

Requirements Engineering and Business/IT Alignment: Lessons Learned

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Abstract—This paper presents a review on the Business/IT alignment with the goal of exploring how requirements engineering can help model business environment and how business environment can help perform requirements engineering tasks in order to develop a system which meets business expectations. It discusses ten lessons learned from the Business/IT alignment research area in the context of requirements engineering (RE). It is intended to be useful to researchers and graduate students who consider doing research into alignment using requirements engineering approaches, and also to requirements engineers who are interested in deriving system requirements from business environment. Challenges to the value of alignment research, the role of requirements engineering research in alignment, and recommendations for RE researchers in order to highlight future RE research directions in Business/IT alignment domain are also presented.

Index Terms—Requirement engineering (RE) future; Business-IT alignment; Alignment challenges; Business environment; Requirements derivation

I. INTRODUCTION

Today, it is widely accepted that information systems (IS) have penetrated almost all aspects of our life in a huge variety of ways. However, the development of IS is always a complex process due to the lack of information on system and customer needs. Therefore, the success/failure of the system is heavily dependent on how well it fulfills the expectations of its users and how it will fit with the user's environment [6]. In this context, systems requirements is a method that to obtain this information, and RE is a set of activities concerned with the identification of the user, system needs and the contexts in which the system will be used. A successful RE process involves determining the needs of the system including who are the stakeholders; what needs to be included in the system; why the system is needed; and where it is going to be used.

The literature presents several methodologies from different perspectives of the requirement engineering (RE) research area [7] [8] [9] [10] [11]: elicitation, which helps to explore the system belonging to the stakeholders; requirement analysis, which describes whether the collected requirements are complete or not as well as checking the feasibility of the requirements; documentation, which manages the stakeholders' requirements in document format, a very formal process between the system manager and the customer; validation, which helps the system developers and engineers to determine whether the proposed requirements are acceptable or not; and requirements management, which is used to capture the overall system, for example, changes in requirements, and tracing and controlling requirements. In addition, we consider estimation of size and effort of an information system in the early stage of the development as a part of the RE process, and present a communication protocol-based technique to indicate the system resources at the RE level of the software development life cycle (SDLC) [12].

Requirements research over the past several years has delivered numerous methods, techniques and tools, with researchers often conducting their studies in the domain of SDLC in system development companies. Therefore, it is important to expand the domain for RE research. After having undertaken a detailed survey and in-depth research into the Business/IT alignment field in the context of RE [13] [47] [1], we believe that alignment issues can be solved using RE techniques and that furthermore, the quality of systems requirements can also be improved by considering the business environment. Alignment refers to the optimized synchronization between dynamic business objectives/processes and respective technological support by IT. A number of methodologies from different perspectives of RE have appeared: business goal-driven RE for systems; RE for business process modeling; RE for strategic alignment; RE for managing rapid change in business goals; RE for

structural alignment; RE for managing security-related risks in business; RE for improving IT belief within the business organization; and RE for the development of an IT system according to business expectations.

This paper presents a review on the Business/IT alignment with the goal of exploring how requirements engineering can help model business environment and how business environment can help perform requirements engineering in order to develop a system which meets business expectations. It discusses ten lessons learned from the Business/IT alignment research area in the context of RE. It is intended to be useful to researchers and graduate students who consider doing research into alignment using requirements engineering approaches, and also to requirements engineers who are interested in deriving system requirements from business environment. Challenges to the value of alignment research, the role of requirements engineering research in alignment, and recommendations for RE researchers in order to highlight future RE research directions in Business/IT alignment domain are also presented.

II. LESSON 1: CONCEPT OF ALIGNMENT AND REQUIREMENTS ENGINEERING

One of the first things we have learned from Business/IT alignment research is that in order for a company to have strong alignment, there must be a good working relationship between business and information technology (IT). Alignment refers to the optimized synchronization between dynamic business objectives/processes and respective technological support by IT. Successful alignment may result in better business performance for the organization, more effective strategic planning and better IT support for business processes [1]. But, achieving strong alignment has always been a difficult issue for several reasons: a lack of IT belief, structural differences between business and IT, a lack of system support, rapid changes in business goals, strategic differences between business and IT, planning differences between business and IT, security issues, and a lack of methodologies to manage business processes etc. As a result, this issue has been a top concern among business and IT professionals over the last two decades [1].

The concept of alignment is not new, first appearing in the early 1970s. Since then, researchers have tried to link the issue by examining it from different perspectives of the organization such as: structure [2], culture [3], strategy [4], and social aspects [5]. In relation to the organization's structure, scholars considered complex structures, and quick changes in structure. In relation to the organization's culture, they examined the lack of communication, weak relationships and a lack of IT belief within the organization. In relation to the organization's strategic directions, factors such as formal business and formal IT strategy were considered in terms of alignment. In relation to the social aspects of the organization, factors such as a lack of shared domain knowledge, a lack of IT knowledge in the business department and a lack of business knowledge in the IT department were considered.

The literature shows that alignment has been studied from various levels, each level demonstrating a specific part of the enterprise, for instance, the internal and external level of alignment between business and IT, the department level of alignment, the project level of alignment, etc. In the external level, the enterprise is aligned with the business partner or with other similar enterprises such as enterprise clients, enterprise dealers and enterprise challengers. In the internal level of business/IT alignment, all enterprise departments such as marketing, finance, human resource management, administration, technology etc, are aligned with each other. This type of alignment is known as organizational level alignment, departmental level alignment, top business management alignment and operational level alignment, project level alignment and technology level alignment.

III. LESSON 2: REQUIREMENTS ENGINEERING AND ORGANIZATIONAL GOALS

Research into Business/IT alignment has shown that rapid changes in business goals negatively affect the process of alignment between business and IT due to the fact that businesses require less time to move to another goal but IT requires more time to support the new goal. A goal is an organizational action or a set of actions that need to be achieved and can be defined into various concepts [14]: goal as maintenance refers to those organizational goals that are usually high level and must be complied with. These kinds of goals generally map to the non-functional system requirements; goal as achievement represents the objectives of an enterprise or system; goal as belief describes design rationale and enables firms to consider domain characteristics that reflect the decision-making process in the firm or system development phase; goal as soft refers to soft goals where there are no straightforward criteria for whether the condition is fulfilled; and finally goal as constraint places a condition on the achievement of a goal.

There are two viewpoints on the concept of business goals in relation to system RE in Business/IT alignment research: 1) methodologies (I*, Goal-based Workflow, GOMS, RE approach to improving Business/IT alignment, EKD) are developed to derive system requirements from business goals; and 2) methodologies are developed to model business goals using RE. In relation to the former, the I* framework is based on a business goal concept that allows IT analysts to observe the requirements at an early stage of system development. The I* authors found that organizational actors have their own goals and beliefs, where each actor is connected to one another [16]. The Goal-based Workflow and GOMS approaches suggest a business goal-based infrastructure for system requirements elicitation in regard to clarifying the systems requirements and to understanding the current organizational circumstances [17] [18]. More recently, Ullah and Lai (2011a) proposed business goal modeling using an RE approach. The aim of the approach is to help IT developers better understand business goals and their expectations of the required IT system. They

recommend four attributes of requirements elicitation in regard to understanding business goals: who - defines stakeholders or goal agents; where - describes the location of the goal to be used; when - outlines the time frame by which stakeholders need the goal; why - describes what needs to be included in the goal and the reasons stakeholders need the goal to be implemented [1].

It is widely accepted that understanding business goals is a complex process due to rapid changes in the business environment, changes in market conditions etc. Organizational goal modeling is one way to gain an in-depth understanding of business goals, as one organizational goal may contain more than one sub-goal or goal task and every sub-goal or task is linked to the other, hence, this will help in the prioritization of business goals. The term prioritization refers to the allocation of a position of importance for each business goal, for example, identifying goals which are currently of less importance than other goals; and eliminating business goals which are no longer appropriate to the enterprise. Enterprise Knowledge Development (EKD) is the language used in the RE analysis phase to model business goals, for example, what needs to be included in the proposed goal and how to link goals within the business environment. The technique is composed of several sub-models such as: business role model, process model, goal model, actor's model, resource model etc [15].

Furthermore, according to some methodologies, goals can achieve and support the following: 1) goals support the selection of the right criterion to ensure the completeness of system requirements specifications [19]; 2) having clear goals ensures that irrelevant requirements during the analysis phase are avoided [19]; 3) goals can help to trace the requirements by linking high level concerns with low level technical concerns [20]; 4) goal refinement helps to document the system RE process [20]; 5) during the requirements elaboration process, as software engineers become concerned about various alternatives that need to be considered, goal refinement can help to identify all alternatives proposed and pinpoint the best alternative [20]; 6) business goals can help to explore the root cause of conflict between the system requirements and help to resolve them [21]; 7) goals help to manage the evolution of the requirements by separating stable information from volatile information [22]; and 8) goals are the fundamental driving force to recognize the system requirements [20].

IV. LESSON 3: REQUIREMENTS ENGINEERING AND BUSINESS/IT STRATEGIES

The term business strategy refers to the direction and scope of an organisation by which the business organisation achieves a benefit through the allocation of its resources in a rapidly changing business environment in order to meet both the needs of the market and the stakeholder's expectations. The concept of business strategy varies within organizations levels: business corporate strategy refers to the overall purpose and scope (goals/objectives) of the business in order to fulfil stakeholder expectations; unit strategy refers to how a business organization competes in a particular business environment; and operational strategy is concerned with how each unit of the organization is structured to address the company's goals and objectives. Moreover, rapid changes in the business environment force organizations to change their business strategy. For example, in the late 60s, the business organizational strategy was to manufacture quantity product; in the 70s the organizational strategy was to produce products for a low cost; in the 80s the goal was to produce quality products; in the 90s, the organizational strategy was to produce products in less time; and in the 21st century, the strategy has changed towards offering extra services [13].

Successfully linking business and IT strategies depends on the degree to which the IT objectives, mission, and plans are supported by the business organizational objectives, mission, and plans. Business/IT alignment research has demonstrated that the issue of strategic differences between business and IT can be resolved using RE techniques. Bleistein et al. (2005) and Bleistein et al. (2006) present an RE-based model called B-SCP that enables the verification and validation of requirements in terms of Business/IT alignment and support for business strategy. The model incorporates the business strategy and low level business goals in the context of RE and links high level business strategy with low level business strategy. The work was successfully validated by the Seven Eleven Japan (SEJ) case study and its results indicate the following contributions to strategic Business/IT alignment and to RE for e-businesses: 1) it analyzes and decomposes business and IT strategies; 2) it identifies the system requirements; and 3) it verifies and validates the system requirements in order to effectively achieve strategic goals [23] [24]. Veres et al. (2009) identify that one problem with the B-SCP model is that it is very difficult to trace the dependency among requirements from the perspective of complex organizational projects. They extend the B-SCP model by describing an ontology data structure in order to represent the system requirements and to establish the link between business and IT strategies [25].

TABLE 1:
MATRIX SUMMARIZING THE RESEARCH INTO RE IN BUSINESS-IT ALIGNMENT

Authors	Business-IT alignment Issue								
	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6	Lesson 7	Lesson 8	Lesson 9
Hermann and Weiß 2008 [30]	×	×	√	√	×	×	×	×	×
Lehtola et al. 2004 [31]	×	×	×	×	×	√	×	×	×
Kappel 2001 [32]	×	×	×	×	×	√	×	×	×
Mayer et al. 2007[33]	×	×	×	×	×	×	√	×	×
Ullah and Lai 2011b [47]	×	×	×	×	×	×	√	×	×
Luis et al. 2007 [29]	×	×	×	√	×	×	×	×	×
Ullah and Lai 2010 [13]	×	×	√	×	×	×	×	×	×
Cardoso et al. 2009[28]	×	×	√	×	×	×	×	×	×
Tomoyuki et al. 2005 [27]	×	×	√	×	×	×	×	×	×
Didar and Zhi 2010 [26]	×	√	×	×	×	×	×	×	×
Veres et al. 2009 [25]	×	√	×	×	×	×	×	×	×
Bleistein et al. 2006 [24]	×	√	×	×	×	×	×	×	×
Nuseibeh and Kramer 1994 [22]	√	×	×	×	×	×	×	×	×
Bleistein et al. 2005 [23]	×	√	×	×	×	×	×	×	×
Yu 1993 [20]	√	×	×	×	×	×	×	×	×
Ullah A and Lai R 2011a [1]	√	×	×	×	√	√	×	×	×
Gordijn et al. 2006 [16]	√	×	×	×	×	×	×	×	×
Card and Moran1983 [17]	√	×	×	×	×	×	×	×	×
Ellis and Wainer 1994 [18]	√	×	×	×	×	×	×	×	×
Yue 1987 [19]	√	×	×	×	×	×	×	×	×
Bleistein 2006 [24]	√	×	×	×	×	×	×	×	×
Anton et al. 1994 [22]	√	×	×	×	×	×	×	×	×

In light of the increasing dependence of business organizations on IT services, there is a need for both business (strategy maker) and developers (service provider) to focus on the creation of co-values between business and their clients. To do this, IT analysts need to conduct system RE in a systematic way in order to perform requirements identification, elicitation, and analysis so that the resulting IT services can support the business strategy. Didar and Zhi, 2010, developed a framework for identifying system requirements in the context of aligning IT strategy with business. The framework supports the systematic identification of system requirements which include the elicitation and analysis of system services that need to be developed in order to satisfy business needs. This framework supports strategic alignment between business and IT [26].

V. LESSON 4: REQUIREMENTS ENGINEERING AND THE BUSINESS PROCESS

The business process is a series of business activities within an organization that leads to a specific business output. A business process identifies the needs of the consumers and provides a service that fulfils the consumer needs. Overall, the business process is essentially a set of interconnected processes that function in a rational flow to ensure the ultimate business goals and objectives are met. Processes in a business organization are the stable central component and need to be well organized and linked optimally with the organization's strategy and other relevant business activities. However, establishing business processes in the research area of alignment between business and information technology is a difficult task [1].

Another lesson learnt from the Business/IT alignment research area is that business processes assist IT analysts in the derivation of systems requirements. Tomoyuki et al. (2005) present a business process-oriented RE model to understand the relationship between business processes and software systems. The model defines three phases of RE: system RE elicitation and business process

verification, where they define the purpose of the business process; system RE elicitation and verification of detailed business processes, where they manage the process-driven system RE using a scenario-based approach; and RE elicitation and system specification, where they specify the system requirements with the customer. Obtaining system requirements at an early stage in the SDLC is crucial [27]. Cardoso et al. (2009) proposed a business process-based model for RE and found that modeling business processes is a conventional practice in the RE field which facilitates problem comprehension, helps customers understand their own business process, and reveals how the system will meet the needs of the process [28].

Recently, Ullah and Lai (2010) presented a business-process-driven RE approach for IT to better understand system requirements, as requirements are automatically generated from business processes and to provide assistance in obtaining the systems requirements quickly. Several components were used in the development of the methodology: 1) Business Process Management Notation was used to set up the link between business and IT infrastructure; 2) UML sequence diagrams were used to determine errors or conflicts between requirements; and 3) automatically-generated UML state diagrams were used in order to represent a true picture of business processes and to describe exactly what the system had to do and how it should do it. A process of order management in an automobile company was used as a case study to validate the approach and to guarantee the development of an IT system that effectively meets the needs of the business, positively influences the process of Business/IT alignment, as well as positively influencing the method of business process management [13].

VI. LESSON 5: REQUIREMENTS ENGINEERING AND SYSTEM SUPPORT

Without the successful development of IS, business organizations cannot achieve their goals and objectives effectively. The development of successful IS means the systems have to be designed/implemented in a way to support business organizational needs or the system should be well fitted to the needs of its users and its environment [29]. However, developing an IS in the context of Business/IT alignment has long been a complex task, as it requires the business organizational environment to be taken into account so that the system completely meets the needs of business.

Another lesson learned from IT/ Business research is that a well managed system RE process helps to develop a system which is preferred by the business. Luis et al. (2007) proposed a system requirements elicitation approach to improve Business/IT alignment, believing that RE is the bridge between enterprise and system domains. The following components were used in their approach: business process management notation (BPMN) to link the business and IT environments; a goal tree derived from the business environment is used to represent the system impact; and a use case model derived from the goal tree is used to depict the systems

requirements. System specification means software that is developed for the enterprise must meet the enterprise goals and objectives [29]. The SIKOSA methodology defines a method of system requirements derivation from the business environment. It enables IT developers to develop a software system where every artefact is aligned with the business needs [30].

VII. LESSON 6: REQUIREMENTS ENGINEERING AND IT BELIEF

Evidence indicates that past failures in IS reduce the organization's faith in the IT department and the confidence that line managers have in the ability of the IT department [41]. The failure of IS also presents a risk to the working relationships of business executives and chief information officers by lowering cooperation, belief and support from the organization's management [42]. IS failures result in a lack of belief in IT which is the reason organizations reduce the budget allocation for IT, however, for successful Business/IT alignment, IT needs to be considered as an organizational resource or asset [43] [44]. On the other hand, many organizations can point to a successful IT history which increases the trust of business executives, resulting in an increased budget for IT.

Research into Business/IT alignment revealed that the development of an IT system which is in line with business expectations and maintains IT belief within the business organization requires a suitable system RE process, where a minimum of four general RE tasks must be executed prior to developing the system: requirements elicitation, requirements negotiation, requirements specification, and requirements validation. Requirements elicitation is used to define what needs to be included in the system; why a business needs a system; who the system stakeholders are; and how to implement the proposed system. This phase helps IT developers to better understand the organizational needs that the system under consideration aims to develop. A requirements negotiation helps to identify business needs and links an agreement between business and IT as to the system requirements. Requirements specification describes the behavior of the system that needs to be developed, and depicts the context of the business organization which uses the system. Finally, requirements validation guarantees that the final version of the system requirements meets both the stakeholders' needs and the internal and external constraints set by the business organization [1].

VIII. LESSON 7: REQUIREMENTS ENGINEERING AND LONG TERM IT FOCUS

Alignment research indicates companies today are moving quickly towards IT-oriented solutions within their businesses, especially the use of IT in business decision making. The literature shows that maintaining long term planning between business and IT is a critical issue for Business/IT alignment [45] [46].

Another lesson learned from the Business/IT alignment field is that companies today are moving quickly towards IT-oriented solutions within their businesses, especially the use of IT in business decision making. The literature shows that maintaining long term planning between business and IT is a critical issue for Business/IT alignment [45] [46]. In most business organizations, planning is only divided into top-down and bottom-up processes, for example, on the business side, planning is sub-divided into different departments such as Human Resource Management (HRM), finance department, marketing department, IT department etc., and on the IT side, the structure is divided into hardware and software, to establish a link between business and IT. Therefore, it is necessary for IT service providers to have a long term IT plan with business.

One way of achieving long term IT planning is to map system requirements with business planning. Decision making in systems RE (e.g. prioritization) must be coupled with company decisions. Lehtola et al. (2004) and Kappel (2001) define the principle of systems RE and make the following two recommendations: to add business value in the RE process; and the person who manages the RE process must take part in business decision making [31] [32]. Moreover, we found in our business goal modeling technique that the implementation of an IT system, according to business expectations, not only needs an understanding of business requirements or the completion of common RE tasks, business decisions must also be taken into account before commencing the implementation phase of the system [47].

IX. LESSON 8: REQUIREMENTS ENGINEERING AND SECURITY RELATED RISKS

Over the past few years, managing and measuring security-related issues, both in public and private organizations, has been a challenging task. Several components of a business need to be assessed in terms of security management, such as business and IT resources, security policies and processes, and risk analysis procedures. Business resources refer to anything and everything that has economic value to the organization and that helps an organization operate its business; and IT resources are part of the organizational resources and support business resources within the organization. Security policies and procedures used to define security-related issues within an organization relate to: data confidentiality, safety, reliability, system failure, human error, etc. Risk analysis procedures focus on the evaluation of risks in security-related tools within the organization so that their effectiveness against possible threats to the business can be determined [47].

Information technology security within the business organization is becoming more focused around risk management. Mayer et al. (2007) proposed an RE approach to tackle the issue of alignment, together with the explanation of underlying security-related risk management ontology, where the main objective of the approach is to provide an accurate solution to security-related issues, with respect to the organizational resources

that need to be protected. There are several other commercial methods such as the Operationally Critical Threat, Asset, and Vulnerability Evaluation (OCTAVE) method, the qualitative risk analysis and management method (CRAMM), and the ITBPM method for IT security management which are available for managing security in an organization and identifying security issues as well as providing a solution that is the most suitable [47] [33].

X. LESSON 9: REQUIREMENTS ENGINEERING AND ORGANIZATIONAL STRUCTURE

An organizational structure refers to how authority and responsibility is distributed across organizational boundaries. Business managers in the organization make judgments about how to structure sub-units and the degree to which authority within the business will be decentralized. In order to design an organizational structure, senior business managers normally assemble sub-units, either geographically or by similar business missions or goals into one group. Grouping business processes enhances cost management by placing similar business units under a single management group. The literature presents four basic types of business structures: 1) sole proprietorship which is the easiest and simplest form of business structure representing business organizations which are owned by one person or a small team; 2) partnership which is similar to a sole proprietorship, with the difference being that this type of business structure is run by more than one group; 3) a limited liability company which is a legal type of organization which offers limited liability to its stakeholders; and 4) a corporation which is the most complicated form of organizational structure which must comply with the rules set by the state in which they are registered [35].

A lesson learnt from Business/IT alignment research is that managing and defining an enterprise structure is a complex task due to non-alignment between business and IT structures within the organization, which may result in the business performing poorly. Several structural alignment methodologies have appeared in the literature where scholars address three major issues: 1) rapid changes in business structure - businesses often make changes within the organization in order to expand their business boundaries and to boost performance as the business structure is the first thing that needs to change when a business grows; 2) the business structure is complex - IT is more flexible in a smaller organizational business structure; and 3) the lack of IT support - the business structure needs to be decentralized to align with the organization's units and the organization's projects.

To date, there is no published work on structural alignment between business and IT in the context of RE. However, after having undertaken a detailed survey in the RE research area, we believe that the above mentioned structural alignment problems can be easily fixed by using different RE phases such as: requirements elicitation and structural modeling in the context of identifying business stakeholders (Sharp et al., 1999),

business objects modeling [34], and business process modeling [13] etc.

XI. LESSON 10: REQUIREMENTS ENGINEERING AND ENTERPRISE CULTURE

A strong business organizational culture is required in order to build a suitable working relationship between the business and IT staff/functions and attain successful alignment between business and IT [40]. Successful cultural relationships between senior management may achieve alignment [3]. However, another lesson learned from the research into Business/IT alignment is that business organizations are frequently becoming more advanced and complex than in the past, which affects the cultural relationship between business and IT in an organization. As a result, the process of alignment suffers.

The notion of business organizational culture became accepted in the early 1980s. Three main fundamentals: shared business values, beliefs/trust; and behavioral norms, are necessary to maintain a well defined organizational culture. Moreover, it is widely accepted that organizations with strong cultural relationships can attain superior business performance. An organization is comprised of people from diverse cultural backgrounds, with differing goals/objectives and emotional drives, which might affect the business performance; therefore, it is important for business organizations to have well defined top level strategy that aligns all these individuals in such a way as to successfully attain organizational goals and objectives [36] [37] [38]. However, so far, after having conducted a detailed survey on alignment between business and IT research, to our knowledge, there is no published work on cultural difference alignment between business and IT in the context of RE.

XII. CONCLUSION AND FUTURE RESEARCH

In this paper, we have described literature in the Business/IT alignment research area in the context of RE, addressing questions such as: what we have learned?; can RE approaches be applied to another domain in another sector rather than the software development domain in IT companies?; how can system requirements be derived from business components?; what challenges has Business/IT alignment research faced?; and who are the contributors to the debate? A total of ten lessons learned from Business/IT alignment research have been presented in order to address these questions. The description of each lesson presents a specific issue of alignment and the way RE researchers have solved the issue. However, table 1 shows that eight alignment issues have been discussed by the RE community but so far, no solution has been found on the issue of “enterprise structure” and “cultural difference” in the Business/IT alignment domain.

Implications: Two main contributions can be derived from this paper for requirements engineers, alignment communities and business organizations. First, for engineers and alignment communities interested in Business/IT alignment in the context of the RE research

area, this paper describes how RE can help solve alignment issues and how the business environment can help to obtain system requirements in order to develop a system which meets business expectations and will be useful to them. Second, alignment has long been a crucial issue for business and IT executives, an area in which researchers have been working for many years. However, this problem still exists due to the lack of IT-driven alignment methodologies. This paper illustrates how executives can measure and maintain the process of alignment issue by issue rather than fixing all the alignment issues of the organization at the same time. This paper presents nine factors (business goal complexity, strategic differences between business and IT, BPM, lack of IS support, lack of IT belief, lack of IT planning, risk management, structural and cultural differences) that can be aligned by considering RE approaches.

Recommendations for future research directions: It is hoped that this paper will spark robust discussion on the merits of continued investigation of RE techniques in the Business/IT alignment domain. After having conducted a detailed survey on the topic, we have highlighted fourteen recommendations in regard to future RE research directions in the context of Business/IT alignment on which the RE and alignment communities can commence work.

- Business organizations are continually facing rapid changes in the business environment, particularly in relation to changes in consumer services, technologies and product lifecycles. In this time of rapid innovation and strong market competition, it is important for IT to develop a system which meets business expectations in a short period of time, which could be possible if the RE community is able to automate the RE process and save time in the SDLC.
- The business environment which incorporates business goals, objectives, strategies, processes, culture, etc can play a pivotal role in obtaining business information system requirements. Therefore, the RE community must model the business goals and processes before the derivation of the system requirements from the business environment.
- Alignment refers to the optimized synchronization between dynamic business objectives and respective technological support by IT. Successful alignment can increase organizational performance and enhance an organization's reputation in the marketplace; however achieving strong alignment is a complex task, and researchers from the early 1970s to today have proposed countless business-driven alignment methodologies. These methodologies are ad hoc, given the level of dissatisfaction in organizations regarding their respective IT departments. Consequently, the alignment issue needs to be studied from an IT perspective. As described

above, the RE community has a very good chance of success in investigating how RE can contribute to Business/IT alignment.

- Researchers have often studied the issues of alignment in terms of using several aspects of RE such as requirements elicitation, requirements modelling, and requirements identification. There is now an opportunity for the RE community to study other aspects of RE such as requirements documentation, validation, analysis, negotiation, requirements evolution etc in the Business/IT alignment domain.
- Researchers should work closely with business analysts in order to sustain long term IT system planning against business planning. In the Business/IT alignment domain, business can quickly move towards new goals and objectives, so it is exigent for IT to provide services to business in a rapidly changing environment.
- Today, RE research has delivered countless RE methods, techniques, methodologies and tools with researchers, often conducting their studies in the domain of SDLC in system development companies. Therefore, it is essential to expand the domain for RE research. In this paper, we have introduced the Business/IT alignment research area as a future domain for RE research.
- The existing alignment methodologies relate to a specific type of organization, however, methodologies which have been developed to align small organizations are not suitable for medium- and large-sized organizations and vice versa. RE and alignment researchers should consider which methodology is appropriate to their sized organization.
- The business environment changes rapidly, which also requires changes in business goals. If business goals are changed, the alignment process needs to be re-aligned. To date, not much research has been published on how to conduct re-alignment, where RE and alignment researchers can take immediate action.
- Security is an essential element of the business organization and often security-related issues negatively affect the process of Business/IT alignment. However, to date, not much research has been published on how to organize security issues or how to defend an organization in the alignment research area. RE researchers must take immediate action on this issue, as the number of organizations moving towards e-business is increasing every day and security is an important aspect of e-business.
- Business processes are a main component of an organization, therefore it is important to explore business processes in detail. However, it is a complex task to investigate business processes in the context of alignment between business and technology.

- It is undeniable that business organizations are heavily dependent on technological services to progress their business capability in almost all areas of the organization and to do this, they spend a large amount of the organization's budget on technology management. This huge investment in technological services indicates that senior management is more aware of information systems and they are making efforts to merge IT department planning with organizational planning. However, establishing a link between IT and business planning is difficult.
- Measurement is an important part of alignment; if alignment can be measured, it is more effective in achieving business goals and objectives, and can be of greater assistance to business executives and IT managers in identifying the reasons for non-alignment. After a detailed analysis of the alignment literature, we believe that both minor and major modifications are needed to existing alignment measurement methodologies.
- For better alignment, there is a need to manage IT resources and investments carefully so that IT will not be considered a burden on the organizational budget.

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