactly how an implementation added value to the original. Secondly, it shows implementation as self-interested because it is associated with familiar ideas based on experimentation, risk sharing, resilience, adaptability, action orientation, loss aversion, etc., without explaining why it is important to connect with them. From a different perspective, Dias and Lisuka (2019) reiterate that some authors question impressive innovations because for them, many of the characteristics describing the phenomenon have already been presented in the entrepreneurship literature, so they criticise the failure to acknowledge previous work, including the benefits of causality. On the other hand, despite many criticisms of the theory, it questions the ability of implementing the theory to provide adequate work, but it does not characterise the scientific value that it provides through the educational adoption of ESA (Arend et al. 2016). Implementation of effectuation is central to the research of Blekman (2021), who introduces five principles:

- *Bird-in-hand principle*: According to Tornell (2020) in light of the bird-in-hand principle, investors prefer stock dividends to potential capital gains because of the uncertainty of capital growth. The theory was developed in contrast to the Modigliani-Miller theory of dividend irrelevance, which states that investors do not care where their returns come from (Chen 2020). One of the central principles of implementation, which is the bird-in-hand principle, is that entrepreneurs create value with what they currently have, but through limited resources. An SME can use existing capital to challenge existing funds related to the goals, strategy and mission through networking that affects exchange patterns.
- *Affordable loss principle*: According to Jongen (2019), the principle of affordable principle is a concept that sounds rather paradoxical. However, implementing this idea can be rewarding. The principle is therefore a conclusion about the production life situation of SMEs based on their current obligations, desires and riskiness. It is useful to think of insolvency as a two-step process. The first step is to ask how much SMEs really need to research and implement 4IR innovations such as AA of EAA. The second step is to ask what SMEs can afford and be willing to lose to start investing in technology. The principle of reasonable loss is an important factor for SMEs in maintaining sound investments based on considered risks. A paradox is used when understanding the concept of opportunity costs in connection with the introduction of EAA. However, such explanations tend to ignore the fact that the higher the business risk, the higher the return on investment.
- *Lemonade principle*: The lemonade principle encourages SMEs to engage in collaboration with other stakeholders to overcome key obstacles such as material shortages, rising freight costs, difficult demand forecasting, port congestion,

changing consumer attitudes, digital transformation, structural change, inflation, and high costs and inefficiencies of last-mile deliveries (Brown 2022). Conversely supply chain collaboration offers SMEs the opportunity to turn disadvantages into competitive advantages. Despite a lot of new knowledge about the role of the AA of EAA, mistakes and surprises are inevitable and may be used to find new opportunities. Moreover, the lemonade principle should be better understood as the basis for exploiting capabilities, including adaptability, learning experiences and accountability, when using a six-sigma approach to total quality management.

- *The patchwork principle*: In general, the patchwork principle provides SMEs with positivity to stakeholder engagement for economic growth. Only a handful of SME employees are said to know four guidelines. Robinson (2020) explains two characteristics in relation to freight logistics, which are *tailgates*, shipping location, cargo description, instant shipping quote and *the airplane pilot principle*: firstly, *tailgates* – if trading partners say they do not need to pursue a certain purchasing or procurement order when they do, it can cause delays, increase costs or even require rescheduling of shipment; secondly, incorrect shipping location reporting could result in the carrier arriving with the wrong equipment for SC activities. It is assumed that if the carrier arrives with the wrong device because of this error, it might increase the cost of the shipment or force the shipment to be rescheduled; thirdly, *cargo description* – a proper shipment description means a geographic location where many first-time shippers stumble. As with the previous categories, incorrectly describing these cargoes might result in unprepared shippers and unexpected costs. When detailing the cargo, the main requirement is a comprehensive description of the dimensions of the cargo, the weight of the package and the appearance of the package. Fourthly, *instant shipping quote* – knowing the importance of accuracy when entering shipping details shows that the customer is ready to receive a quote on your next big shipment. This shows the need to understand the different shipping offers of other customers. To end with, customers use the free quote to find the best deal for their next shipment. This principle suggests that entering into new partnerships can bring new resources and new directions to the project. In addition, it involves building partnerships with the willingness of SMEs to adopt EAA as a technology undertaking for SCM activities.
- Fifthly, *the airplane pilot principle* – this is based on the assumption that future is created and not predicted. Küppers (2020) believes that by focusing on SCM control activities, experienced entrepreneurs know that their activities lead to the expected results. An effective worldview is based on the belief that the future is not discovered or predicted but made. Focusing on activities that are within the SME's control, which are in line with SC partners, it is a better chance of achieving the desired results. When these elements are combined, the outsourcing of deterrence capabilities leads to the sharing

of a technological innovation business idea in AA of EAA. It covers all SME functions related to SME sites and services delivered through compliance intelligence, as the world becomes more fluid, transparent and constantly changing, applying compliance principles will only become more important. The use of meta-analysis on influence indicates that most key behaviours are positively related to SME performance. In contrast, implementation logic is useful when there is uncertainty about the entrepreneur's goals (Sarasvathy 2001a). One important theoretical question that has dominated the field for years concerns SCM in terms of SMEs' infrastructure conditions, industry type, new technologies, talent shortages, unpredictable demand and environmental factors.

Discussion: Meta-analysis review

External dynamic exasperations affect the enterprise as the crow flies from both the competitive market environment and macro-environment business perspectives regarding threats and opportunities. External dynamic exasperations are conferred, indeed, to determine their influx on the intended AA of EAA for SCM in SMEs (Hawks 2019). Furthermore, Beal (2018) states that the external environment has a significant influence on decisions taken in SMEs. Although SMEs have no full control over EDEs, they apply austerity measures to remain competitive. The SMEs justify the costs and expected benefits before proceeding with new investments in technological innovations (Trinh-Phuong, Molla & Peszynski 2012). Several authors such as Thompson (2022), Peterdy (2022) and Du Bruin (2016) report on the analysis of trends in EDEs that demonstrate negative impact on SMEs such as political, economic, social, technological and demographic elements. In the same vein, Schiller (2008) reports that inflation is a classic problem in most SMEs unlike in modern corporations without traditional technologies and strategies incorporated into SCM activities. Austerity measures to combat inflation include the consumer price index (CPI), item weight, core inflation rate, gross domestic product (GDP) deflator, nominal GDP and real GDP (Boyd 2021). Moreover, in traditional SCM, SMEs do not use any tool such as logistics management that is used by most shipping across the world today (Chetty et al. 2008). However, one of the glitches with the mechanism the researcher used to measure EDEs includes the following.

Complex legal and regulatory constraints

In non-fiction, numerous typologies of complex legal and regulatory constraints are discussed through regulatory system governments that affect SMEs via trading policies, import and export quotas, in some developed economies that have legal and regulatory requirements in place (Jooste et al. 2016; Mzekandaba 2018a). The legal constraint is defined as legitimate control over unlawful activities enabling the satisfaction of the interests of the affected party (Moroz 2018). On the other hand, Taeihagh, Ramesh and Howlett (2021) define regulatory constraints as a process in which government requires certain activities or behavioural patterns from

individuals, enterprises and institutions, through legislative processes and Acts. The quick rise of technological advancements introduced a host of legal and ethical issues with copyright and intellectual property compliance because of new ethical and legal considerations that are constantly arising (Walcerz 2018). Legal complexity refers to methods that measure and monitor the legal aspect of an entity governed by legal theorists and statutory regulators such as: (1) Small Enterprise Development Agency, the Department of Trade Industry and Competition, Companies, and Intellectual Property Commission, (2) Limpopo Economic Development Agency and (3) Small Enterprise Development Agency to reflect on the law's complexity to adhere to trading standards and norms (Ruhl & Katz 2015). This study exemplifies the nature of the forces that compels every enterprise to compete for to execute its strategy based on assets, liquid assets, resources, quality, regulatory compliance, interests of stakeholders, organisational culture and risk tolerance (Spacey 2019). Previous studies suggest that levels of EDEs are independent of the size of the SMEs and business regulations by the government, which include legal frameworks, regulatory instruments for markets, social customs and technology (Leenes et al. 2017). Additionally, legal frameworks are developed to achieve a competitive advantage by challenging predominant SMEs' modus operandi models on exploiting gaps in legal and regulatory environments (Rossi 2014). Although this is the most comprehensive account of EDEs produced so far, it does suffer from several legislations such as *the Cooperatives Act 14 of 2005*, which provides for the formation and registration of cooperatives, the establishment of a Co-operatives Advisory Board, and the winding up of cooperatives and matters connected therewith. Financial Advisory and Intermediary Services Act 37 of 2002 intends to regulate the rendering of certain financial advisory and intermediary services to clients; to repeal or amend certain laws; and to provide for matters incidental thereto. The *National Credit Act 34 of 2005* promotes a fair and non-discriminatory marketplace for access to consumer credit and for that purpose to provide for the general regulation of consumer credit and improved standards of consumer information. *Small Enterprise Finance Agency Companies Act 71 of 2008* provides for the incorporation, registration, organisation and management of companies, the capitalisation of profit companies, and the registration of offices of foreign companies carrying on business within the Republic of South Africa. *Industrial Development Corporation Act 22 of 1940* intends to constitute a corporation the object of which shall be to promote the establishment of new industries and industrial undertakings and the development of existing industries and industrial undertakings and to provide for other incidental matters. *Small Enterprise Development Agency (SEDA)* focuses on designing incubation models, managing national incubation standards, market assessments aimed at feeding opportunities to the ecosystem, influence or direct private sector and government spend accordingly, monitoring and evaluating the entire system, to name a few.

South African National APEX Co-operative (SANACO) includes assisting cooperatives both financially and non-financially

on compliance, which includes assisting cooperatives with financial statements. South African National APEX Co-operative continues to engage all organs and state-owned institutions to support cooperatives in South Africa. Small and micro enterprises be duty-bound to least build an adaptive and agile SC with rapid planning and integrated production. Studies by Schnädelbach (2010) and Laan (2016) indicate an adaptive architecture that includes standard templates, configurations of infrastructure components, new instances of infrastructure and configured components, automated configuration registry storage, configuration registry and definition files with standard templates that are kept in a version control system. Small and micro enterprises' infrastructure is designed to adapt to technologically accepted models that could inhabit SCM systems, entirely driven by internal data. The legal dynamics regulating SMEs on the adoption of EAA ought to be taken the pressure off so that SMEs will have a better competitive advantage and cost-benefits analysis that could assist them to master economic tools to aid in decision-making for any legal matter arising. Drawing from these, the Acts functions as a catalyst and buffer between the governmental institutions and SMEs for implementing the rules and regulations that are fair and transparent without any deviances.

A lack of external financing

External financing can be in the form of bonds, loans and debt financing, or to acquire funds from business angels and venture capitalists as a way of raising capital rather than retained earnings (Althuser 2018; Harvey 2012). It is worth noting that external financing results in a financial burden of the interest rate being charged (Rossi 2014). This has negative implications on both the banks and SMEs as they bear a financial burden with exorbitant interest payable on repo rate and prime rate (Gerber 2018). Financial service companies are competing with fluctuating market interest rates that affect SMEs (Mulesoft 2009). From an external view, the acquisition of funds depends on creditworthiness, financial statements, feasible business plans and bank statements (Guimarães 2012; Ritchot 2013). Companies are increasingly unprepared to effectively integrate advanced technological infrastructure that requires additional capital (Benay 2016). Limited expansion of opportunities is a consequence of slow GDP growth and a lack of external financing for SMEs (Brooks 2019). According to Zucker (1987), institutional theory instigates that institutional elements have a direct target as obstacles such as social orders, context on specific rules, and social atomisation widening the gap between the institutional environments, which makes it difficult for SMEs' internal operations. Interestingly, Sembene (2021) alludes to the highest global institutions: 'Access to finance in the IMF is concessional resources by temporarily raising its annual access limits at the onset of the Corona virus disease 2019 (COVID-19) pandemic, during the crucial and desperate need for money to combat the global financial crisis'. The analysis of the lack of external financing undertaken extends the knowledge of broadening the financial range of

instruments such as asset-based finance, alternative debt, crowdfunding and hybrid instruments.

Low technological capacity

Low technological capacity indicates an SME's incapability to absorb technology to transmogrify operations as a technique of maximising production adeptness and gaining a competitive advantage within SMEs (Reichert & Zawislak 2014; Spacey 2015). At the same juncture, there is no clear definition for LTC, while a variety of literature guided this study to propose a definition for LTC as the enterprise's incapacity to invest in technological infrastructure for the adoption of EAA (Del Carpio & Miralles 2018; Spacey 2015). In support of EDEs, the adoption of EAA induces absorptive capacity theory in several cases that moderates algorithms and routines, which enable enterprises to acquire, assimilate, transform and utilise new external knowledge to create value (George et al. 2001). On the other hand, technological capacity is a sustainable enterprise's aptitude for adopting new technologies to improve innovation performance (Khalifa 2016). According to Suhadak and Mawardi (2017) and Wayner (2019), SMEs have different business requirements, diverse technological standards and IT systems for sharing data and information and receiving trade advice centre programme. Be that as it may, the absence of technological capacity leads to low network capacity, which in turn leads to slow processing systems for transactions for both internal and external partners in SCM (Buckow & Rey 2010; Del Carpio & Miralles 2018). Although this is the most comprehensive account of LTC encountered so far, it does suffer from a few imperfections during the adoption of EAA. Nevertheless, innovation through technological capacity could accumulate positive results for SMEs. According to Ann (2019), development in the technological transfer is critical to remove barriers and close gaps in achieving increased SCM proficiency. Endro et al. (2017) affirm that new entrants to the business markets bring new capacities leading to an automatic increase in competition.

Cavallari (2020) maintains that a failure to embrace SMEs' culture that lacks the propensity to face internal and external challenges such as resistance to change, support from the leadership team, transparency in the complexity, poor governance and communication, a lack of collaboration between teams with poor algorithms and procedures could lead to disastrous adoption of EAA. Schulz and Dankert (2017) assert that emerging technologies provide the assurance for reliable and predictable SCM activities. They also point out that outsourcing strategies should be in line with regulatory objectives and within the framework of corporate social responsibility in order to protect the image of SMEs and normative factors that influence and determine the behaviour of end users. In support, Bell, Mondliwa and Nyamwena (2019) report that dynamic capabilities are viewed as being a firm's capacity to shape its market in ways that lead to the creation and capture of value. The quantitative method is considered in this context for determining the

impact of EDEs on the AA of EAA. A key strategy and precedence in absorptive capacity theory should balance acquisition and assimilation, transformation and exploration of overwhelming LTC.

Relative advantage

According to Reichert and Zawislak (2014), Maduku et al. (2015) and Tagged (2019), RA is regarded as the process whereby customers realise the benefits of a product or service based on its enhanced features and benefits rather than those of other substitutional computer software or hardware systems. A more comprehensive RA on computer systems includes the use of advanced laptops rather than old-school devices such as typewriters. Furthermore, Zhang and Jensen (2006), and Skoko, Buerki and Ceric (2006a) denote the RA on two consonants: the variable capturing the relative productive efficiency based on monetary value and relative balance and management of factors. Consequently, RA includes customer relationship management systems (CRMSs), knowledge management systems, sales and marketing systems, manufacturing and production systems, finance, accounting, and links with human resources management (Ann 2019; Kehring 2018). It is also vital to highlight that DTI postulates five characteristics of innovation that affect diffusion, namely: (1) RA reflects the degree to which new IT provides more advantages to the existing tools. (2) Compatibility refers to its reliability with collective practices and norms among its users. (3) Complexity refers to its ease of use with processes. (4) Trialability denotes the opportunity to explore new technological systems (the AA of EAA). (5) Observability depicts the positive side before the actual use (Dillon & Morris 1996). Adopting EAA in SCM can lead to RA by integrating different business strategies (Gerstein 2012). The RA is advantageous if SMEs change the existing business models for the adoption of EAA (Rossi 2014).

A comprehensive SCM system initiates, monitors and supports decision-making and reports on activities required to complete SC operations and planning (Bowersox et al. 2013; Gulati, Kahn & Baldwin 2018). This concept has recently been challenged by Ahmad and Mehmood (2015) who allude that if sustainability factors are incorporated from the very inception, benefits are realised in the sustainability dimensions, and the adoption could yield positive results. The RA could lead to a competitive advantage in SMEs with an element of superiority in SCM. The existing accounts on SMEs' infrastructure fail to resolve the contradiction between EDEs and the adoption of EAA. However, there is an inconsistency with this disagreement. Nevertheless, the EAA algorithm employs stochasticity for optimisation (Oldewage, Engelbrecht & Wesley 2019), and the introduction of stochastic demand reinforces the benefits for SMEs to invest in early product design knowledge in building a successful EAA (Zha & Sriram 2006). Surveys such as that conducted by Parise, Lygeros and Ruess (2015) show that a proposed approach for dealing with stochasticity requires data from many different

replicates of the system. Drawing on the theory of planned behaviour, SMEs will adopt EAA for a specific platform only if they perceive RA surpassing traditional channels (Choudhury & Karahanna 2008; Escobar-Rodríguez & Bartual-Sopena 2015). Sharing information across the SC compels SMEs to improve accuracy and reduce the cost of orders at strategic, tactical and operational levels (Mzekandaba 2018b; Reyes et al. 2015; Sewdass 2012). Also, the RA of using IT is that it allows the reach of all types of systems and employees can give their inputs and suggestions (Endro et al. 2017; Sweeney 2011). The RA might be classified based on AA of EAA into compatibility, resource availability, self-efficiency, subjective norm and interest, and institutional branding.

Hardware systems compatibility

At first glance, compatibility is described as the interoperability of hardware and software systems to work together without requiring further alterations (Wigmore 2013). This distinction is further exemplified using the general semantic theory of computer systems, which includes operational semantics in three dimensions. Firstly, *operational semantics* indicate that a construct is specified by the computation it induces when it is executed on a machine. Secondly, *denotational semantics* assume that different meanings are modelled through mathematical objects that represent the effect of executing the constructs. Thirdly, *axiomatic semantics* reflect specific properties of the effect of executing the constructs expressed as assertions. A more recent point of view on the general semantic theory of computer systems has been summarised by Golenkov et al. (2018), which includes the following: (1) semantic theory of knowledge depends on metaphor knowledge base, ultra-ontology dynamic knowledge base used in generalised valence mode, and the integration of information based on multilingual translation; (2) semantic theory of problem-solving models indicates that some problems are solved when the ontology is applied, and ambiguity can also appear on the syntactic level; (3) semantic theory of interaction of information processes for human-computer interaction is dysfunctional without semantic computing; (4) semantic theory of user, including natural language interfaces, requires semantics for the purpose of natural language processing and understanding; (5) semantic theory of non-verbal sensory-effector interfaces; and (6) theory of universal interpreters of semantic models of computer systems and the theory of semantic computers. Wang, Wang and Yu (2017) narrate the explicit nature of semantic theories in all magnitudes explaining their values and functions. However, much ambiguity still exists about the relation between hardware and software systems and semantic theory. Drawing upon two hardware for EAA adoption and research into EFTs, this study distinguishes between these two peripherals as a single-and-joined component.

Software systems compatibility

Software systems compatibility is widely used in two types of testing as denoted by Bagthaliya (2021): firstly, backward

compatibility testing is considered as a technique to intersect the behaviour and compatibility of developed hardware or software with their previous versions. The testing is entirely predictable as almost all alterations from previous versions, and it is predictable, as several changes, are known. Secondly, forward compatibility testing is a technique to check the developed hardware or SSC with the latest versions, and it is challenging to predict the changes. Further testing compatibility is explored in six dimensions. These dimensions are:

- Cross-browser compatibility testing as a non-functional form of testing emphasises availing the website's basic features and functionality to users on different browser-OS combinations, devices and assistive tools (Pai 2021). There are few best practices to consider while using cross-browser compatibility testing, which include researching audience, preparing a browser matrix, choosing the right automation tool and testing on real device browsers.
- Hardware systems come with challenges such as security vulnerabilities and patches as well as security baselines as they are not inherited security deployment settings, bypass the hardware mandates and drastically reduced size of the patching (Bradley 2021).
- Computer networks are grounded on advancements in technology and their uses are increasing rapidly. Furthermore, networks come with several common challenges such as performance degradation, security issues, host identification, configuration conflicts, capacity concern, slow connectivity, and monitoring and maintenance (Jana 2022).
- Mobile application architecture refers to a set of rules, techniques, processes and patterns to develop a mobile application with a set of algorithms that meets both the business requirements and industry standards.
- Operating system on the other hand is a software that acts as an interface between computer hardware components and the user. It is a requirement for every computer system to have at least one operating system to run other programmes (Williams 2022). This includes multiprocessor operating systems, multiprogramming operating systems, distributed operating systems, multitasking operating systems, time-sharing operating systems, client or server operating systems and batch operating systems.
- Application and hardware system version refers embraces specific the release of a technological product on software or hardware that comes with unique identifiers, such as numbers, dates, or codes (Hawthorne 2022).

Last of all, one of the most noticeable requirements in SSC is that it requires precise and detailed installations with regard to operating system, central processing unit (CPU), random access memory (RAM) and storage capacity. This relates to the setting out and development of the thinking in relation to computer programming, which includes to create, debug, maintain or otherwise support other programmes and applications of the ideas as well as the language used in the writing.

Supply chain management success factors

Despite its exploratory nature, EAA offers some insight into three basic layers (Gillin 2022). The database layer includes modules related to low-level dependencies such as servers, databases, networks, storage and middleware. The business layer includes modules that set rules for logic that are specific to the business, such as currency calculations, workflows, application interfaces and data models. The presentation layer defines the way users interact with the application. Examples include menu structure, navigation schemes and placement of interactive components such as buttons. This provided an important opportunity to SMEs to advance the understanding of EAA on different scales. With successive increases in intensity of the EDEs, the AA of EAA moved further to six success factors that stimulate SCM for SME success (Fernand 2022):

- *Continuous flow model*: On completion of the continuous flow model, the process of model specification and parameter estimation carried out on traditional SCM methods depends on naïve forecasting on a quantitative approach (Kruger et al. 2013).
- *Agile model*: Myerson's (2014) model of lean and agile SC assumes two main strategies: firstly, *hybrid SC strategy*, based on SMEs' strategy to become mass customised by producing progressively smaller batch sizes to specific customers, and secondly, *lean SC strategy*, which focuses on adding value for customers while marginalising costs and eliminating waste. The model prioritises flexibility, as SMEs may have a specific need at any given moment and must be prepared to perform accordingly.
- *Fast chain model*: On completion of the fast chain model, the process of model specification and parameter estimation is executed with three capabilities: market concept in a short time, highest forecast accuracy to reduce market mediation cost, and end-to-end efficiency to ensure affordable costs for customers (Parikh 2022). This model emphasises the agile turnover of a product with a short lifecycle striving to capitalise on a trend, quickly produce commodities, and ensure the product is transactional before the trend ends.
- *Flexible model*: Attention that is more recent focuses on the provision of the flexible model that works best for enterprises impacted by seasonality in production (Fletcher et al. 2020). This denotes the notion that a flexible model of SCM secures productivity at all times.
- *Efficient model*: Having an efficient model enabled the researcher to incorporate the AA of EAA; for SMEs competing in industries with very tight profit margins, a company may strive to get an advantage by making their SCM process the most efficient (Rielly 2022). This includes utilising equipment and machinery in the idyllic techniques in addition to managing inventory and processing orders most efficiently.
- *Custom model*: A custom model was chosen because it is one of the most feasible ways to project personalised products with quality standards with the ability to

create unprecedented market intelligence from online customers for existing products and prototypes (Sodhi & Tang 2017). The aforementioned models have low competitiveness; custom models could be regarded as buffers such as automobile manufacturers. With the continuous increase in the intensity of SCM activities, the AA of EAA has moved in an even more complex direction, because the need to develop in maturity levels is part of computer practice. It is the result of constant communication and negotiation between SCM and other functional departments, which leads to the development of IT. Engagement models integrating SCM activities and project management process into the organisation's work culture.

At this juncture, SMEs start the process of adopting EAA; the most serious drawback of this method could be based on the following advantages:

- *adopting a demand-driven planning and business operating model based on real-time demand insights, and demand shaping* – synthesising EAA as the system of science that includes agent modelling and simulation of fundamentals, design, layers, quality attributes and archetype patterns (Avram 2008; Silverman & Lim 2016).
- *Align SME SC with business goals by integrating sales and operations planning with corporate business planning*. Integrating creativity, innovation and design formed the central focus of a study by Zaugg and Warr (2018), in which the researchers report that specialised equipment facilitates the integration of interdisciplinary projects into the interplanetary. The adoption of EAA for SCM in SMEs is not an exception. This indicates a need to comprehend the various perceptions of EDEs that exist among SME challenges.

Summary table

The summary table is encrypted in Appendix 1 for comparing common research topics, purpose of the research questions, summary points and recommendations. It illustrates the summary for literature reviewed on important aspects with pertinence to the study aim. Recent developments in measuring, monitoring and managing legal complexity have the claim that a body of law that is too complex requires identifying an optimal legal complexity and some way of comparing a particular law's complexity to that standard (Ruhl & Katz 2015). That have heightened the need for SMEs to master legislations and regulatory systems in operating their SC activities. In his study in policy recommendations, Sembene (2021) asserts that in the current context, characterised by weak market confidence and strong fiscal headwinds facing bilateral partners, the IMF, the World Bank and other multilateral institutions are expected to be among the most reliable sources of additional external financing for Africa. Recently, attention has been paid to the financing of loans intended for the financing of SMEs with a small financial burden. Del Carpio and Miralles (2018) show the past research in emerging economy and low-tech sectors:

- by characterising each configuration, SMEs can derive research initiatives and investment infrastructures that focus on the elements of the absorptive capacity of firms.

These propositions provide insights into partner-supported market knowledge creation and operational performance influenced by interrelated roles of coordination knowledge and rich knowledge.

- Analyse how non-technological innovation affects technological innovation in low technological firms. With the successive increase in EDE intensity, the AA of EAA moved towards technological innovation, including new product development, while non-technological innovation includes strategy and management, culture and climate, innovation and collaboration, and organisational and environmental development.
- Identify non-technological innovation as a mediator in the relationship between absorptive capacity and technological innovation. In today's globalised and highly competitive business world, companies are trying to find new ways to stay ahead of their competitors.

Choudhury and Karahanna (2008) contend that the RA of electronic channels is multidimensional and involves the cumulative evaluation of the RA s of channels along three dimensions: ease of obtaining information, trust and efficiency. Perhaps the most serious advantage of this comparative advantage is that as countries and industries move closer to the technological forefront, comparative advantage and gains from trade decline. Ideally, compatibility testing is a type of software testing that verifies that the software will work on different devices, systems, network environments, applications or mobile devices (Bagthaliya 2021). Part of the aim of the AA of EAA is to develop software that is compatible with software, hardware, mobile and network (Bradley 2021). Overall, hardware and software systems are dependent on the operating system called CPU as well as the RAM for utmost speed and agility.

Research methods and design

The interpretivism research philosophy guided the study for integrating human interest into an investigation. The research strategy included a quantitative approach to attain greater knowledge and understanding of the 4IR to observe EDEs that affect the AA of EAA. The research setting and participants included SMEs' owners and managers for demonstrating SMEs image through constructive criticisms, taking responsibility for actions, developing and managing processes from several industries. The data collection approach used in this study is through questionnaire based on its objectivity, generalisability, hypothesis testing, comparison and replicability. Methods and procedure for results interpretation include two approaches: (1) diagnostic test and data analysis through Kolmogorov–Smirnov and Shapiro–Wilk test for data validity, Cronbach's alpha for data reliability, and descriptive statistics on normality test; (2) Pearson correlations, Analysis of Variance (ANOVA), Pearson coefficients, linear regression and coefficient of

variation (CV). Ethical issues include voluntary participation, informed consent, anonymity, confidentiality and plagiarism.

Research instrument and Data collection

The questionnaire was structured in the form of a Likert scale, with probable options ranging from *strongly disagree* (1), *disagree* (2), *moderate* (3), *agree* (4) and *strongly agree* (5). A door-to-door inspection was conducted for collecting data. About 340 questionnaires were distributed, of which 30 were not recovered, and 10 were not fully responded on. As such, about 310 were considered for data analysis. Questions were guided by literature review, and using the relationship research questions seeking to explore and define trends and interactions between EDEs and the AA of EAA, see Appendix 2: Questionnaire, extracted from Lamola (2021). Questions were categorised between EDEs and the AA of EAA. The target industry included retail stores that use the e-commerce transaction data, customer feedback and in-store (physical or web) browsing behavioural pattern. Both SMEs' owners and managers were considered as the sample frame relevant to the study based on exposure to 4IR characterised by the fusion of the digitisation, as well as the growing utilisation of new technologies such as artificial intelligence, cloud computing, robotics, 3D printing, the Internet of Things (IoT) and advanced wireless technologies, among others. The industry stratum included the following: wholesalers, electricity, gas and water; catering and accommodation, transport, storage and communications; and finance and business services. Data were collected in Capricorn District Municipality that include Blouberg (Bochum) Municipality, Molemole (Dendron) Municipality, Polokwane Municipality and Lepelle-Nkumpi (Lebowakgomo) Municipality. A critical analysis into the emergence of 4IR and its implications in SCM through automation, as well as the critical analysis of technological additivity and competencies for e-commerce organisations.

Sample

The total proportions of the population in the sample calculation were calculated by adopting the n -formula from Leedy and Ormrod (2014). The n -calculation includes 310 for two reasons: 15 questionnaires were not returned and 5 were not fully answered.

The study considered a stratified sampling, as the SMEs comprised of 1900 (N), with 135 SME owners and 175 managers. This was made up of 55 women and 45 men, which produced a representative of 100 people.

Ethical considerations

Ethical clearance to conduct this study was obtained from the University of Limpopo, Turfloop Research Ethics Committee (TREC) (No. REC-0310111-031).

Results

In this study, the relationships between variables were measured. The results were categorised into stability diagnostic test as a prerequisite to actual data analysis.

TABLE 1: Kolmogorov–Smirnov test on enterprise application architecture and external dynamic exasperations.

Tests of normality	Kolmogorov–Smirnov†			Shapiro–Wilk			Median	Skewedness	Kurtosis
	Statistic	df	Sig.	Statistic	df	Sis-			
External factors	0.163	310	0.000	0.900	310	0.000	30.000	-1.165	1.185
Actual adoption of EAA	0.090	310	0.000	0.973	310	0.000	24.000	-0.289	-0.349

EAA, enterprise application architecture; Sig., significance; df, degree of freedom; Sis-, external dynamic exasperations.

†, Lilliefors Significance Correction.

TABLE 2: Item-total statistics on actual adoption of enterprise application architecture and external dynamic exasperations.

Constructs	Scale mean if item deleted	Scale variance if item deleted	Corrected item total correlation	Cronbach's alpha if item deleted
External dynamics exasperations	352.6500	1357.933	0.683	0.868
Actual adoption of EAA	381.6029	1641.880	0.310	0.873

Note: $\alpha < 0.75$.

EAA, enterprise application architecture.

The data reported here appear to support five assumptions on linear regression denoting the following: (1) all variables should be in a linear relationship; (2) all variables should be multivariate normal; (3) there should be homoscedasticity among the data; (4) there should be no multicollinearity in the data and (5) there should be no autocorrelation in the data. All these assumptions are encrypted in Table 3, Table 4 and Table 5 and in Figure 1 and Figure 2.

Stability diagnostic tests

Data validity: Kolmogorov–Smirnov test on external dynamic exasperations and actual adoption of EAA

Table 1 shows the Kolmogorov–Smirnov test for normality of EDEs and the results indicate that the EDEs do follow a normal distribution, where $D(310) = 0.163$, which is more than $p = 0.05$. The validation on confirmation processed leads to the conclusion that the EDEs can be used for statistical examination with a linear regression model for analysing the relationship between EDEs and the actual adoption of EAA for SCM in SMEs.

Data reliability test: Cronbach's alpha

Table 2 illustrates data reliability on internal consistency for both EDEs and the AA of EAA. The Cronbach's alpha (α) is most likely the first analysis processed to test if the scale items in the questionnaire are intercorrelated. In this study, the rule of thumb instigates that the α on a coefficient takes values between 0 and 1 where values above 0.70 are accepted.

The reliability statistics table indicates the reliability alpha coefficient for all items included in the analysis. Therefore, the alpha value is 0.868 (> 0.7) for EDEs and 0.873 (> 0.70) for AA of EAA, which is interpreted as better results.

Descriptive statistics on normality test: Double exponent

Both Figure 1 present the frequency distribution as thus; (1) EDEs produced a Cauchy distribution curve with a μ of 27.89 and σ of 5.571 with a negative skewness at -1.165 and kurtosis at 1.185. The kurtosis figure should be near 0, and the figure of -1.165 indicates that it is a normal distribution that is slightly peaking and is slightly skewed to the left.

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{1900}{1 + 1900(0.05)^2}$$

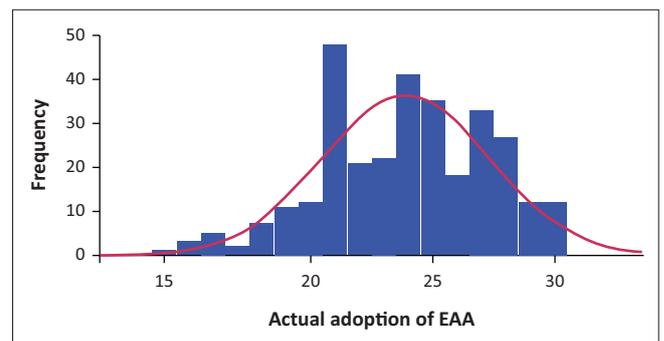
$$n = \frac{1900}{1 + 1900(0.0025)}$$

$$n = \frac{1900}{1 + 4.75}$$

$$n = \frac{1900}{5.75}$$

$$n = 330$$

Source: Leedy, P.D. & Ormrod, J.E., 2014, *Practical research, planning and design*, 10th edn., British Library Cataloging-in-Publication Data, viewed 18 May 2023, from https://cirt.gcu.edu/research/developmentresources/research_ready/quantresearch/sample_meth

FIGURE 1: Actual adoption of enterprise application architecture and external dynamic exasperations.

EAA, enterprise application architecture.

Note: Mean, median and mode are all equivalent at 23.89. $\sigma = 3.405$. $N = 310$.

FIGURE 2: Normal distribution on actual adoption of enterprise application architecture indicates a sympatric distribution as the values of variables appear at predictable frequencies and the mean, median, and mode occur at the same points.

On the other hand, Figure 2 produced double-exponent distribution curve with a μ of 22.89 and σ of 3.405 with negative skewness at -0.289 and kurtosis at -0.344 .

This confirms that the model is of the best fit as all variables should be multivariate normal as it indicates that a linear combination of the random variables should have a normal distribution. The distribution is asymmetric and it validates that the confirmation processed leads to the conclusion that the EDEs can be used for statistical examination with a linear regression model for the AA of EAA for SCM in SMEs.

Discussion of results

Pearson correlations on external dynamic exasperations on actual adoption of enterprise application architecture

Table 3 provides the results on correlations between EDEs and the AA of EAA. The p -value is near zero at ' < 0.001 ' with the required value set at 0.05.

Pearson correlations is on positive associations between variables at 0.239, Sig. (two-tailed) at 0.000 and values are given as means ($n = 310$), $p < 0.005$, $p < 0.000$. The findings on association suggest that, in general, there is a positive relationship between EDEs and the AA of EAA bearing the change of the sign in mind.

ANOVA on external dynamic exasperations and actual adoption of enterprise application architecture

Table 4 displays the ANOVA results attained for scores on EDEs and the AA of EAA. The dependent variable is regarded as the AA of EAA, while the independent variable is regarded as EDEs. The statistical technique 'ANOVA' tests the hypotheses between the dependent variable, namely, the AA of EAA, and the independent variable, such as EDEs.

The general F -statistic is significant ($F = 18.615$, $p < 0.001$), thus signifying that, overall, the model accounts for a significant proportion of the variation in the adoption of EAA for SCM in SMEs. The relative scale of the sum of squares of EDEs in ANOVA generated in SPSS increases as the variation in AA of EAA within the categories of EDEs decreases. The alternative H_{a1} that 'EDEs affect the adoption of EAA for SCM in SMEs' is accepted, while the null H_1 that 'EDEs do not affect the adoption of EAA for SCM in 'SMEs'' is rejected. This means that there is a statistically significant

TABLE 3: Pearson correlations on actual adoption of enterprise application architecture and external dynamics exasperations.

Variables	Notations	Actual adoption of EAA	External factors' exasperations
Actual adoption of EAA	Pearson correlation	1	0.239**
	Sig. (2-tailed)	-	0.000
	N	310	310
External dynamics exasperations	Pearson correlation	0.239**	1
	Sig. (2-tailed)	0.000	-
	N	310	310

EAA, enterprise application architecture.

Note: Correlation is significant at the 0.01 level (2-tailed) and values are given as means ($n = 310$), ANOVA: Actual adoption and enterprise application architecture, **, $p < 0.000$.

TABLE 4: Analysis of Variance, actual adoption of enterprise application architecture and external exasperations.

Model1	Sum of squares	df	Mean square	F	Sig.
Regression	204.167	1	204.167	18.615	0.000†
Residual	3378.104	308	10.968	-	-
Total	3582.271	309	-	-	-

Note: Dependent variable: actual adoption of enterprise application architecture and ANOVA processed on dual variables.

†, Predictors: (Constant), External dynamics exasperations.

TABLE 5: Pearson coefficient on AA of EAA & EDEs.

Model		Unstandardised coefficients		Standardised coefficients	t	Sig.	Collinearity statistics	
		B	SE	Beta			Tolerance	B
1	(Constant)	19.821	0.962	-	20.603	0.00	-	-
	External dynamics exasperations	0.146	0.034	0.239	4.294	0.00	1.000	1.000

Note: Dependent variable: Actual adoption of enterprise application architecture and independent variable: external dynamics' exasperations. Pearson correlations on dual variables. y = actual adoption of EAA and External dynamics exasperations.

SE, standard error.

difference between the means of the different levels of the EDEs variable.

Pearson coefficients on external dynamic exasperations and actual adoption of enterprise application architecture

Table 5 presents the results for the coefficient between EDEs and the AA of EAA. The p -value is $0.000 \approx 0.001$, while the Pearson coefficient is 0.239, thus indicating that there is a positive relationship between EDEs and the AA of EAA, which is below the cut-off point at 1.

The independent t-test is used to determine the confidence interval at 95% of the coefficient; therefore, the t-test is (20.603, 4.294). The results on the coefficient state that there is a positive correlation between EDEs and the AA of EAA.

Linear regression on external dynamic exasperations and actual adoption of enterprise application architecture

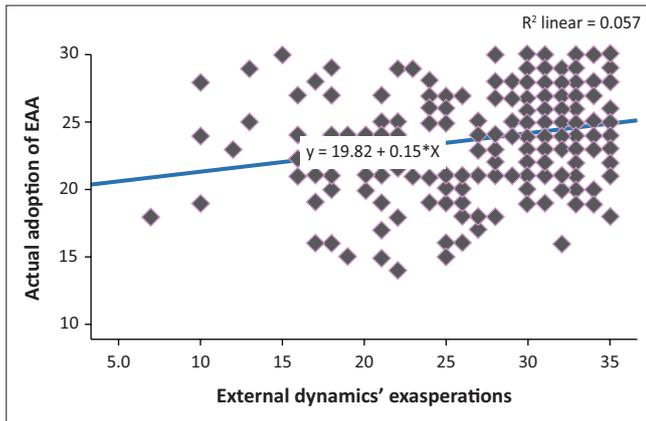
Figure 2 projects summaries on different characters where $\bar{Y} = AA$ of EAA, $a = y$ -axis intercept, $b = +$ slope and x -axis intercept as EDEs. The R^2 value is 0.057 of the variances that are accounted for in this scatter plot from the independent variable as EDEs.

The positive linear regression ascertains the assumptions on a model for best fit. As indicated, there are many points above or below the line of regression, and the ones that lie outside the line of regression are the outliers. The linear regression where $Y = 19.82 + 0.15 * x$. The slope of 0.15 will bring the same increase in Y . The R^2 value of 0.057 indicates that the level of variation in the prognostic variable could be described by variation in the independent variables. Likewise, the R^2 is converted to r , thus $\sqrt{0.057} = 0.238$, which is ≈ 0.239 , confirmed in Table 1 and Table 4 for Pearson correlation and coefficients. This approves that the model is adequate with a positive slope and the model is adequate. The results indicate that EDEs are the important factors for the AA of EAA in SCM.

Coefficient of variation

In this study, the CV is considered as an important concept that allows to predict variables within and outside data sets that are between EDEs and the AA of EAA. While it has its roots in mathematics and statistics, CV applied in different contexts including population demographics.

Arithmetically, $CV = \sigma / \mu * 100$:



Note: Slope (+0.15) of upright upshots, gives the average change in the y-variable for a change in the x-variable on one unit. Where $R^2 = 0.057$.

FIGURE 3: Linear regression on actual actual adoption of enterprise application architecture and external dynamics' exasperations.

- CV (EDEs) = Figure 1: $(5.571 \div 27.89) \times 100\% = 19\%$
- CV (AA of EAA) = Figure 2: $(3.405 \div 23.89) \times 100\% = 14\%$

Based on this result, SMEs could direct greater focus on EDEs that could produce interesting findings that account more for the AA of EAA.

Limitations of the study

Although the findings might be valuable, worthwhile and cherished, they are confronted with some limitations. The findings in this report are subject to at least three limitations: firstly, stakeholder misalignment on how each team is measured according to EAA design by taking into account management by objectives (MBOs) and key performance indicators (KPIs) that can impact how different functional departments react towards a new technology; secondly, risk assessment by neglecting perceived attitudes on two dimensions: perceived value and usefulness of the technology are outweighed by the required investment. Although the study focused on six EDEs, the major limitation of this study was to determine SMEs' level of visualisation, transformational impact, long-term competitive advantage, cybersecurity, trialability and observability.

Recommendations of the study

In future studies, it might be possible to use the different EDEs in which SMEs could be able to circumnavigate and dominate challenges that might affect their enterprise operations, particularly in SCM. This may include suppliers and partners being disinclined to compromise, employees struggling to adjust to new processes and tools, lack of practice and training before implementation, difficulties with communication internally and externally, and customers' concerns, issues and poor experience. It is recommended that further research be undertaken in the following areas: (1) complex legal and regulatory requirements should address issues such as the following: licensing processes and opaque tax assessment rules are among the most important

regulatory issues facing companies. (2) A lack of external funding should be taken into account, derives policy recommendations and encourages discussions between policymakers, financial institutions and SME representatives on new approaches to financing entrepreneurship. (3) Low technological capacity should be identified within new sectors close to the current national production space and then design targeted strategies to encourage innovation, either by improving the product or the production process. (4) The relative benefit should be acknowledged and recognised by all key stakeholders for effective implementation. (5) The compatibility of software systems should include the following aspects: best software testing tools, software testing courses, freelance software testing writer job for technical content, software testing course feedback and reviews and application testing. (6) Hardware system compatibility should include problems restoring hardware configurations by performing the following steps: identify the problem, update drivers and firmware, replace hardware, adjust settings and use compatibility mode.

Conclusion

These findings cannot be extrapolated to all SMEs. The findings support this hypothesis; however, it is also found that EDEs are not the most noticeable originator in this research study model. Overall, SMEs' owners and managers can counterplan the EDEs by considering Saras Sarasvathy's theory of effectuation, which defines a methodology in making decisions and performing actions in entrepreneurship processes for achieving its goals with limited resources. The findings are sustained by statistical analysis generated through Pearson correlations at one denoting positive relationship, ANOVA with a significant F-statistic 18.615, Pearson coefficients with t-test (20.603, 4.294) and linear regression with a positive slope of 0.15 on EDEs for the AA of EAA. According to these findings, despite the exploratory nature of EDEs, this study offers some insights into SME owners and managers as great inspirations with passion, striving for continuous improvement, adaptability to situational factors, to list a few. In some cases, these EDEs compel SMEs to acquire loans and use old technology with outdated hardware.

This study proposed and examined EDEs that affect the adoption of EAA for SCM within Capricorn District Municipality. It is hypothesised that there is a positive relationship between EDEs and the AA of EAA for SCM in SMEs. The emergence of regulatory guidelines to encourage better regulation has been an important development for public administration in complex legal and regulatory requirements. A lack of external financing from bank loans, investments from private individuals or investment companies, grants and the sale of company shares are examples of external financing. Before you set out on your journey to securing outside funding, you need to understand the pros and cons that come with it. To mitigate the LTC, a significant effort is needed to equip the Limpopo Enterprise Development Agency, the sector's education and training

authority and the private sector with the ability to use it. Relative advantage represents the degree to which consumers perceive a new brand as better than existing alternatives in terms of certain advantages or attributes: (1) Software systems compatibility examines the compatibility of the application and product with different computing environments, including usability, reliability and performance of the application and product. (2) Hardware system compatibility includes drivers that are software components that enable your hardware devices to communicate with your operating system and applications. The most interesting finding was that the constructs in EDEs are dynamic in nature. Overall, these results indicate that EDEs have a direct impact on the AA of EAA as encoded in ANOVA, Pearson's coefficient and positive slope for linear regression. Therefore, we can conclude that some EDEs are made difficult by statutory regulators, access to loans by banks and financial institution through collateral and age restriction as barrier.

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Competing interests

The author declares that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

Author's contributions

K.X.T.L is the sole author of this research article.

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Data availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available because of restrictions on confidentiality stated in ethical considerations, as the questionnaire contains the personal information of the respondents and that could compromise the privacy of research participants.

Disclaimer

The views and opinions expressed in this article are those of the author and do not necessarily reflect the official policy or position of any affiliated agency of the author.

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Appendix 1

TABLE 1-A1: Summary table.

Author(s)	Article title	Research topic	Purpose or research question	Summary point	Recommendations
Ruhl & Katz 2015	Measuring, Monitoring, and Managing Legal Complexity	Complex, legal and regulatory constraint	What is legal complexity, and what attributes and variables go into making legal systems complex?	Scholars and other legal complexity theorists focus on offering prescriptive advice to build adaptability and resilience into legal systems to keep pace with co-evolving social, technological, physical and biological systems.	Early attempts to develop legal complexity metrics, build out a system model through Legal Maps, conduct stress tests, locate systemic risk, seed the system with machine learning sensors, and propose new legal designs will be rudimentary, coarse, and often wrong, and will be criticised for that.
Sembene 2021	Mobilising External Financing for Africa's Crisis Recovery	A lack of external financing	This article reviews external financing options and assesses the extent to which each would benefit African countries, taking into account the variety of circumstances they face. In particular, it aims to inform ongoing efforts by the global community to shape international support for crisis recovery in Africa.	Review of external financing options. Expansion of multilateral financing and mobilisation of private finance. The IMF should enable African presumed blenders with adequate borrowing space to enjoy potentially greater access to its non-concessional funding in the event available concessional resources remains insufficient to close their external financing gap.	In the current context characterised by weak market confidence and strong fiscal headwinds facing bilateral partners, the IMF, the World Bank and other multilateral institutions are expected to be among the most reliable sources of additional external financing for Africa.
Del Carpio & Miralles 2018	Absorptive Capacity and Innovation in Low-Tech Companies in Emerging Economies	Low technological capacity	To have a better understanding of how non-technological innovation influences technological innovation.	<ul style="list-style-type: none"> • Show how absorptive capacity helps non-technological innovations and technological innovations. • Analyse how non-technological innovations impact on technological innovations in low technological intensity companies. • Determine non-technological innovation as a mediator in the relationship between absorptive capacity and technological innovation. 	While it is suggested that future research be carried out in emerging economies focusing on companies of low technological intensity, considering different industries, for example, food, beverage and soft drink industries, clothing industries, in order to identify patterns of behaviour in carrying out activities that lead to innovation development.
Choudhury & Karahanna 2008	The relative advantage of electronic channels: A multidimensional view	Relative advantage	To investigate consumers' decisions to adopt electronic channels at each of four stages in the purchase process: requirements determination, vendor selection, purchase, and after-sales service.	Stages in the purchase process. Dimensions of relative advantage. Efficacy of information acquisition.	Additional research is needed to further examine the underlying structure and dimensions of relative advantage across a range of products that vary in complexity.
Bagthaliya 2021	Compatibility Testing: Everything You Need to Know [Definition, Types, Process and Tools]	Software systems compatibility	Currently, there is a lot that has been spoken about compatibility testing. The problem today is that people have limited knowledge about the same, but there is a lot to know about this topic. Hence, if you are looking forward to gaining more insights into compatibility testing, this is the right place for you.	What is compatibility testing? What are the types of compatibility testing? How to do compatibility testing?	The test engineer will check the compatibility remotely and stem the flow from end to end. Therefore, it will go until the app tends to stabilise or is working perfectly for all the essential functions.
Bradley 2021	After a rocky year for patching, a look ahead to '22.	Hardware systems compatibility	If 2021 was all about ongoing patch issues with Windows 10 – and the arrival of Windows 11 – 2022 might be the year those issues become at least manageable.	Windows 10 will turn into a boring and predictable operating system. The desktop operating system will be less important.	Expect more changes as Microsoft responds to feedback and as users make changes in how we work with technology. Ultimately, any software company has to figure out how we are going to use technology in the future.

IMF, International Monetary Fund.

Appendix 2

Perceived attitudes

TABLE 1-A2: Section B: External Dynamic Exasperations.

Sigma notations	Please tick an appropriate box (✓) from 5.1 to 5.7	Strongly disagree (1)	Disagree (2)	Moderate (3)	Agree (4)	Strongly agree (5)
5.1)	Legal constraints hinder the use of new hardware and software in my business.	(1)	(2)	(3)	(4)	(5)
5.2)	Lack of external financing impact the adoption of Information Technology.	(1)	(2)	(3)	(4)	(5)
5.3)	Low technological accessibility impact the adoption of Information Technology.	(1)	(2)	(3)	(4)	(5)
5.4)	Information Technology leads to unfair advantage within the market.	(1)	(2)	(3)	(4)	(5)
5.5)	Difficult requirements in technological environment affect the adoption of Information Technology.	(1)	(2)	(3)	(4)	(5)
5.6)	Tolerant with external computers affect business activities.	(1)	(2)	(3)	(4)	(5)
5.7)	Information Technology expose the enterprise to information theft.	(1)	(2)	(3)	(4)	(5)

Note: 5) Please indicate your agreement with the following statements on the external factors on new information systems such as Enterprise Application Architecture[†] (see bottom page).

[†], Enterprise application architecture is a system where the applications and software are connected to each other in such a way that new components can easily be integrated with existing components.

TABLE 2-A2: Section D: Actual Adoption of Enterprise Application Architecture.

Sigma notations	Please tick an appropriate box (✓), from 7.1 to 7.3.	Strongly disagree (1)	Disagree (2)	Moderate (3)	Agree (4)	Strongly agree (5)
7.1)	Information Technology simplify my day-to-day activities.	(1)	(2)	(3)	(4)	(5)
7.2)	Information Technology highlight technical errors for me.	(1)	(2)	(3)	(4)	(5)
7.3)	It makes work flow straightforward	(1)	(2)	(3)	(4)	(5)
7.4)	Information Technology improves my job satisfaction.	(1)	(2)	(3)	(4)	(5)
7.5)	Information Technology support all aspect of my job requirement.	(1)	(2)	(3)	(4)	(5)
7.6)	Information Technology allows me to accomplish more work than in manual process.	(1)	(2)	(3)	(4)	(5)

Source: Lamola, K.X.T., 2021, *Factors influencing the adoption of enterprise application architecture for supply chain management in small and medium enterprises within Capricorn District Municipality*, viewed 15 November 2023, from <http://ulspace.ul.ac.za/handle/10386/3467>

Note: 7) Please indicate your agreement with the following statements on the intention to use new information systems such as Enterprise Application Architecture[†] (see bottom page).

[†], Enterprise application architecture is a system where the applications and software are connected to each other in such a way that new components can easily be integrated with existing components.