

Revving up SMEs' competitive advantage: Embracing emerging technologies for strategic renewal decision-making

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Abstract

Emerging technologies have a significant impact on the (post)pandemic world, with artificial intelligence (AI) and Internet-of-things (IoT) being central to recent research in enterprise business management. Current literature focuses on emerging technologies adoption (ETA) as an outcome of firm leadership decision-making for process optimization. There is a lack of evidence that ETA is exercised as a strategic renewal decision driving SMEs competitive advantage (CPA), addressing strategic challenges arising from SMEs interactions with their business ecosystem. The resource-based view (RBV) is used as a focused theory on organizational competencies, together with the technology-organisation-environment (TOE) framework analytical capabilities. The proposed conceptual model is underpinned in the TOE context as integrated determinants of ETA driving SMEs CPA. Hypotheses and potential theoretical and practical contributions are discussed, supporting SMEs leaders with an ETA based strategic renewal decision-making model driving CPA.

Keywords: Emerging technologies, strategic renewal decision-making, competitive advantage, SMEs

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1 Introduction

Over the years, technology adoption was identified both as an innovative source for a firm's competitive advantage, and as one of the firm's strategic challenges (Benlian and Hess, 2012; Masood and Sontag, 2020). Enterprises address challenges through strategic choices (Mintzberg, 1990), one of them being the strategic renewal through digital technology adoption (Van Zeebroeck et al., 2021), representing the firm's effort to reconfigure their resource bases (Schmitt et al., 2016) through ETA, thus transforming organizations, and strategically aligning business and information technology (Henderson and Venkatraman, 1999; Van Zeebroeck et al., 2021).

ETA driving CPA, as a relationship based on the organization resources and capabilities (Barney, 1991; Newbert, 2008) has consistently retained the attention of researchers (Bhatt and Grover, 2005; Blichfeldt and Faillant, 2021; Chiu and Yang, 2019). Recent work by Chiu and Yang (2019) established the link between ETA and CPA, and Blichfeldt and Faillant (2021) demonstrated that digital technology adoption represented by Industry 4.0 is a driver of firm CPA. Further, within the current era of Industry 5.0, ETA will increase the competitiveness of SMEs as humans and intelligent machines will work side by side (EU, 2023) to support the general shift of the future world from economic benefits to societal ones.

With focus on the RBV theory (Penrose, 1959; Wernerfelt, 1984; Barney, 1991, 2001), ETA has been evaluated as a driver of CPA, within the firm TOE framework (Tornatzky and Fleisher, 1990). RBV is a foundational theory for adoption and use of information technology in SMEs (Caldeira and Ward, 2017).

Despite the fact that everyone has become accustomed to remote interactions and virtual business, as outcome of (post)pandemic era, the adoption of emerging technologies such as AI and IoT is driven by the need to keep individual businesses running, and consequently, the societal system on the move. Therefore, there are various adoption models, and the majority of them treat individual components of the TOE framework as determinants of the emerging technologies adoption (Awa and Ojiabo, 2016; Pillai et al., 2021, 2023; Priyadarshinee et al., 2017; Ramdani et al., 2009). In some instances (Chwelos et al., 2001), the proposed models used few of the individual components of TOE contexts as integrated constructs. This study proposes a model that fully integrates individual components of TOE contexts, resulting in research questions that address the corresponding gap in the literature in reference to SMEs CPA driven by ETA. The key research question is:

- *What is the influence of TOE determinants on AI and IoT adoption driving SMEs CPA?*

The research sub-questions are:

- *What is the influence of ETA on SMEs CPA?*
- *What is the influence of TOE integrated contexts on SMEs CPA?*

Several researchers propose that emerging technologies are to improve decision-making processes (Grandon and Pearson, 2004; Hsu, Kraemer, Dunkle, 2006; Hsu and Yeh, 2017). This perspective emphasizes emerging technologies' contribution to processes optimization (Caldeira and Ward, 2003; Cragg et al., 2011; Grover et al., 2020). This study complements the above perspective with a comprehensive conceptual model that fills a gap in the literature defined as strategic renewal through ETA driving SMEs CPA. This study's conceptual model is unique in that it offers researchers TOE-based integrated contexts as determinants of the ETA driving SMEs CPA.

Beyond this introductory paragraph, the remainder of this study contains a brief literature review in the next section, followed by the research model and applicable hypotheses. The discussion section comes next, followed by the study's conclusions and implications.

2 Literature Review

The origins of this research idea of evaluating the determinants of ETA driving SMEs CPA is stemming out from an initial research concern on how SMEs create value out of inter-firm relationships (Yang et al., 2013; Franco and Haase, 2015), with a starting point on SMEs strategic alliances literature that has been reviewed to identify the applicable theoretical frameworks and methodologies that researchers used to justify their findings on how SMEs perform and create value. As outcome of this review several factors have been identified, out of which the influence of globalization and technological innovation (Hoffman et al., 2003) in the context of firm current performance, has been found to influence SME's appetite to enter future alliances (Lohrke et al, 2006). Further, technological innovation, has been found to be related to CPA (Ko and Liu, 2017), and a driver of the SMEs performance (Shibin and Gunasekaran, 2017). The relationship between CPA and SME performance is complemented with SMEs minimum business performance, as survival strategy, provided the SME showcases adaptability to the competitive environment. Therefore, reviewed literature supports the argument that SMEs should constantly create CPA as outcome of continuous innovation (Terziovski, 2010; Rosenbusch et al., 2011; Ferreira and Franco, 2017).

While querying databases such as Scopus, ProQuest, Elsevier, for key words as “technological innovation”, “technology adoption”, “SMEs”, “competitive advantage” various articles have been found connecting these concepts with “emerging technologies”, “disruptive technologies”, “smart systems”, AI” and “IoT”. The outcome of these searches crystalized in the idea that SMEs evolve in a multidimensional context of factors that influences their performance as outcome of their appetite for ETA. The summary of the most representative articles that supported this research idea is presented in Table 1.

Table1 Studies on emerging technologies published in peer-reviewed journals.

Source	Theoretical underpinning	Constructs/factors (independent variables)	Dependent variable	Methods	Data	Key Findings
Awa and Ojiabo, 2016;	TOE	Technology (ICT infrastructures, technical know-how, perceived compatibility, perceived values, security, organization (firm size, demographic composition, scope, subjective norms) environment (external support, competitive pressure, trading partners readiness)	ERP adoption	Logistics regression and Wald's statistics	Survey of 373 SMEs	The model explains 45.6% of the variance of ERP adoption. The model is confirmed as all the independent variables have their corresponding Wald coefficient higher than 1.96 at 95% level.
Chatterjee et al., 2021	TAM and TOE	Organizational competency, organizational complexity, organizational readiness, organizational compatibility, competitive advantage, partner support, perceived usefulness, perceived ease of use.	AI adoption	PLS-SEM	E-mail survey of 562 firms in manufacturing	The model explains 71% variance of intention to adopt AI. Perceived usefulness and perceived ease of use are the main drivers of the intention to adopt AI.
Hsu and Yeh, 2017	TOE	Technology infrastructure, IT expertise, expected benefits, top management support, organizational readiness, government policy, supporting industry, competitive pressure, data security, institution security, system security	IoT adoption	DEMATEL technique	42 logistics experts interviews	The study found that the system security and the institution security were the most important dimensions for IoT adoption. This study finds that the technological dimension is easily influenced by the other two. Technology infrastructure is found as having a major influence on the technology integration, and top management support is found as having the most important impact on the organizational dimension. The environmental dimension, represented by government policy and competitive pressure affects the most IoT adoption.

Source	Theoretical underpinning	Constructs/factors (independent variables)	Dependent variable	Methods	Data	Key Findings
Lin et al., 2018	TOE	IT Maturity, technology incentives, perceived benefits, external, pressure, government policies	Industry 4.0 adoption	Multiple regression analysis	Survey of 165 firms in automotive industry	The model explains the variance of Industry 4.0 within values of 54.6% for perceived benefits and external pressure as 15.2%, and the last one, although significant at 0.05 level, is considered non-representative.
Oliveira et al., 2014	TOE and DOI	Security concerns, cost savings, DOI (relative advantage, complexity, compatibility), technology (technology readiness), organization (top management support, firm size), environment (competitive pressure, regulatory support)	Cloud computing adoption	PA-SEM	E-mail survey of 2000 manufacturing and service companies	This study uses DOI theory strengthen with elements of TOE framework. The research model explains 38.1 % of the variance of cloud computing adoption, for the full sample, with 36.1 % explained variance for manufacturing industry and 40.8% explained variance for services industry.
Pillai et al., 2021	TOE and RBV	Perceived compatibility, perceived benefits, IT infrastructure, support from vendors, government support,	AI adoption intention	PLS-SEM	460 online and in person surveys	The model indicates that all path coefficients are significant for 0.05 level. Perceived compatibility is a good predictor of the adoption of industrial robots. Infrastructure is not a significant predictor of adoption intention. However, adoption intention is a strong predictor of potential use of industrial. The study main recommendation is that TOE framework be extended to include additional proxies to capture the value of resources for technology adoption.
Priyadarshinee et al., 2017	TOE	Technology (perceived IT security risk, risk analysis, technology innovation, organization (trust, management style), environment (usage of technology, industry usage)	Cloud computing adoption	SEM-ANN	E-mail and interviews of 660 managers in service, manufacturing, and power sector industries	Technology innovation, risk analysis, management style, and trust, are found to have a significant impact on cloud computing adoption, that in turn has a direct impact on business performance. Industry usage and usage of technology are found not to be significant to cloud computing adoption.

2.1 Emerging technologies foundations and evolution over time

Emerging technologies are fast growing radical innovations, with potential of noticeable impact on the socio-economic system (Rotolo et al., 2015). Numerous research articles present new technologies, as having a growing role in the business and social context of digital transformation for improving customer experience, lean operations, and for creating business models (Warner and Wager, 2019). These recent findings support the scope of this study for the effect of ETA onto firm's CPA.

The constant evolution of emerging technologies and their adoption represented over time the premises for processes optimizations and contributed to the increase of organizations efficiencies. Starting with personal workstations (PWS), that increased speed in completing tasks (Moore and Benbasat, 1991), and continuing with integrating all the functional areas in an enterprise (Lai et al., 2016), managed remotely through cloud computing (Ancarani et al., 2019; El-Haddadeh, 2019; Oliveira et al., 2014a; Priyadarshinee et al., 2017) fundamental improvements of inter-organizational business operations system have been achieved that led into competitive advantage of the firm.

The evolution of emerging technologies, culminate in the current era, with AI and IoT, as systems with computing capability allowing for real-time sensing, collecting, and processing of significant amounts of remote data (Warner and Wager, 2019). Further, the introduction of chatGPT, as a “trained AI application that follows an instruction with a detailed response” (Open AI, 2023), represents a new frontier for SMEs allowing SME leaders to make sound business decisions for SME CPA, despite the already known limitations of SMEs as size and resources availability (Eisenhardt and Schoonhoven, 1996; Das and Teng, 2000; Lu and Beamish, 2006).

2.2 Current emerging technologies - AI and IoT

Current emerging technologies are identified in literature as stand-alone concepts, or in many instances, referred to each other as part of a defining concept, being represented by Industry 4.0, Cyber Physical Systems (CPS), AI and IoT (Masood and Sonntag, 2020; Grover et al., 2020). The concept of emergence has many definitions, each of them covering a specific characteristic. AI is defined as a source of innovation due to the capability of a system to learn (Grover et al., 2020) and replicate human intelligence (Metcalf et al., 2019). IoT is referred broadly as systems with “sensing, communicating, processing and actuating capabilities” (Atzori et al., 2010; Government Accountability Office, 2017), capable to control physically separated system components (Atzori et al., 2010; Metallo et al., 2018). Elhoone et al. (2019) have bridged the AI and IoT as emerging technologies in use in the manufacturing sector, supporting with evidence that the two systems work in conjunction for operations optimization.

With the society and the technology stepping in the Industry 5.0 domain, characterized by sustainable, human centric industries (EU, 2023) the interaction between human intelligence and the artificial one, facilitated through IoT opens a new frontier where economic priorities are to be surpassed by societal ones, with AI and IoT to continue their role as facilitators of human-machine interaction (Panagou et al., 2023).

AI and IoT are departing the computer-aided field, represented by e-business, ERP, EDI, or cloud computing technologies (Hsu et al., 2006; Lin and Lin, 2009; Oliveira et al., 2014; Awa and Ojiabo, 2016; Priyadarshinee et al., 2017). The purpose of AI and IoT is shifting from a support role into one of engaging, learning and decision-making, based on accumulated information converted into applicable knowledge.

3 Conceptual Model and Hypotheses

3.1 Theories supporting emerging technologies adoption

Technology adoption is generously represented in the reviewed literature, with examples presented in Table 2, and include various theories, models, and frameworks used to evaluate both the individual and the organization, as unit of measure.

The reviewed articles indicated that the most used theories on technology adoption included the Theory of Planned Behaviour (Ajzen, 1991), the Technology Adoption Model (TAM) (Davis, 1986; Lai, 2018; Rana and Dwivedi, 2016), the Unified Theory of Acceptance and Use of Technology (UTAUT) (Dwivedi et al., 2019), the Diffusion of Innovation theory (DOI) (Rogers, 2003), the Institutional Theory (INT) (DiMaggio and Powell, 1983; Eisenhardt, 1988; Scott, 2014), the Technology-Organization-Environment framework (TOE) (Chatterjee et al., 2021; Tornatzky and Fleischer, 1990), and the Resource-Based View (RBV) (Wernerfelt, 1984; Barney, 1991).

Technology adoption research had TAM as its theoretical beacon, being applied for a diverse panel of technologies. Attie and Meyer-Waarden (2022), used TAM to research IoT and Smart Connected Objects (SCO), recognized the model limitations, and expand it with additional elements, as perceived social image and perceived well-being. DOI is the theory most used in organizations' technology adoption research; however, it is limited to emphasis on innovation factors (Nguyen et al., 2015; Xia et al., 2022), and without consideration to contexts that are influencing the organization. To address these limitations, Tornatzky and Fleisher (1990), included elements of DOI in their TOE framework and provided a multi-faceted perspective on the technological innovation decision making process. A comprehensive perspective on the effect of technology adoption on the organization, is provided when TOE framework is used in conjunction with RBV. Ahani et al. (2017) refer to RBV as the base theory that could explain the importance of social CRM adoption for organization strategy and performance (Henderson and Venkatraman, 1999), supported with the contextual setting established by the TOE framework. Pillai et al. (2021) also use RBV as a driving theory with TOE as the analytical framework, to study the use of AI powered robots for improving performance in manufacturing SMEs in the automotive industry.

3.2 Research model and hypotheses

The proposed conceptual model (Figure 1), presents a multi-level approach, based on a hierarchical components model (Lohmoller, 1989). The model starts with components of technological (TEC), organizational (ORG), and environmental (ENV) contexts, drawing on TOE framework (Tornatzky and Fleischer, 1990). At the context level, its components, part of the TOE framework, are based on the theories described in Section 3.1: TEC based on DOI; ORG based on RBV; ENV based on INT. This conceptual model represents a holistic incorporation of firm internal capabilities and emerging technologies availability to face environmental business challenges and resides on the theoretical foundation of RBV.

Table 2 Theories and model constructs used in previous studies

Theory	Dependent variable	Source	Technological innovation	Compatibility	Complexity	Triability	Rel. advantage	Trust in technology	Management support	Intellectual Capital	Cost savings	Financial resources	Government pressure	Competitive pressure	Industry pressure	Reg. support	Firm size	Emerging technologies adoption
KBV	Innovation Adoption	Dost et al., 2016								X								
TOE and RBV	AI adoption intention	Pillai et al., 2021														X		X
TAM and TOE	AI adoption	Chatterjee et al., 2021		X	X													X
TOE	IoT adoption	Hsu and Yeh, 2017							X					X				X
TOE	Industry 4.0 adoption	Lin et al., 2018																X
TOE	Cloud computing adoption	Priyadarshinee et al., 2017	X					X	X		X							X
TOE	Cloud computing adoption	Oliveira et al., 2014		X	X	X	X		X					X		X		X
TOE	EDI adoption	Chwelos et al., 2001										X		X	X			X
TOE	ERP adoption	Awa and Ojiabo, 2016;		X										X			X	X
TOE	E-business adoption	Lin and Lin, 2009		X										X				X

3.2.1 Technology (TEC)

TEC includes technology innovation, compatibility, complexity, trialability, relative advantage, and trust. The higher the compatibility between the organization and the technology, and the lower its complexity, together with availability of technology for trial without any obligations, resulting in relative advantage, contributes to increased levels of trust from the organization towards the emerging technology considered for adoption.

The reviewed literature demonstrates that *technology innovation* (Priyadarshinee et al., 2017; Verbano and Crema, 2016) demonstrate that technological innovation is an important factor for cloud computing adoption, an emerging technology at the time of its introduction. Rogers (2003) stated that the innovation must fit with an adopter previous experience, present values and needs, and therefore, *compatibility* is regarded as a major determinant of innovation adoption, when applied to current emerging technologies (Pillai et al., 2021). Therefore, compatibility translates in economic sense by offloading human involvement to machine driven algorithms. Grover et al. (2020) explains the *complexity* of emerging technologies as the difficulty to understand and use AI, based on the general interpretation of complexity applied to innovation (Thompson et al., 1991) as the opposite to the concept of easy to use. Further to that, organizational complexity is negatively influencing technology adoption (Chatterjee et al., 2021), mitigated by integration of technology into business operations (Chwelos et al., 2001).

Rogers (1983) define *trialability* as a characteristic of innovation rate of adoption, understood as opportunity to try technology before deciding whether to use it, or not (Moore and Benbasat, 2001), and it is found as having a major influence on adoption, when applied to emerging technologies as autonomous vehicles (Yuen et al., (2021). *Relative advantage* represents the degree to which an innovation “is perceived as being better than its precursor” (Moore and Benbasat, 1991). Relative advantage and technology adoption is the most studied relationship in selected articles for this study (Huang et al., 2008; Hsu and Yeh, 2017; Krell et al., 2016; Oliveira et al., 2014b; Ramdani et al., 2009), being found to have a positive association with ETA. *Trust* is described as a strategic factor driving CPA out of relationships that SMEs establish with other entities (Geneste and Galvin, 2015), allowing SMEs to compensate for lack of available resources and know-how. In summary, the constructs evaluated in this section technology innovation, compatibility, complexity, trialability, relative advantage, and trust are included in the integrated, technology (TEC) context, and lead into the following hypotheses:

H1. TEC has a positive association with ETA.

H2. TEC has a positive association with SMEs CPA.

3.2.2 Organization (ORG)

ORG includes management support favouring emerging technologies adoption, thus providing financial resources required for organization intellectual capital involvement, translating in the opportunity of creating cost savings for the organization, thus leading into emerging technologies adoption.

Management support is a social influence factor exercised towards achieving SMEs business objectives (Thompson et al., 1994), and includes leadership and strategic direction, resources allocation, supporting integrated business processes while taking both financial and organizational risks towards emerging technologies adoption (Huang et al., 2008; Oliveira et al., 2014b).

There are no current studies to have identified a relationship between emerging technologies adoption and *intellectual capital*. Subramaniam and Youndt (2005) established the intellectual capital influence on innovative capabilities, Li et al. (2018) established the interplay between innovation and emerging technologies adoption, further supported by findings of Ahani et al. (2017), Huang et al. (2008) and Peltier et al., (2012). Business efficiency and lower operating costs are strategic objectives, with *cost savings* being a significant factor in AI adoption (Grover et al., 2020). Dubey et al. (2019) evaluate the cost and operational performance of enterprises that adopt predictive analytics tools relying on big data, in order to react to strategic challenges through decisions that are bringing in operations efficiency and lower costs.

In the context of the organizational readiness, *financial resources* are studied together with technological resources (Chwelos et al., 2001; Iacovou et al., 1995). Technology adoption is influenced by firm's technical ability, financial resources, and partner's readiness. and Dwivedi et al. (2019) posit that financial resources availability drives AI development, with AI as integral part of digital strategies initiated both in the public and private sector. In summary, the constructs evaluated in this section management support, intellectual capital, financial resources, and cost savings are included in the organization (ORG) integrated context, and lead into the following hypotheses:

H3. ORG has a positive association with ETA.

H4. ORG has a positive association with SMEs CPA.

3.2.3 Environment (ENV)

ENV considers pressures exercised by competition, industry and government for emerging technologies adoption together with regulatory support and refers to the firm business perimeter. The business environment is influencing emerging technologies, driving their development and adoption (Chatterjee et al., 2021; Grover, 2020; Kumar, 2019), that in turn influence the environment, through optimized interactions (Ransbotham et al., 2017). *Competitive pressure* is a significant determinant of adoption of new technologies by SMEs (Premkumar and Roberts, 1999) in relationship with innovation adoption conferring the firm CPA. Chan and Chong (2013) found that SMEs may not consider adopting new technologies out of readiness concerns, and Awa and Ojiabo (2016) found that firms should be strategically inclined towards technology (Zhu et al., 2006). However, adoption is not a discretionary decision, rather being a necessity driven by the pressure exercised on the enterprise by its competitors. *Industry pressure*, as part of the competitive environment is exercised by trade or professional associations (Chwelos et al., 2001), being also exercised by major business partners, who already use a given technology, and demand their smaller partners, or suppliers, to adopt and implement such technologies (Kuan and Chau, 2001). *Government pressure* refers to having SMEs using mandatory means of business engagement and operations driven by government regulations and policies (Hsu et al., 2006), as coercive pressure, part of institutional pressures, with the purpose to reach operational effectiveness and cost performance (Dubey et al., 2019), or as compliance requirements (Rieger et al., 2013), having a different impact according to the industry where technology is to be adopted (Kung et al., 2015). To counterbalance firms' reserve in technology adoption, the government provides *regulatory support* as incentives for the adoption and use of technologies (Zhu and Kraemer, 2006), together with a regulatory framework (Rieger et al., 2013), that defines the accountability and responsibilities of firms using such technologies, that favours technology adoption (Lin et al., 2018; Oliveira et al., 2014). In summary, the constructs evaluated in this section , competitive pressure, industry pressure,

government pressure and regulatory support, are included in the higher order construct, environment (ENV), leading into the following hypotheses:

H5. ENV has a positive association with ETA.

H6. ENV has a positive association with SMEs CPA.

3.2.4 Emerging Technologies Adoption and Competitive Advantage

ETA – AI and IoT

The adoption of AI and IoT is discussed in the literature as AI – machines with human like thinking capabilities, including analysis, learning and decision-making (Huang and Rust, 2018; Haenlein and Kaplan, 2019; Kumar et al., 2019; Grover et al., 2020; Chatterjee et al., 2021); and as IoT – devices with capability of sensing, collecting, transmitting, and executing commands part of a business model exploiting technology capabilities for creating value for the firm (Metallo et al., 2018).

CPA

AI, as ETA, is assessed as giving an organization CPA (Chatterjee et al., 2021), because according with the type of AI to be used, mechanical, analytical, intuitive, or empathetic (Huang and Rust, 2018), implying various degrees of learning, leading into recognition and adaptation and to situational contexts, organizations could gain CPA out of the AI mobility, adaptability and speed in assisting organizations with decision making process (Grover et al., 2020). Hence, the following hypotheses are presented with consideration towards emerging technologies mediating the relationship between technological, organizational and environmental context and a direct relationship between emerging technologies adoption and competitive advantage is proposed as well.

H7. ETA has a positive association with SMEs CPA.

H8. ETA has a mediation effect between TEC and the SMEs CPA.

H9. ETA has a mediation effect between ORG and the SMEs CPA.

H10. ETA has a mediation effect between ENV and the SMEs CPA.

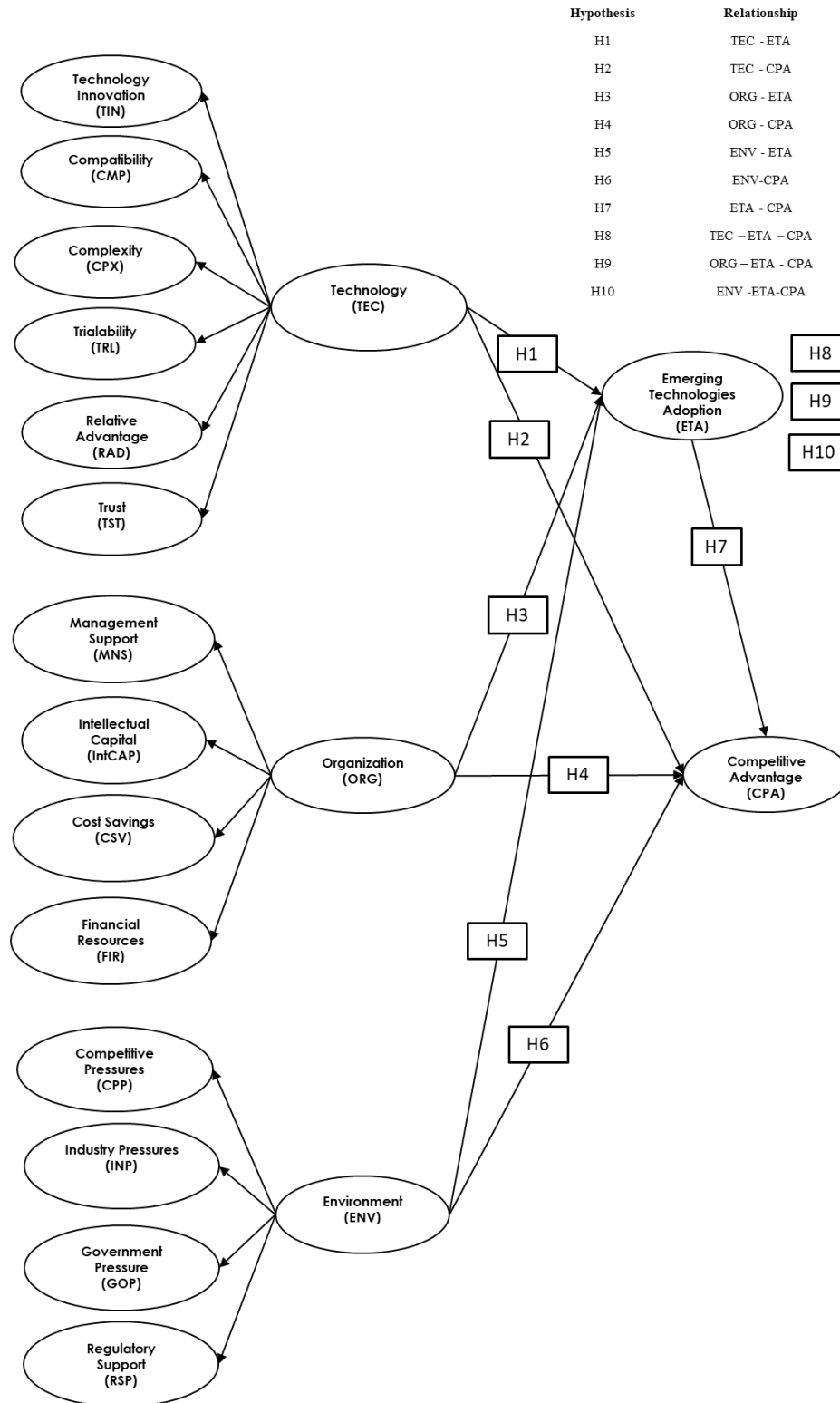


Figure 1 Proposed conceptual model

Note: The arrows in Figure 1 suggest a reflective approach

4 Discussion

4.1 Inferences from the reviewed literature

The SMEs interest in emerging technologies, is documented by OECD (2022), with SMEs found to be proactive towards technology adoption for CPA through improved productivity (Ram et al., 2014), and gained capabilities to adapt to a changing business environment (Pavlou and Sawy, 2010). This is representative for the SMEs level of awareness, and interest on emerging technologies (IBM, 2022).

SMEs are interested in ETA given the advantages provided for organizational performance (Zhang and Dhaliwal, 2009), supporting consistent productivity with less employees (Chatterjee et al., 2021; Chiu and Yang, 2019). This reflects SMEs capability in adopting new technologies, as strategic renewal, driven by their developed proactive attitude toward change (Peltier et al., 2012), as organizations engaged in digital transformation (Grover et al., 2020). SMEs that conduct their business activity in product and service innovation, have a constant interest in novel, disruptive, and radical technologies (Blichfeldt and Faullant, 2021; Casidy et al., 2020; Pappas et al., 2021). According with their industry, SMEs are exposed to various requirements that are either regulated or self-imposed by industry and professional associations. The SMEs conduct business under competitive pressures (Masood and Sontag, 2020; Sherer et al., 2016), exercised from their direct competitors. There are also exercised government pressures, through regulations meant to protect data privacy, accessibility, and confidentiality (El-Haddadeh et al., 2019), accommodated through digital means (Chan and Chong, 2013; Grandson and Pearson, 2004; Krell et al., 2016; Premkumar and Rammamurthy, 1995; Premkumar and Roberts, 1999), within a well-defined regulatory environment (Zhu et al, 2006). Therefore, ETA supports such pressures mitigation, and lead into CPA out of established customer and supplier relationships (Lin and Lin, 2008; Nguyen et al., 2015).

4.2 Applicability of the conceptual model

This study conceptual model relies on the TOE contexts, as determinants of the ETA driving SMEs CPA, within the RBV theoretical foundation and proposing an integrated perspective of the components of each TOE context, available to SMEs for assessing the organization resources and capabilities to deal with strategic challenges.

Given the SME leaders decision-making role, the conceptual model can be used for assessing both direct relationships and mediated ones between TOE contexts, ETA and SMEs CPA. Hypotheses H1 to H7 represent direct relationships between TOE contexts, ETA and SMEs CPA. Hypotheses H8 to H10 are representing the mediation role of ETA in the relationship between each TOE context and CPA.

This conceptual model and its hypotheses are new to the ETA and CPA literature, and there are no current studies conducted on the relationships between TOE framework integrated contexts, ETA and CPA. Therefore, the conceptual model proposes an original perspective where the SMEs CPA is associated with the TOE framework contexts. The novelty of this approach is supported by the evidence from reviewed studies that evaluated SMEs CPA as outcome of technology adoption, in relationship with individual components of TOE framework contexts, set as predictors, under various theoretical underpinnings.

The originality of this model is reinforced by the newly introduced intellectual capital construct, representing further the value and the rareness of resources available to the organization. A positive association of TEC with SMEs CPA could be a reconfirmation of the

cyclical nature of the organizations strategic renewal for aligning their business with their information technology as a fit between internal capabilities and external business requirements.

Previous research studies on SMEs leaders, have found that SMEs managers, will be driven towards technology adoption (Nguyen, 2013; Ram et al., 2014; Tan et al., 2007), being knowledgeable of the benefits brought by emerging technologies. However, owners, will resist adoption of emerging technologies, being concerned with sustained enterprise performance (Newbert, 2008; Wade and Hulland, 2004), undermined by the costs associated with such adoption, and the need for qualified resources. The SME owners perspective is supported by Miles and Snow (2003) who posit that business owners faced with an entrepreneurial problem of choice of product and market, are to exercise their choices on technology with awareness on the organization resources availability or lack of, and its capabilities for such endeavour.

5 Implications and Conclusions

5.1 Research contributions

The most important contribution of this conceptual model is the introduction of a new relationship between the TOE contexts, as integrated determinants of ETA and SMEs CPA. This relationship is proposed to be quantitatively evaluated and that will open the door for both theoretical and practical contributions bringing an original perspective to the body of knowledge of enterprise management through strategic renewal decision-making.

5.1.1 Theoretical contributions

A decision-making process is about selecting a rationale alternative that has the likelihood to produce the expected outcome (Simon, 1955). This conceptual model theoretical implications extend from the results of the reviewed literature that identified the research gap represented by the need for an integrated model exploring the contextually set determinants of ETA, represented by AI and IoT, driving SME CPA. This study major theoretical contributions are discussed below.

Contribution 1. TOE integrated contexts of ETA

The introduction of the TOE contexts as integrated determinants of ETA, underpinned by the RBV as main theory supported through TOE framework analytical capabilities is a first in the SME literature. The setting of integrated contexts of internal and external components, opens the possibility to use this model for decision making at various management levels, when addressing the enterprise both strategic and tactical goals. Previous research (Chwelos et al., 2001; Sethi and King, 1994) treated TOE contexts individual constructs as higher order ones, but not for any of the TOE contexts in their entirety. The proposed conceptual model provides an incremental theoretical perspective addressing the general context of resource-based decision making while also making available a more granular definition of the elements supporting that strategic renewal decision to be made by SMEs owners and managers.

Contribution 2. ETA as a repeated phenomenon

This research also introduces the concept of the *temporal ETA*. The emerging technologies concept has been previously used in the literature (Alexander et al., 2012; Day and Shoemaker, 2000; Rotolo et al., 2015) as a standalone concept addressing specific domains of activity and

being defined in a limited way with regards to novelty, possible impact, and transformational capabilities. This conceptual model associates ETA as a general term with the repeated adoption of novel, disruptive, and fast-growing technologies that could transform existing industries or create new ones out of innovation outcome at the moment in time when they become available.

Contribution 3. Top-down or bottom-up approach decision-making

The ETA is treated from two perspectives. The *top-down approach* is used when the adoption decision is channelled from SME leaders through managers to the entire organization. The *bottom-up approach* is used when managers volunteer their observations to leaders, in support of decision making that aligns the firm internal resources and capabilities with the external environment. Both approaches are meant to support the decision-making process for changing the enterprise established path (Barney, 1991; Schmitt et al., 2016), thus a strategic renewal achieved through ETA driving SMEs CPA.

5.1.2 Practical contributions

This conceptual model proposes TOE contexts as integrated determinants of ETA driving CPA, that could be used in the enterprise management, and strategic renewal decision making (Zeebroeck et al., 2021). The proposed conceptual model represents a gradual framework allowing SME leaders to engage in decision-making processes through an incremental and differentiated approach towards evaluating their resources against the environment at various levels of the enterprise (Schmitt et al., 2016). ETA is gaining priority on corporate leadership agenda as reflected in the recent IBM study for AI global adoption index (IBM, 2022). SME leaders have to consider ETA from a strategic perspective for their enterprise CPA. Therefore, ETA becomes part of SMEs strategic plans for aligning the organization internal capabilities with the external competitive environment (Blichfeldt et al., 2021; Peltier et al., 2012). The studies conducted on ETA and CPA are frequently represented in the manufacturing industry studies mainly because of the applicability of the IoT and AI in manufacturing processes (Chatterjee et al., 2002; Masood and Sonntag, 2020; Oliveira et al., 2014a; Pillai et al., 2021). In the industrial context, emerging technologies are instrumental for process monitoring and optimization, equipment maintenance tracking and scheduling, defect source identification, predictive maintenance, and repair information. These technologies have a major contribution on manufacturing high-quality products, where process control is paramount, facilitated by the use of IoT, represented by intelligent devices that collect and transmit data, and execute commands received from AI entities involved in the decision-making process.

5.2 Limitations and recommendations for future research

This conceptual model proposes a novel approach of the decision-making process for strategic renewal, relying on an integrated perspective on determinants of ETA driving SMEs CPA. Nevertheless, the conceptual model has its limitations arising from the theoretical setting, that although combines RBV and TOE framework, considers only the resources and capabilities of the firm assessed in the firm ecosystem. Although the organization is the unit of measure, the individual preferences of the organization members, their own capabilities, motivations and interests towards new technologies are recommended to be factored in (Chatterjee, et al., 2021; Huang et al., 2008; Masood and Sonntag, 2020; Oliveira et al.,

2014a). To further understand what drives employees to become involved in the SME strategic renewal initiatives (Schmitt et al., 2016), it is also recommended that focused research is conducted on employee engagement through organization business processes facilitating the ETA for creating CPA.

Individual elements of the TOE framework have been studied in the reviewed literature with outcomes indicating that they are significant factors of ETA in various industries, including, manufacturing, health, services, and retail (Chatterjee et al., 2021; Ahani et al., 2017; Grandon and Pearson, 2004; Moore and Benbasat, 1991; Pillai et al., 2021; Xia et al., 2022). Therefore, it is recommended that this conceptual model to be empirically verified in future research, specifically in the manufacturing, health, services, and retail, to explore an integrated perspective on emerging technologies based strategic renewal.

5.3 Concluding remarks

This conceptual model provides a reference on the evolutionary nature of the technology adoption, being an emerging one at the time of adoption due to novelty, radicalness, and potential for better serving the adopting organization. The identified research gap refers to the lack of an integrated approach towards strategic renewal through ETA driving SMEs CPA. This gap addressed through the proposed conceptual model, theoretically underpinned by the RBV and empowered by the analytical capabilities of the TOE framework, is, to the authors' best knowledge, a first in the enterprise management and information systems literature. The use of the TOE contexts as integrated constructs establishes the premises for a differentiated evaluation of such determinants of emerging technologies adoption based on the theoretical level sought for analysis and managerial applications of the model, strategic renewal decision level, or tactical execution of these decisions.

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