An Identification of Non-Technical Issues in SOEA Implementation

Full Paper

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Abstract

Today's business environment pushes organizations to be adaptive and collaborative. This push drives the development of service-oriented enterprise architecture (SOEA) in support of the organization. To realise the advantages offered by SOEA, research on avoiding SOEA implementation failure is of considerable merit. In the review of literature on SOEA implementation failure, two research problems were identified: first, there is a paucity of research on non-technical issues (NTIs) in SOEA implementation; and second, the definition of an NTI in the Information Systems (IS) field remains implicit, incomplete, and incongruent. Addressing these two research problems therefore becomes the research objective of this paper. The overarching research design framework is qualitative, mixed-method research. Under the guidance of this framework, literature reviews, semi-structured interviews, and an online survey were conducted. The key findings are a clarified scope for NTIs in the field of IS and the identification of the critical NTIs in SOEA implementation.

Keywords (Required)

Service-oriented architecture, enterprise systems, implementation, non-technical issues

Introduction

Companies today face a volatile and globalised business environment. Such an environment demands that companies be able to adapt to the external and internal environment (Minguez et al. 2009), and can collaborate with their distributed partners/divisions on a regular and effective basis.

As an indispensable component of today's companies, information systems (IS) should facilitate such adaptability and collaboration. However, current IS, for one thing, is too tightly-coupled (i.e. components of current IS cannot be changed, assembled or reused easily and rapidly) to support such adaptability. Due to this tight inter-component dependency, any change in one component triggers a ripple effect of changes in other related components; time and effort is needed to assemble components; and it is difficult to reuse an existing component without including other components. For another, it is common for current IS supporting a company and its partners/divisions to be developed using different platforms. Technologies and protocols adopted by these platforms differ, resulting in incompatibility in IS between the various sections, which hinders collaboration.

Another obstacle to efficient adaptability and collaboration is the organisation itself. Organisational structure, including the authority structure, operational rules and guidelines in general, lacks the flexibility to change. It is also difficult to enable efficient collaboration between experts from different domains, making it difficult to reach an organisation-wide consensus on the direction of change, and the steps needed to enforce the change.

Given these constraints on current IS in supporting adaptability and collaboration within and between companies, Service-Oriented Enterprise Architecture (SOEA) becomes significant. To put it simply, SOEA

combines Enterprise Architecture (EA) with service orientation, applying service orientation as the overarching architectural principle to every architecture domain of EA. With the implementation of SOEA, companies are facilitated by loosely-coupled IT solutions to change their way of doing business in response to changes in the internal and external environment quickly and easily, and service reusability allows better collaboration with their partners/divisions. SOEA thus helps companies to achieve the demands of a volatile and globalized business environment: being adaptive and collaborative both within and between companies. The advantages of SOEA motivated an examination of current SOEA implementation.

A review of existing literature on SOEA implementation identified that, although existing research has covered much of the research on SOEA implementation process, such as SOEA implementation roadmaps (Oracle 2012; Remier 2007; SAP 2008), maturity models (Hirschheim et al. 2010; Oracle 2013), and governance (Brown et al. 2006; Susanti et al. 2011), there is a lack of research on SOEA implementation, and in particular, on problems/issues/factors contributing to SOEA implementation failure. Moreover, it has been generally acknowledged in prior research in EA that, as opposed to technical problems/issues, non-technical problems/issues (NTIs), such as insufficient stakeholder understanding and support and lack of mutual engagement between business and IT, are the major causes for the failure of EA (Deng et al. 2012).

Despite plenty of prior research and practical publications relating to NTIs in the IS area, there is a lack of comprehensive and congruent understanding of NTIs in the whole IS field (Bostrom et al. 1977; Jasperson 2005; Jiang et al. 1998; Polites 2013; Venkatesh 2008). Prior IS research simply listed the NTIs (Gary 1980) or indicated what NTIs were (Lucas 1975). Also, those lists and indications of NTIs had varying scopes. Some scoped NTIs to organisational behaviour (Liu et al. 2007; Lucas, 1975); while others scoped to people (Yu 2005). Such lack of congruent understanding has hindered data collection for future research, as well as making it very difficult for policy makers to issue meaningful guidelines in practice (Chew 2013). Considering the potentially critical role of NTIs in EA implementation and more recently SOEA implementation, as well as a lack of comprehensive and congruent understanding of NTIs in the IS field, the scope of this research is NTIs and SOEA implementation failure. Based on this the research objectives are (a) to synthesize the varying terms and definitions given to NTIs in the IS field to clarify understanding of this subject and (b) to identify the critical NTIs for SOEA implementation failure. Moreover, this is exploratory research that uses a quantitative lens.

In the following sections of the paper we first define non-technical issues in the context of SOEA. Then the critical NTI's in SOEA implementation are examined followed by a description of the research methodology. Finally, the findings are discussed and then we conclude with a summary of the research.

Non-technical Issues in information System

The existing understanding of NTIs is incomprehensive, implicit, and incongruent. This section aims to find conceptual solutions to the research objectives. First, NTIs in the IS field will be defined by looking at their development of understanding and second, the critical NTIs in the SOEA context that contribute to SOEA implementation failure will be discussed in the next section.

Despite a growing human interaction with IS over a long period of time, the idea that NTIs contribute to IS failure did not appear until the late 1960s, when a real look was taken at the reasons for IS failure. By then, NTIs were considered to be 'people-related', and phrases related to people, like "motivation", "perception", "resistance", "reward", began to appear in the literature as reasons for IS failure (Gary 1980). In the 1970s, the literature on NTIs grew much richer, for instance Lucas (1975) noted for the first time that NTIs were reckoned to be the major reasons, as opposed to the "the technicals," for IS failure. Lucas (1975) considered NTIs to be "organizational behaviour problems". He maintained that NTIs were related to system usage and the relationship between users and the information services department. However, Lucas (1975)'s implication and list of NTIs/ "organizational behaviour problems" only offered an implicit definition, which is insufficient to allow a comprehensive understanding, to distinguish NTIs from technical problems, or to explore potential research on this subject. A solidly theory-based explanation to NTIs proved to be much needed. In 1977, the sociotechnical system (STS) theory was proposed and Bostrom and Heinen (1977) maintained, based on STS theory, that NTIs should be termed "social system problems", and were the major culprits in IS implementation failure. Although this article

did not explicitly define NTIs/ "social system problems", it did indicate what NTIs were by defining the source of the problems. According to Bostrom and Heinen (1977), the social system is concerned with people's attributes (e.g. attitudes, skills, values), relationships among people, reward systems, and authority structures. Based on Bostrom and Heinen (1977)'s indication, NTIs were held to relate to people, and the relationships between people, work practices, authority structures, and reward systems. The STS theory regarded IS-implementing organisations as an organisational work system, in which technology (i.e. IS in this research context) and human participants perform processes to generate products or services for both internal and external customers (Alter, 2002). This organisational work system is viewed as consisting of two interacting subsystems: technical subsystems and social subsystems (Bostrom et al. 2009; Kappelman et al. 2006; Lamb et al. 2003). Our understanding of a social system has evolved to contain the elements of: individuals (users, programmers, end users, etc.) (Briggs et al. 2010; Zhang et al. 2010) and their attributes and relationship among individuals (Ryan, Harrison, and Schkade 2002; Jensen et al. 2010); work practices such as communication and collaboration (Poltrock et al. 2010); reward system (Bostrom et al., 2009); and authority structures that exist in the organisation (Bostrom et al., 2009). Based on this updated composition of the social system, we define NTI as issues relating to people, work practices, authority structures, and reward systems that contribute to IS failures. We also define IS failure as one or more of the following: the overall performance of the system is sub-optimal; it is rejected by user and underutilized; development costs exceed benefits over its useful life; the system is abandoned before completion.

In summary, understanding of NTIs in the 1960s was limited to lists of NTIs, which was very fragmented. Stepping into the 1970s, the understanding of NTIs became richer. Lucas (1975) took a more detailed look at NTIs and NTIs were first reckoned to be the major culprits in IS failure as opposed to "the technicals". Also, understanding of NTIs became theory-based (Bostrom et al. 1977). However, these richer understandings of NTIs were only implied, never explicitly stated. In the next section we will examine critical NTIs in SOEA implementation.

Critical Non-technical Issues in SOEA implementation

As discussed previously, SOEA is essentially an evolution of EA to adopt the service-oriented concept. The purpose of this section is to use Leavitt's (1965) organisation change model to identify the NTIs that, if not managed properly, might lead to failure in SOEA implementation.

It is commonly acknowledged by both researchers and practitioners that introducing new technology will impact the adopting organisation as a whole (Bieberstein et al. 2005; Dumas and Kohlborn 2015). Leavitt's Diamond model (Leavitt 1965) offered a new approach to examining such impacts on organisations by breaking them down into four components: People, Task, Structure, and Technology (Figure 1). By studying the interactions of these four components, the Diamond model allows organisational change to be studied more thoroughly, and is valuable in explaining the impact of technology on organisations.

Organisations need to adopt Service-Oriented technology as part of SOEA implementation, therefore the immediate impact is technology change. The impact will propagate and consequently affect other non-technical aspects of the organisations, namely People, Structure and Work Practice.
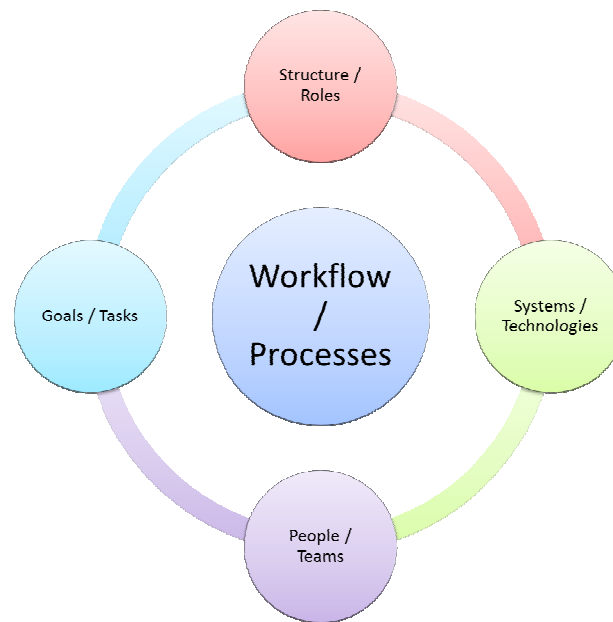
Figure 1: Elements of an Organisational System (Adapted from Leavitt, 1965)

In the context of SOEA, existing literature has revealed the interaction of four components described in Organisational Change Theory. As Knorr (2006) pointed out, introduction of service-oriented technology results in a technology-related change from tightly-coupled applications to loosely coupled solutions; and such change affects the organisation as a whole. The concept of "opportunity-based design" (Eisenstat et al. 2011) necessitates organisational changes is required to fully take advantage of the technical flexibility brought by service-orientation. Such structural change, will ensure further adjustment in working practices and reform social culture (Powell 1987). The appropriateness of using organisation change theory to understand SOEA implementation is further supported by the common application of organisation change theory to the study of other enterprise system such as ERP for predicting the evolution of NTIs (Morton and Hu 2008). Additionally, NTIs by definition should originate from one of the following aspects in implementing organisations: people (including people attributes and the relationships among people), work practices, authority structures, and reward systems, NTIs are related to task, people, and structure-related aspects; and thus any impact on the task, people, and structure-related aspects will further impact on NTIs, resulting in a certain level of evolution of NTIs.

Organisational Impact of the transition from traditional EA to SOEA

It is a pre-requisite for organisations adopting SOEA to implement a Service-Oriented enterprise system as a technical backbone (Erl et al. 2014). This implementation is initially a technical change. As described in Levitt (1965)'s Organisational Change model, this technical impact will then trigger other organisational components to adjust correspondingly, thus triggering other organisational change. Therefore, the introduction of the Service-Oriented technology required by SOEA will require a re-examination of the NTIs that originated from EA, and assessment of how relevant they remain in the context of SOEA. At an abstract level, the technological change introduced by service-oriented technology can be summarised as two points. The first is the introduction of the service concept; the other is the introduction of workflow technologies, such as Business Process Execution Language, that make service orchestration and choreography possible (Dumas and Kohlborn 2015).

Service as a Technical Concept

Service originated as a technical concept in software development. Service is technically defined as a piece of code that can be reused across different platforms, to deliver consistent functionality. Another concept closely related to the *Service* concept is the Interface or Service Contract. The interface provides another layer of abstraction. (Dumas et al. 2006;)

Enterprise Service as Organisational Units

The concept of *Service* has been extended to describe business architecture combining engineering disciplines and computer science to solve practical business problems. In a business sense, service, or enterprise service, refers to a relatively high-level functional unit which delivers business values. The enterprise service, as a functional unit, shares the same attributes as *service* in the software development. The business value is independent from its original context, can be reused in different process, and therefore is reusable and interoperable (Bieberstein et al. 2005; Dumas and Kohlborn 2015). The adoption of Enterprise Service as an organisational unit has implications for business organisation, with impacts on Organisational Structure, Task Practices, and People as Employees.

Introduction of Workflow Technology

Another effect of SOEA adoption is the introduction of workflow technologies such as Business Process Execution Language (BPEL). Workflow technologies allow business processes to be composed by internal or external enterprise services through process orchestration and choreography.

Structural Change

Service Choreography extends the business process outside the organisation's boundaries. It is important to break the business processes into modular independent services that can be reused by other organisations on-the-fly using dynamic service choreography mechanisms. This implies organisations will need to adopt cross-organisational management processes (Rosen et al. 2012). Another implicit organisation structural change introduced by the advance of Workflow Technology is the change from Value Chain to Value Network. As loosely-coupled enterprise services can be dynamically discovered and consumed by other organisations to form their own business process, these service-enabled systems essentially form an ecosystem that collectively co-creates value, and requires closer and more dynamic collaboration between organisations.

Task

As discussed before, the evolution from value chain to value network requires organisations to adopt to manage business processes at cross-organisational levels. This implies working practices need to be coordinated across organisations. In the context of EA, this implicitly means that the Enterprise Events (or triggers) of the business process must be defined in a way that is consistent and results in no ambiguity among the organisations, and they need to pursue mutually agreed values and strategic goals. Communication and coordination to ensure consistency across organisations should be adopted as routine working practices for organisations that adopt SOEA.

People

The cross-organisational coordination effect discussed above and required in the adoption of SOEA requires a new set of roles and responsibilities. Demirkan et al (2008) recommended a new role, responsible for orchestrating business service choreographies with virtual resources, reusable services and components.

We have discussed the NTIs that organisations need to address to ensure the successful adoption of service orientation on organisational structure, people, and working practice. This discussion has led to the development several hypotheses on how NTIs will change in an organisation's SOEA adoption programme. The hypotheses are as follows:

Hypothesis 1: Inter-organisational collaboration as an NTI becomes more critical in an SOEA than it was in the traditional EA environment.

Hypothesis 2: Lack of a role responsible and accountable for the acquisition and management of shared services inter-organisationally, is a critical NTI in SOEA implementation.

Hypothesis 3: Insufficient stakeholder support, including lack of organisation sponsorship and lack of commitment, is less critical as an NTI in the SOEA environment than in a traditional EA environment.

Hypothesis 4: Lack of Adaptive and Cooperate Culture is a Critical NTI in SOEA.

Hypothesis 5: Lack of required skills /knowledge such as service principles when organising business operations is a Critical NTI in SOEA implementation.

Hypothesis 6: Overusing the business flexibility and agility endowed by SOEA is not a critical NTI in SOEA.

The next section will describe the research methodology. Essentially, an exploratory, mixed method, qualitative approach was adopted that comprised of a comprehensive literature review and interviews with a select group of SOA experts. This was followed by a survey of professional in the social media network LinkedIn. The first stage of the research, literature and interviews, was more exploratory in nature and raised issues that were then examined in detail in the survey.

Research Methodology

This research adopted a qualitative paradigm for achieving the research objectives and answering research questions. According to Myers (1997), qualitative research was originally developed in the social sciences to study social and cultural phenomena. It involves the use of qualitative data, such as interviews, participant observation data, and documents, for understanding and explaining social phenomena (Myers 1997).

Furthermore, the research objectives and research questions of this study are related to NTIs, which come from one of these aspects in implementing organisations: people (including people attributes and the relationship among people), work practices, authority structures, and reward systems, which indicate the complexity of research into human behaviour and experience. To deal with such complexity in a more rigorous and valid manner (Nunamaker et al. 1990), mixed method was adopted as the basis of building up the overarching research design framework. This research employed literature reviews on the research questions and solutions, and semi-structured face-to-face interviews. These two interactive research strategies formed the qualitative core on which the initial theory was based. An online survey through LinkedIn was the qualitative supplementary strategy to validate the initial theory, and so inform the final theory of this research. Bearing the research design framework of this research in mind, this research is designed for answering the research questions and building theory.

The core qualitative part of the research (Phase 1 and Phase 2) identified the research questions and generated the seven hypotheses to test those research questions along with a list of predefined codes for data analysis regarding critical NTIs in SOEA implementation.

To refine this list of predefined codes and refined the hypotheses, semi-structured, face-to-face interviews with experts in the field of SOEA implementation where conducted. These experts were asked for opinions on the two research questions. After the formal interviews, Phase 3: Predefined coding schema using the steps proposed by Miles and Huberman (1994) was conducted based on the formal interviews and the hypothesis generated from the literature reviews. During Phase 3, this research was enabled to refine the hypothesis using the interviewees' expert opinions. These refined hypotheses were then transformed into interview questions for conducting Phase 4, an online survey through LinkedIn for theory validation. A larger number and wider scale of SOEA experts, twenty five in number, participate in the validation of the hypothesis, theory, and answers to the research questions. With the data collected from the online survey

through LinkedIn, this research conducted Phase 5 – confirmatory data analysis – to count the frequency of support for each of the refined hypotheses. Based on the frequency of support, this research eventually drew conclusions on the theory built from this research.

Results and Discussion

In the first part of this section the findings relating to the definition of an NTI in the IS field is presented. This is followed by the discussion on the findings relating to the critical NTIs in SOEA implementation.

Definition of an NTI in the IS field

After the online survey, the final phase of the research methodology, the frequency of support for the proposed definition was 70%, which led to the conclusion that: An NTI in the IS field can be defined as meeting the following two criteria. (a) It contributes to at least one of these four architectural failures: the architecture as a whole does not operate as expected and its overall performance is sub-optimal; it does not perform as originally intended on implementation or it is so user-hostile that it is rejected by users and underutilised; the cost of development exceeds any benefits the architecture may bring throughout its useful life or the architecture is abandoned before it is completed. (b) It originates from one of these aspects in implementing organisations: people (including people attributes – the knowledge, skills, attitudes, values, and needs they bring to the work environment – and the relationships among people); work practices; authority structures; or reward systems.

Since there has been no comprehensive, explicit, and congruent understanding of NTIs in IS field in extant literature, the finding contributes to the body of knowledge by developing an empirically grounded definition of NTIs in IS field. This contribution is critical in that NTIs are the major cause of IS failure and are playing an even more important role in SOEA implementation than it used to be in traditional EA implementation. Also, this finding is in align with the initially proposed definition of NTIs based upon STS theory, which further confirms the solid and important status of STS theory in the IS field.

Critical NTIs in SOEA implementation

After the online survey, the frequency of the support for each hypothesis is shown in Table 1 below.

Hypothesis	Frequency of support	Result
H 1	83%	Supported.
H 2	78%	Supported.
H 3	50%	Supported.
H 4	33%	Rejected.
H 5	76%	Supported.
H 6	37%	Rejected.

Table 1. Results of Hypothesis Test

Reflecting on the results of the hypothesis tests we came to the following conclusions.

H 1: Inter-organisational collaboration issues become a more critical NTI in SOEA than in the traditional EA environment.

The finding aligns with the hypothesis. As mentioned, the probable reason for the hypothesis being proven was that the changes in organisational structure, introduced by SOEA, expose isolated business processes within the organisation to enterprise services that are shared across organisations. As a result of this, organisations adopting the service-oriented concept are transforming from a value chain to a value

network, and require constant communication and collaboration across organisations in the value network to ensure their strategy, values, priorities, and work practices are closely aligned.

H 2: The lack of a role, like a role responsible and accountable for the acquisition and management of inter-organisational shared services, is a critical NTI in SOEA implementation.

The finding aligns with the hypothesis. The probable reason the hypothesis was confirmed is, as Demirkan et al (2008) proposed, there needs to be a new role of service conductor, to ensure the effective collaboration and coordination across different organisations to reach a mutually agreed set of values and strategic goals. This proposal highlights the need for roles within service-oriented organisations to manage cross-organisational collaboration. With regard to which role is in lack, there are two probable types of role and three potential roles lacking: an intra-organisational role to align the business and IT; and two inter-organisational roles (a) a business manager working in conjunction with a service manager to cover all systems and/or integration supporting that service, and (b) a role responsible and accountable for the acquisition and management of shared services across organisations.

H 3: Insufficient stakeholder support is a less critical NTI in the SOEA environment than the traditional EA environment.

The finding aligns with the hypothesis. The probable reason the hypothesis was confirmed is that introducing the service concept to an organisation provides a common language that bridges the vocabulary gap between different domain experts. Also 'service' (as a mutually understood concept) becomes the 'pin' that enforces alignment across different architecture domains. Therefore, adopting the service concept makes it easier to communicate with sponsors, and makes it easier to demonstrate the potential value of SOEA. A better demonstration of potential business value also improves organisational sponsorship and manager commitment.

H 4: A lack of an adaptive and cooperative culture is not a critical NTI in SOEA. The finding does not align with the hypothesis. The inconsistency is possibly because culture is naturally led by working practices, skills, aptitudes, and knowledge. In the SOEA environment, working practices, skills, aptitudes, and knowledge are based on a service orientation that is adaptive and cooperative by nature. As such the working practices, etc., are adaptive and cooperative as well, all of which leads to an adaptive and cooperative culture. The data shows that an adaptive and cooperative culture is not a critical NTI in SOEA environment. The hypothesis was based on the postulation that an SOEA gives an organisation the ability to change with ease and speed, The hypothesis might have missed one point, that there is a set of adaptive and flexible working practices, skills, and knowledge an SOEA-implementing organisation is equipped with that might naturally lead a change from a rigid culture to an adaptive and flexible culture.

H 5: A lack of required skills, aptitudes, and knowledge for successful SOEA implementation is not critical. The finding aligns with the hypothesis. A lack of required skills/aptitudes/knowledge such as service principles when business people are organizing business operations for successful SOEA implementation is considered a sub-NTI of uncritical NTI in SOEA.

H 6: Overusing the business flexibility and agility endowed by SOEA is not a critical NTI in SOEA. This finding did not align with the hypothesis. Such inconsistency is probably because even assuming that an organisation could overuse the business flexibility and agility, an SOEA alone is not enough to give the business flexibility and agility. Some survey respondents mentioned that SOEA alone is not the whole picture when it comes to facilitating IT agility and flexibility, which further facilitates business flexibility and agility. Our hypothesis overestimated the power of SOEA, omitting the fact that it still requires other elements (such as other technologies, people, and culture) to facilitate business agility and flexibility.

Conclusion

Motivated by the outstanding advantages of SOEA in helping organisations to achieve what is being demanded by a volatile and globalised business environment, i.e. being adaptive and collaborative within and across organisations, as well as by the potentially critical role of NTIs in SOEA implementation failure, this thesis aimed to contribute to two research gaps in existing IS field: a lack of explicit, comprehensive, and congruent understanding of NTIs in the IS field; and a lack of understanding of the critical NTIs contributing to Service-Oriented Enterprise Architecture (SOEA) implementation failure. The first key finding of this research is a clarified scope of NTIs in the IS field, which has previously been

vague and implicit. This research clarifies the scope based upon sociotechnical system theory and interviews with IS professionals. The scope of NTIs in the IS field is framed by the following aspects: people (including people attributes and the relationships between people), work practices, authority structures, and reward systems.

An integrated model of the subsequent key findings is shown in Figure 1 below.

	Most Critical NTIs in SOEA Implementation	Critical NTIs in SOEA Implementation	Less Critical NTIs in SOEA Implementation	New and Emerging Critical NTIs in SOEA Implementation
People-related		▪ Lack of required skills/aptitudes/knowledge such as service principles when business people are organising business operations for successful SOEA implementation is a critical NTI in SOEA.	▪ Insufficient stakeholder support including lack of organisational sponsorship and lack of commitment is a less critical NTI in SOEA environments than in traditional EA environments	▪ Lack of skills in organisational change management ▪ Lack of aptitudes in understanding, customising, and applying large integrated SOEA frameworks such as TOGAF and ITIL.
Working practices-related	▪ Inter-organisational collaboration issue as a NTI becomes more critical in SOEA than it was in traditional EA environments		▪ Intra-organisational collaboration is a less critical NTI in SOEA environments than in traditional EA environments	
Organisational Structure-related		▪ Lack of specific roles, such as a role responsible and accountable for the acquisition and management of shared inter-organisational services, is a critical NTI in SOEA implementation		▪ Lack of inter-organisational roles in particular business managers working in conjunction with service managers covering all systems/integration supporting that service

Figure 1. An Integrated Model of the Key Findings

As the synergy between service-orientation and enterprise architecture, SOEA represents a whole new domain that awaits academic exploration. This research is among the first to dedicated to the exploration of SOEA, therefore it has limitations and opens up opportunities for future research.

First of all, although the identification of most critical NTIs, critical NTIs, and less critical NTIs in SOEA implementation was supported by adequate data, the new and emerging critical sub-NTIs were not sufficiently supported. In other words, due to the limitation in data, this research is constrained in identifying critical NTIs in a broad sense. It would be of great value for future research to look at critical NTIs in a more detailed sense.

As a preliminary work, this research identified NTIs using qualitative studies by interviewing and surveying practitioners. This approach has two major potential limitations: firstly, the suggested NTIs and their potential impacts will be more valid if they are supported by quantitative data; therefore it would be helpful if further quantitative research can be conducted to support or reject the present findings. Additionally, while this research identified the critical NTIs perceived by practitioners in SOEA implementation, it does not sufficiently address how these NTIs would impact on the SOEA adoption program, and why inappropriate handling of these NTIs will lead to failure. Future studies can adopt research methodologies including Case Study or Action Research to further explore the causal relationship between these NTIs and different outcomes of SOEA.

Last but not least, as discussed in the introduction section of this paper, the definition of EA has three perspectives: system integration; organisation alignment and enterprise transformation. The EA definition adopted in this research paper is primarily focused on the enterprise transformation perspective. It would be interesting to review the impact of adopting service-orientation on the other perspectives.

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