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

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Keywords: Enterprise Architecture, e-Business Reference Model, Digital Strategy, SME, e-Business Architecture.

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 (Iacob 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 (∫-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 (∫-Framework) (cf. Figure 1).

3.1 Description of the ∫-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).

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, ... network-based solutions – ICEIS 2020 - 22nd International Conference on Enterprise Information Systems
696
Moreover, to ensure that the SME’s readiness is related to the CAFs, we rely on instances (people, business, data, ... of cloud storage. Lower Marginal costs of digital assets – Social network-based solutions

cf. key components: 1) business model content map (Figure 4), and 2) digital value 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 instantianted 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 2016¹. 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.

<table>
<thead>
<tr>
<th>Merkatos Context CAFs</th>
<th>CAFs Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholders (people)</td>
<td>Stakeholders</td>
</tr>
<tr>
<td>Technology</td>
<td>Technology</td>
</tr>
<tr>
<td>Information (of data)</td>
<td>Information</td>
</tr>
<tr>
<td>Organization (business)</td>
<td>Organization</td>
</tr>
<tr>
<td>People-centred</td>
<td>People-centred</td>
</tr>
<tr>
<td>Data-centred</td>
<td>Data-centred</td>
</tr>
<tr>
<td>Technology (inf. tech. etc.)</td>
<td>Technology</td>
</tr>
<tr>
<td>Social</td>
<td>Social</td>
</tr>
<tr>
<td>Political</td>
<td>Political</td>
</tr>
<tr>
<td>Economic</td>
<td>Economic</td>
</tr>
<tr>
<td>Cultural</td>
<td>Cultural</td>
</tr>
<tr>
<td>Technological</td>
<td>Technological</td>
</tr>
<tr>
<td>Adoption</td>
<td>Adoption</td>
</tr>
<tr>
<td>ETA</td>
<td>ETA</td>
</tr>
</tbody>
</table>

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,

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¹ 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.

![Figure 2: Merkatos E-Business Motivation Model.](image)

![Figure 3: Merkatos E-Business Digital Strategy Model.](image)

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

<table>
<thead>
<tr>
<th>Merkatos’ Industry Digital-Value Drivers</th>
<th>Value Drivers</th>
<th>CAFs</th>
<th>Digital SWOTs</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Elements</td>
<td>People, Business, Data, Cloud</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAF: Digital Strategy Options to Reduce Cost</td>
<td>People</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Related Strengths (S):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grey generic industry or business context’s digital-value drivers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAF: Digital Strategy Options to Reduce Cost</td>
<td>People</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Related Weaknesses (W):</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Grey generic industry or business context’s digital-value drivers.</td>
<td></td>
<td></td>
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</tbody>
</table>

![Figure 4: Merkatos’ E-Business Model Diagram.](image)

Table 4: Merkatos’ Value Stream Definition.

<table>
<thead>
<tr>
<th>Value Stream Definition</th>
<th>Description</th>
<th>Marketing Strategy, Finance Clark</th>
<th>Entrance Criteria</th>
<th>Exit criteria</th>
<th>Value Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value stream</td>
<td>Advertising</td>
<td>Build a social media channel</td>
<td>Social media channel available to the customer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value stream</td>
<td>Advertising</td>
<td>Manage marketplace Ads</td>
<td>Social media channel available to customer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value stream</td>
<td>Advertising</td>
<td>Engage via social and content analytics</td>
<td>Social media channel available to customer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value stream</td>
<td>Advertising</td>
<td>Monitor and feedback</td>
<td>Social media channel available to customer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Merkatos’ Value Stream Decomposition.

<table>
<thead>
<tr>
<th>Value Stream</th>
<th>Description</th>
<th>Stakeholders</th>
<th>Enablers</th>
<th>Outcome</th>
<th>Value Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertising</td>
<td>Build a social media channel</td>
<td>Social media channel available to the customer</td>
<td></td>
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<td></td>
<td></td>
<td>Social media channel available to customer</td>
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</tbody>
</table>
Figure 5: Merkatos E-Business Value Stream Map Coupled with a bundled Reference Digital Value.

Table 6: Merkatos’ Value Stream and Capabilities 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 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 B4 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.
ACKNOWLEDGEMENTS

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