

e-Business Reference Modelling Framework for SMEs: An Enterprise Architecture based Approach

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Abstract: Through the digital industry and economy, we find countless researches providing conceptual models aiming to depict digital technology adoption by different businesses. However, according to existing studies, we found that SMEs lack an e-business reference modelling framework that supports the design and adoption of digital-enabled business models. Therefore, we exploit an adaptive and technology-independent approach to propose an EA-based e-business reference modelling framework for SMEs in diverse business contexts. Our framework comprises mainly of three interrelated building blocks, starting with the 1) situational analysis to determine the motivating factors for change and barriers of the business environment; followed by SMEs profiling. The SMEs profiling embodies the 2) SMEs' readiness depiction based on the existence of digital strategy, digital-value drivers' catalogue, and business models proposals; and culminates with the 3) description of the implementation based on e-business architecture. In addition, a fourth building block is incorporated into the framework for e-Business solutions architecture, selection, and deployment into the current SMEs' business context. In this study, we assume a practical approach, proposing and demonstrating the application of tools that support the conception of an SMEs' e-business in the business context in all the different facets of our framework.

1 INTRODUCTION


The digital ecosystem and economy offer plenty of opportunities for businesses to thrive. Although many corporations and large firms easily engage and thrive in the digital landscape, this is not the case of countless SMEs from multiple business contexts. For most of the countries around the globe, SMEs are the cornerstone for the economic development of many industries, specifically in developing countries. Unfortunately, researches and literature pinpoint the limited adoption of digital business or digital supported business models by SMEs. For instance, as discussed in summary by (Putra & Hasibuan, 2015), many critical factors are appointed as drivers or hinders. Hence, as many of the indicated factors are intrinsic to a specific industry or country, notably two problems are unfolded:


- SMEs' lacking e-business reference models to guide the adoption of e-business. Also,

- Literature lacking e-business reference modelling frameworks.

Although SMEs' e-business adoption behaviour analysis falls beyond the scope of this work, we agree that every business (enterprise) is a social system (Hoogervorst, 2011, 2017) and behaves differently to others, which is challenging to model its behaviour for change. Herein, acknowledging the fact that digital technologies are used for business purposes, these businesses are assumed as having – managed or unmanaged – enterprise architecture (EA) (Armour, Kaisler, & Liu, 1999). Thus, we are induced to answer the following research question:

- Which conceptual model should support the development of technology-adaptive e-business reference models based on enterprise architecture of SMEs, in diverse industries or business contexts?

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2 RELATED WORK

Our discussion over the main referenced works, researches, literature, techniques related to e-business frameworks that support our proposal follow two streams of studies: one from the practitioners' perspective related to the design of digital-enacted business, and another from the academia perspective related to the framing of e-business adoption's patterns of *SMEs*. Herein, we identified former conceptual models serving as the basis for our proposal.

2.1 e-Business Adoption Pattern Framework

In our days, it is unimaginable a business that doesn't use ICT resources regardless of its size. Although the concepts of e-business stand for the use of electronic technologies in support of business activities, researchers argue that its adoption approach by *SMEs* and businesses, in general, must be adaptive and technology-independent (Putra & Hasibuan, 2015)(Mišić & Zhao, 2009)(Fettke & Loos, 2006). In fact, there are many e-business technologies and technology-based frameworks. However, as discussed in former studies, they lack guidance – to support *SMEs'* decision-makers – on the e-business adoption process, in diverse *SMEs'* industry or country's context. Thus, e-business models are not designed independently of the technologies (Mišić & Zhao, 2009).

From the existing research, we identified the baseline conceptual model for our study – “*Initial descriptive model of integrated e-business for SMEs framework*” – as by (Putra & Hasibuan, 2015). *This work* suggests three facets:

- 1) for the **critical adoption factors** influencing the *SME* e-business readiness,
- 2) for the **readiness** encompassing *SME's* profiles in a specific industry or country and,
- 3) for the **implementation** facet where *SME's* decision-makers decide to adopt an e-business.

The authors argue that the existing frameworks “insufficiently provide a practical tool for *SMEs* to implement e-business.” In addition, they claim the need for an established set of *CAFs* of e-business for *SMEs* as a source of indicators in signalling the readiness of *SMEs* to adopt e-business. Considering the *SMEs'* idiosyncrasy and the business environments, establishing a set of generic *CAFs* could be misleading. Instead, we suggest establishing purposeful tools and methodology to guide *SMEs* to evaluate its context *CAFs* based on cross-industries

digital key elements of a moment in time of an *SME* lifecycle. Although, we agree on the authors summarized former research contextualizing *SMEs'* readiness as based on strategic vision, enterprise financial resources, management and employee's IT skills, attitude (motivation).

Also, they posit that *SMEs'* readiness need to “relate the *CAFs* into *SMEs* readiness profiles” and suggest a readiness evaluation as *SMEs'* profiling. From this standpoint, we agree on *SMEs'* profiles as relevant reference components for e-business adoption patterns evaluation. However, an *SME's* Profile must span the readiness and implementation facets, comprising all necessary e-business adoption references. Also, *an SME's profile must be of digital context addressing a digital strategy and digital business model at readiness facet*. By following our approaches, *SMEs'* e-business will be well structured for future evaluation of the e-business adoption maturity.

Moreover, the author proposes an implementation perspective based on *SME's* value chain. We agree that this perspective is appropriate for the overall e-business adoption maturity evaluation; however, *SME's* value chain encompass too many processes (Porter, 2001), which could limit a concurrent e-business adoption approach, *becoming a barrier for SME, specifically for those in developing countries*. Instead, *we suggest a more granular adoption perspective through value-streams, specific activities in the value chain* (The Open Group, 2017). To adopt this approach, we propose a strict modification of this baseline framework by adding necessary building blocks to complement its functionality. In addition, this approach is suitable for design science paradigm to develop artefacts as the outcome of the analysis in the context of people, organizations, and technology.

2.2 e-Business Model Designing Frameworks

Following the contextual analysis, the strategic options are spotted, and this could lead to business innovation process through business model design. A business model is an intermediary element between strategy and tactics (Casadesus-Masanell & Ricart, 2010)(DuPont et al., 2018). For e-business modelling purposes, we identified the *BMC* – a well-known framework in the context of management, among others within the *EA* discipline. Scholars have proposed some extension of *BMC* to facilitate the design of digital-enacted business model. One extension that we found fitting our purpose is the *EV* Framework (Cigaina & Riss, 2017) – based on *BMC*.

This is a powerful framework that supports the development of e-business models through core digital concepts as 1) digital connected *people*, 2) digital-connected businesses (*organizations*), 3) digitally connected business *assets*, 4) business information (set of *data*) as a digital resource, and 5) digital services' infrastructures – directly or indirectly owned IT infrastructures (e.g. *cloud* computing).

Herein, we understood that SMEs pursuing different business goals, within an industry or country, can share the same digital key elements. Therefore, these SMEs need to articulate their business models in one or more of the BMC components to pursue a specific strategy or *course of action* and realize business drivers and goals. Moreover, with this approach, one or more digital-value drivers are explicitly linked to each digital key element and BMC component. The *EV Framework* is supported by a questionnaire-based methodology, and this is useful for the elicitation of current or future digital value drivers out of the business environment.

Additionally, within the EA discipline, we found scholars and practitioners proposing mechanisms that support the translation of BMC into architecture models, with ArchiMate language (Jacob et al., 2014; Meertens et al., 2012). Cigaina & Riss (2017) provide valuable insights over the cross-industries digital elements, the depiction of digital strategies through its related digital-value drivers. Even Though, they scope their research in the digital business model design context only. So, we posit that adopting some aspect of EV framework is helpful for SMEs' e-business modelling with ArchiMate. Also, the integration of business models in our proposal aligns with some BA practitioners standpoints (DuPont et al., 2018). It's recommended that e-business architectures are based on business models and, in turn, business models are aligned with business strategy.

3 PROPOSED FRAMEWORK

Following, we present our SME's e-business reference modelling framework (J-framework) proposal. This framework is made up of three facets encompassing three different levels of e-business from conceptualization to implementation. Also, it incorporates an extra deployment block addressing the e-business solution architecture to be managed outside the SME's boundaries by e-business solution providers. We present a similar approach as the research basis by Putra & Hasibuan (2015), to emphasize the devising of SME's e-business adoption

model. In the following sections, we demonstrate how this analysis is accomplished, and different methodologies and techniques are combined to support our proposed framework (J-Framework) (cf. Figure 1).

3.1 Description of the J-Framework

We adopt the EA-based approach to propose an integrated e-business reference modelling framework. Essentially, this framework comprises three facets (Putra & Hasibuan, 2015).

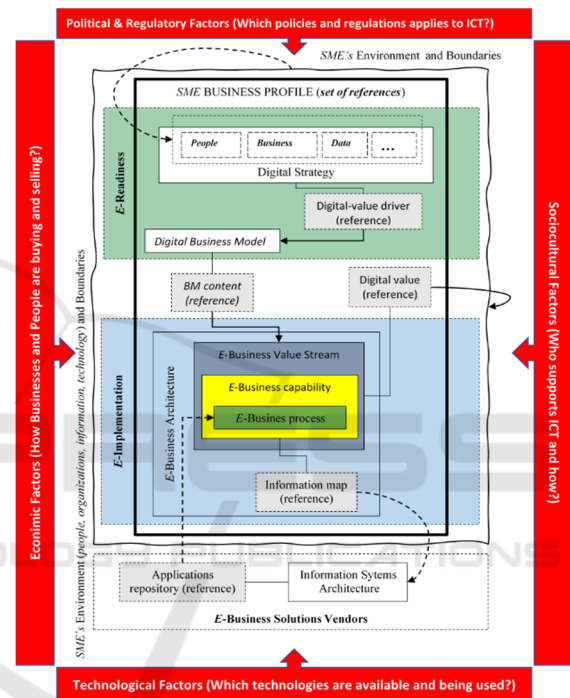


Figure 1: E-business reference modelling framework for SMEs (J-Framework).

First, for *CAFs Analysis building block* we incorporate four components for the situational analysis relying on extended *STEP* analysis over cross-industries digital elements: *people, organization, information, and technology* (cf. Table 1). In addition, the *CAFs analysis* are translated into stakeholders' motivation views with ArchiMate (cf. Figure 2).

Second, for *SMEs profiling*, we span the SMEs' profile covering both the *Readiness evaluation facet* and *Implementation description facet*. Then, for *Readiness facet* per se, we introduce components for digital strategy, digital business model, and digital value drivers catalogue as key elements for *Readiness assessment* (cf. Table 2 – 3 and Figure 3 – 4).

Moreover, to ensure that the *SME*'s readiness is related to the *CAFs*, we rely on instances (people, business, data, etc.) of environment's digital elements (people, organizations, information, and technology) in the digital strategy building block – were the *SWOT* analysis is performed (cf. Table 2).

Third, for Implementation *design*, we introduce the *E-Business Architecture* building block, and we substitute the *SME* value chain with e-business value stream and e-business application by e-business process. Additionally, we include the Information map building component. E-business architecture takes business model contents as reference inputs and provides two reference artefacts: 1) e-business information map, and 2) digital value (cf. Table 4 – 6 and Figure 5 – 7).

Fourth, within the *SMEs* business profile, we add two key components: 1) business model content map (cf. Figure 4), and 2) digital value map (a description of the digital offer) (cf. Figure 5). Also, we integrate a *deployment facet* into the *SMEs*' environment; in this new facet, *SMEs*' e-business solutions are designed, identified, or developed and deployed by (non-technology) *SMEs* (cf. Figure 1). The deployment includes the Information Systems Architecture (*ISA*) building block and Applications repository component and has as input the information map. Further details are out of the scope of this study.

We adopt a technology-independent approach (Putra & Hasibuan, 2015), and we ensure that businesses systematically choose and adopt any available e-business solution (Fettke & Loos, 2006) in an evolutionary manner. To ensure the adaptability and *SME*'s interoperability, the e-business information maps are used as a reference in the *ISA* of the specific industry – which provides application selection references for *SMEs*' e-businesses (cf. Table 7). While applications exist already in the *SMEs Context Applications Repositories*, suitable e-business applications can be instantiated into a specific *SME*'s e-business profile.

4 CASE STUDY

In the following section, we demonstrate the application of our proposed framework in designing e-business reference models. *Merkatos* is an *SME* operating in the marketing industry in Mozambique, to provide traditional mass media marketing services for diverse business sectors, mainly brick-and-mortar

retailers. *Merkatos*' core competencies are the production and publishing of graphical, audio, and video marketing content. Since 2015, Mozambique is facing an economic deficit leading to a 19.1% inflation rate in 2016³. Therefore, *Merkatos managers* are looking to “reduce 3% of publishing costs,” and enhance the market access for premium customers to increase profit by 1% by third Quarter(Q3) in 2020. *Merkatos* expenditures on multimedia channels are 25% off the quarterly budget. Despite the company's need to continue using the mass media to reach audiences randomly, they see potential of the internet as a substitute and how it facilitates new entrants. Through this scenario, we will demonstrate how to implement the proposed framework to devise an e-business adoption reference models for *SMEs* in this country. This scenario alludes to some of the *Merkatos* critical factors for digital enacted businesses adoption - summarized in Table 1.

Table 1: *Merkatos*' *CAFs* Analysis over Cross-Industry Digital Elements.

Merkatos Context <i>CAFs</i>		<i>CAFs</i> Categories			
		Social	Technological	Economic	Political
<i>CAFs</i> Digital Elements	Stakeholders (people)	- Low technology literacy. - Social networking.	- Growing internet access - Digital consumers - Mobile banking	- Low income. - High inflation rate	- Adoption ETA.
	Organization (business)	-	- Growing internet access - Connected partners - Data and content providers	- High inflation rate.	- Adoption of ETA.
	Information (set of data)	- People network effect - People share information openly	-	- Adaptive pricing	- Data privacy enforcement by ETA
	Technology (cloud, IoT, etc.)	-	- Business usage of cloud storage. - Social network-based solutions	- Lower Marginal costs of digital assets	-

This situational analysis of *Merkatos external* context is complemented by *SWOT* analysis in Table 2. By coupling the inside and outside state of affairs, *Merkatos* envisioned the business motivations and depicted the strategic options. Table 3 presents the industry generic digital-value drivers' reference catalogue. The catalogue heat-map signalling the readiness gaps, whereas, **Green** mean *Merkatos* owns supporting capabilities, or competences, or resource for a specific value driver. **Yellow** mean *Merkatos* resources, capability, and competence to be enhanced to realize a specific value driver. **Red** mean *Merkatos* important digital-value drivers in which an *SME* is required to acquire the supporting competences,

³ Source: <https://www.imf.org/en/countries/moz>, visited on 2019/03/05

capabilities, and resources. Grey generic industry or business context's digital-value drivers.

Table 2: Matching of CAFs with its Related SWOTs to Develop Digital Strategy.

Merkatos' Digital Strategic Options to Reduce Cost		CAF's Digital Elements (People, Business, Data, Cloud)	
CAF's Digital Elements (People, Business, Data, Cloud)	Related Weaknesses (W): - Personnel (employees) with limited digital skills;	Related Strengths (S): - Expertise in multimedia production; - Knowledgeable of digital content management; - Competent in social media platforms	
	Related Opportunities (O): - Socially networked people; - Internet-connected businesses; - Low publishing costs	Related Threats (T): - Low technology literacy; - The high cost of data services;	
	Digital OW Strategy: - Collaborate with Internet marketers to publish digital ads.	Digital OS Strategy: - Develop a digital content marketing channel. - Provide a market access channel for 24/7 availability.	
	Digital TW Strategy: - Partner with operators for SMS marketing.	Digital TS Strategy: - Develop a social media channel targeting local subscribers only.	

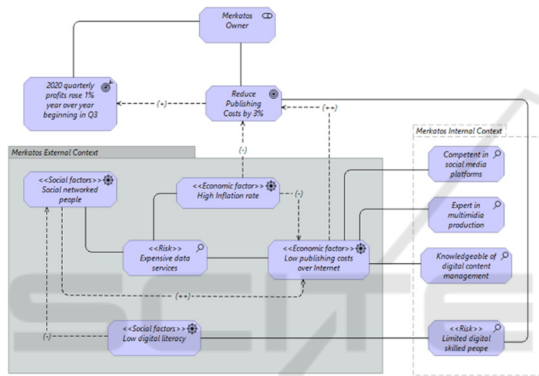


Figure 2: Merkatos E-Business Motivation Model.

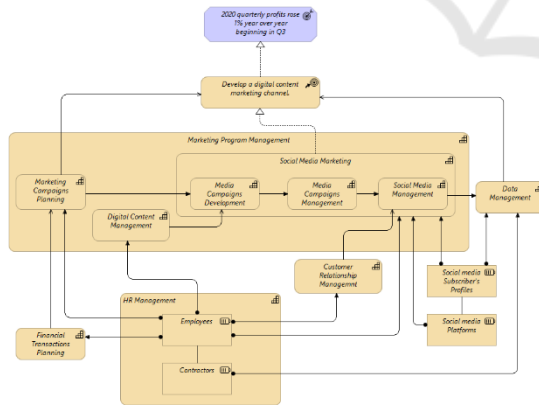


Figure 3: Merkatos' E-Business Digital Strategy Model.

Table 3: Merkatos' Industry Digital-Value Drivers' Catalogue.

Merkatos Digital Value Drivers	BMC Components									
	Value proposition	Customer segments	Revenue streams	Channels	Customer relationships	Key partners	Key resources	Key activities	Key costs	Cost structure
people	Social network-based solutions	Digital consumers	Digital access points as a channel	Social network-based customer relationships						People network effect
business				Business network-based customer relationships	Connected partners					Cost reduction by digital marketing channel utilization
cloud										Lower Marginal costs of digital assets
data	Customers with high information demands	Adaptive pricing	Customized channels	Better knowledge of customers	Data and content providers	Data as a resource	Data Management			

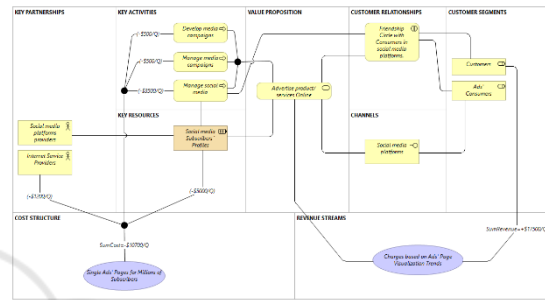


Figure 4: Merkatos' E-business Model Diagram.

Table 4: Merkatos' Value Stream Definition.

Name	Advertising Online
Description	Delivery of product/service promotional information on social media channels.
Stakeholders	Retail store wishing to advertise and social media subscribers (End-consumers)
Value	People can see product/services Ads online

Table 5: Merkatos' Value Stream Decomposition.

Advertising Online					
Value stream stages	Description	Participating stakeholders	Entrance criteria	Exit criteria	Value item
Plan marketing campaigns	The act of defining the strategy, objectives, and metrics of the Marketing campaigns.	Retailer, Marketing Finance Clerk	Customer looking for Advertising plan.	Customer Engage with Merkatos	Ads campaign plans available to the customer.
Build a social media channel	The act of building a social media marketing channel like Facebook pages	Retailer, Marketing Manager, Content designer	The customer selects the Ads plan.	Customer Approves channels	Social media channel available to customer
Manage marketplace Ads	The act of producing digital content, uploading, and posting the Ads.	Retailer, Marketing Manager, Content designer	Customer Approves channels.	Customer approves Ads contents	Online Ads visibility
Engage with end-consumers online	The act of promoting Ads and interacting with social media subscribers (consumers)	Social media subscriber, Marketing Manager, Content Promoter	Customer approves the publishing of Ads' contents	Consumer engages with Ads contents	Consumers' brand awareness rate.
Measure and feedback	The act of evaluating the channel's performance and Optimization.	Marketing Manager, Retailers, Content designers	Consumer engages with Ads contents	Customer receive Feedback	Customer intimacy rate.

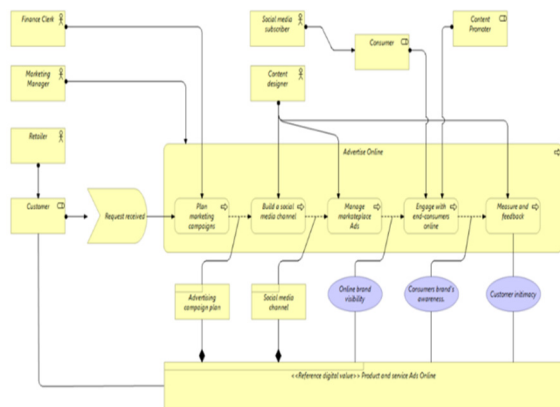


Figure 5: Merkatos E-Business Value Stream Map Coupled with a bundled Reference Digital Value.

Table 6: Merkatos' Value Stream and Capabilities Mapping.

Advertising Online				
Plan marketing campaigns	Build a social media channel	Manage marketplace Ads	Engage with end-consumers online	Measure and feedback
Capability	Capability	Capability	Capability	Capability
Marketing Campaigns Planning Financial Transaction Planning	[Digital] Marketing Channels Development	[Digital] Content Management Social Media Marketing	Social Media Marketing	Customer Relationship Management [Digital] Marketing Channels Management Data Management

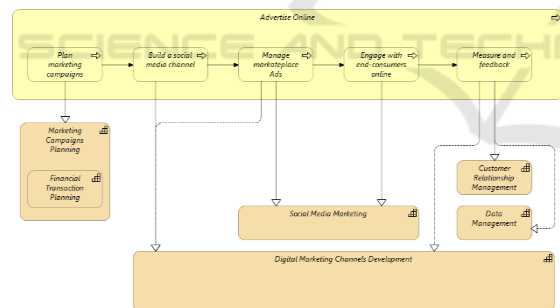


Figure 6: Value stream and capability mapping.

The implementation description is core and begins with the translation of the *Merkatos Key activities* of the *E-business model* into value streams. The value proposition for end-consumers is providing customers with local products and service information anywhere at any time namely – Advertising Online. For instance, one of the *Merkatos' Key activity* is *Managing social media* – described in (APQC, 2019) – which requires upskills. This new capability is coupled with *Merkatos* extant capability – *Development and management of media campaigns*, also described in (APQC, 2019). These

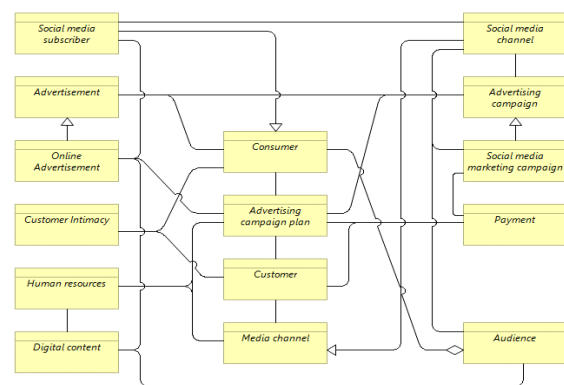


Figure 7: Merkatos' Reference Information Map.

Table 7: Merkatos E-Business Processes vs. E-Business Systems Map.

E-Business Information Entities	Advertising Online				
	Plan marketing campaigns	Build a social media channel	Manage marketplace Ads	Engage with end-consumers online	Measure and feedback
Planning systems	Ads campaign plan				
Payment systems	Payment				
...		Social media channels	Online visibility trends	Ads	
Customer Relationship System				Consumer awareness rate	Customer intimacy rate

core capabilities were translated into the following value-adding activities:

- 1) Plan marketing program
- 2) Build a social media channel
- 3) Manage marketplace Ads
- 4) Engage with consumers online
- 5) Measure and feedback

As *Merkatos E-Business Profile* is concluded and contain the artefacts from the e-readiness analysis to the implementation descriptions, the senior managers can engage on the next stage challenges – *selecting the e-business applications to adapt and deploy*.

5 DISCUSSION

In this research we adopt an ex-post evaluation strategy (Venable et al., 2012, 2014) to analyse how our framework could support the design and implementation of a manageable *SME's* e-business in line with the criteria proposed by Putra & Hasibuan (2015), and in the context of design science paradigm. We had limitations in applying our proposed

framework in a real-business scenario; however, we are analysing over the created reference models in the previous section to depict the proposed framework usability and suitability.

Following, we analyze our proposal over the created artifacts also regarding former reported *SME* limitation in the baseline research (Putra & Hasibuan, 2015). We recall these limitations in summary as – “inadequate provision of practical tools for *SMEs* in decision-making and implementations,” described as:

- Lack of an established set of critical adoption factors of e-business for *SME* serving as the source of indicators in signalling the readiness of *SMEs* to adopt e-business.
- Trivial adoption of e-business applications regardless of *SMEs* profile based on an assessment of their capacity to adopt a specific e-business application or readiness to adopt e-business.
- Need for a well-designed implementation model that is adaptive to technology and receptive to the nature of *SME*, serving as a roadmap towards the transformation of *SMEs*.

What Become Possible for e-Business Profiling.

We recognize that having an established set of drivers and hinders from *SME*, for instance, operating in the US market, could be a misleading reference for an *SME*'s e-business adoption initiative in Mozambique. However, possessing practical tools and a common methodology guiding the assessment of the diverse industry and business context *CAFs* became the pragmatic approach. So, *SME* in any industry and business context, could identify the relevant e-business adoption factors (drivers/hinders) over common cross-industry digital key elements of any moment in time of a *SME*'s lifecycle.

Also, the *SMEs*' readiness profiling based on strategic vision over relevant digital *hotspot* of its industry and business context demonstrated the feasibility of our proposal. Though, *SMEs* could be prevented from trivially adopting any existing technology/e-business applications before they had the motivation and understood both technical and financial capabilities, regardless their ICT maturity level. Additionally, by approaching a well-structured implementation paradigm – *E-Business Architecture*, *SMEs* can roadmap a technology-independent e-business adoption process.

6 CONCLUSIONS

In this work, we exhaustively demonstrated how to approach e-business adoption through *EA* reference

modeling. Also, we have evaluated the utility of the proposed design solution against *leading criteria*, and our conclusions regarding the baseline framework proposed by Putra & Hasibuan (2015) is suitable to couple managerial techniques and *BA* techniques to support the design of e-business for *SMEs*. Moreover, by integrating the two disciplines to build an e-business framework could contribute to enhanced decision-making for the e-business adoption process.

In short, we have achieved our objective of *providing a framework that supports the development of SMEs e-business in diverse business contexts and industries by integrating managerial and EA practices*. This achievement is fundamentally sustained by 1) identification of knowledge base conceptual models regarding *e-business reference modelling and adoption pattern* from existing work; 2) analyzing the adaptability of baseline conceptual models to suit the generic managerial frameworks and *EA* practice components; and by 3) proposing a framework and supporting tools. Henceforth, the main contributions of this research are:

Scholars have a detailed, well-designed, and technology-independent reference modeling approach to support the *SMEs*' e-business adoption pattern description. Through extended common managerial analysis tools for critical adoption factors, facets become possible to identify an *SME*'s specific drivers and hinders related to industry or context transversal digital elements. For readiness perspective, *SMEs*' readiness profiles are explicitly related to context adoptions factors guiding the depiction of *SME* change motivations and business model innovations. And industry or context drivers are cataloged for *SMEs* e-business adoption referencing purpose. Moreover, a fine-grained e-business architecture approach through *SMEs* value-adding activities is demonstrated, independently of e-business solutions being deployed at any stage of the business lifecycle.

Practitioners engaging in e-business implementation have an instrument to apply their competencies on situational analysis to depict digital business value drivers, and digital strategy and e-business models. Also, to boost the understanding in how digital service and technologies are deployed to realize business goals. Moreover, they are benefited from a new approach to handle *SMEs*' e-business architecture analysis and modeling, which is *EA* architecture tools compatible.

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