A GOAL-BASED REQUIREMENTS GATHERING APPROACH TO DETECT AND UNDERSTAND BUSINESS-IT MISALIGNMENTS

by

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Abstract

The alignment of business strategies with Information Technology (IT) is optimal when harmony exists between organizational and system goals. Empirical evidence reveals that effective strategic alignment leads to superior financial performance for organizations. This observation has spurred extensive research into business-IT alignment, and the issue of alignment remains a top concern for CIOs. In this thesis, we argue that the parochial view taken by past research into business-IT alignment is a probable cause for continuing system failures. Subscribing to a multi-disciplinary perspective, we present a method for detecting misalignments between business strategies and IT. Our investigation divides into three essays.

In Essay 1, we develop a goal-based framework that incorporates goal concepts from multiple disciplines to investigate business-IT alignment. When applied to a case study, the framework revealed several insights to assist systems analysts in understanding the links between goals at the operational level and goals at the strategic level of an organization. One of the novelties of the framework is the explicit distinction between goals assigned to users versus goals interpreted by users.

In Essay 2, we explore whether there exist salient factors that influence users when they describe goals to systems analysts. In a laboratory study, we found that motivation and experience of users and the complexity of describing tasks do influence the extent to which users describe their assigned goals to systems analysts. In this research, we also discovered that the complexity of describing goals is highest at the middle management level as opposed to the executive level.

In Essay 3, we propose a systematic mapping methodology to complement the framework proposed in Essay 1. The methodology when applied to a case study highlights several insights for the effective alignment of operational level goals with strategic level goals. One of the contributions of the methodology is its capability to explain, in the context of business-IT alignment why some operational level goals do not show direct contributions to strategic level goals.

Collectively, the findings of the three essays enrich our understanding of the use of goal concepts to detect business-IT misalignments.
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To my family
Co-authorship Statement

Professor Carson Woo was very instrumental in helping me to identify the research themes for the three essays. He assisted me in structuring the design of the framework in Chapter 2, the empirical model in Chapter 3 and the methodology in Chapter 4. In Chapter 3, Professor Andrew Burton-Jones helped me to design the empirical study, in particular by offering suggestions to improve the quality of the tests in both the pilot and main studies.
CHAPTER 1

THESIS INTRODUCTION

1.1 Background

Although technological systems are celebrated for their capacity to realize competitive benefits for organizations, their colossal failure rates have deterred prospective firm investments. As documented in a landmark study conducted by the Standish Group (1994), of the 175,000 software projects undertaken within the United States for that year, 31 percent failed, costing the American economy upwards of USD $59 billion in incurred losses. To contextualize this figure the following examples identify the failure rates of Information Technology (IT) systems and the losses thus incurred: the $65 million Bank of America back office system; $145 million United Airlines reservation system; $400 million California SACSS system; $650 million United Education and Software project; $1 billion U.S. Army Sgt. York system; $1.2 billion B1B bomber software; and $2.2 billion British Nimrod software (Roetzheim 2004). Since then, follow-up studies conducted by the Standish Group (Rubinstein 2007) have revealed little progress towards improving the success rate of system development.

Within extant literature, causes for software project failures are plentiful and encompass a wide spectrum from the inadequate elicitation of business requirements to poor system implementation. While there is no silver bullet for resolving software project failures (Brookes F. 1975), there is growing recognition that proper business-IT alignment is pivotal to the success of system development (Luftman et al. 2006); for example, it increases performance within the organization (Chan and Reich 2007) by ‘keeping the lights on’ (ensuring that the machines are running and their response times are acceptable), delivering applications that business users request on time and to specifications, and by creating competitive advantages (e.g., identifying opportunities to expand business and beat the competition) (Porter and Millar 1980).

The importance of aligning technology with business is best summarized in the following remark by Pete Delisi, president of Organizational Synergies: “for many years, Information Technology (IT) alignment has been the No. 1 issue on IT executives’ minds. However, despite the focus and attention we’ve paid to this idea, we’re no closer to IT alignment today than we were 20 years
ago” (DeLisi 2005). While business-IT strategic alignment has been the subject of much research, it is still considered a failure by business managers and IT practitioners (Ciborra 1997), and a major practical challenge in the industry (Chan 2002).

Aligning strategic business goals with information systems goals is one of the many possible approaches to investigate business-IT alignment. Over the last decade, requirements engineers found that the goals of information system (defined as the ‘whys’) tend to provide additional and meaningful context to systems analysts when they try to understand the contribution of technology to an organization’s success. In the traditional format, systems analysts used requirements (defined as the functionalities or ‘whats’) only to design and implement an information system. Goals are defined at different levels and notably are able to handle scalability by abstraction and to integrate different organizational perspectives (Salinesi and Thevenet 2007).

Scholars in the Requirements Engineering (RE) discipline have proposed several goal-based frameworks to model and evaluate alignment between IT and business strategies. However, the business strategy components in many of these frameworks are modeled only in terms of strategic goals. Very few of the frameworks capture collectively the people and the context in which business strategies are designed, implemented and executed. To appreciate alignment between information systems and business strategies, it is necessary to explicitly understand the context associated to the business strategies. Failing to understand this context may sometimes result in incorrect translations of the requirements and goals, which are then inputted into the information system. Incorrect translation, and therefore execution, of the business strategies is sometimes attributed to the multiple ways in which goals and requirements are interpreted and expressed within an organization. To support this statement, a stream of research has revealed that goals and requirements that are assigned to users implicitly or explicitly are not always interpreted correctly. The variation in interpretations is attributed to several factors, including a lack of understanding of the goals, differences in stakeholder’s ability and their past success, and complexity of the task (Vancouver and Austin 1996). There are also social, cultural and political reasons to explain why users interpretations of goals maybe different from the assigned goals (for example, employees feeling that managers are exploiting them, or employees deliberately shirking their work). We do believe that these factors are important and should be considered in
such an investigation, however, it is beyond the scope of this thesis to include social, cultural and political factors. Future research could address some of these aspects using agency theory (Jensen and Meckling 1976).

The research presented in this thesis seeks to address alignment between early system requirements and business strategies. In particular, our central theme is to investigate whether the requirements and goals that users of the intended IT system describe to systems analysts are aligned with the requirements and goals that were assigned to them by their executives and managers. The broader scope of the investigation is to understand whether a better representation of the strategic domain in an RE framework will increase contextual understanding of alignment between the information systems and business strategies. Better representation is defined as ‘the inclusion of constructs and relationships that better represent the strategy domain.’ To perform this research, we will be drawing on goal concepts from multiple disciplines, in particular strategic management, RE and personnel psychology.

1.2 Research Questions
To conduct this research systematically, the thesis aims to address the broad research question:

“How can a better understanding of goals assist systems analysts to detect misalignments between information systems and business strategies?”

The key set of words in the research question are ‘assist systems analysts,’ ‘misalignments,’ and ‘goal concepts.’ The solution to the research question should include an approach using goal concepts to detect misalignments, and provide tools to help systems analysts to be aware of and understand misalignments. The method of detecting misalignments can be decomposed into a framework and a methodology. The framework will highlight key constructs and relationships which are necessary to evaluate alignment, while the methodology will describe the process for detecting misalignments.

The solution to our research question shapes our research into three essays. Essay 1 proposes the framework, Essay 2 presents insights that will assist systems analysts to be aware of and understand misalignments, and Essay 3 presents a methodology for detecting misalignments. The insights to which we refer in this thesis focus on the context of business practices at different
levels within an organization and on the characteristics influencing users who describe the goals and requirements aligned with these business practices to systems analysts. While these insights are necessary, they may not be sufficient for understanding misalignments. Nonetheless, these insights are new and will arguably incrementally contribute towards improving alignment between information systems and business strategies.

To contextualize the research for the three essays we present three research questions, of which one will be investigating in each essay. The three questions are:

**Research Question in Essay 1 (Chapter 2):**

Would a framework that describes how goals at the operational level align with goals at the strategic level of an organization help systems analysts to understand the links between goals at the operational level and goals at the strategic level?

**Research Question in Essay 2 (Chapter 3):**

Do users’ motivation and experience, and the complexity of their tasks influence the degree of alignment between the requirements and work goals that users describe to systems analysts and the requirements and work goals the organization has assigned to them?

**Research Question in Essay 3 (Chapter 4):**

Can we develop a methodology to guide systems analysts in using goals to map and align IT with business strategies?

The novelty of the approach taken in this thesis resides in making the explicit distinction between goals assigned to users by managers and executives (assigned goals) and goals interpreted by users (interpreted goals). To the best of our knowledge, none of the frameworks or methodologies proposed in the RE or Management Information Systems (MIS) disciplines make this explicit distinction. Through the use of theoretical underpinnings in literature outside of RE discipline, we will show in all three essays the importance and relevance of this explicit distinction to understanding business-IT alignment.
1.3 Overview of Thesis

The three essays mentioned above are considered building blocks towards answering the broader research question, and they share elements with each other. Figure 1.1 shows an overview of the three main essays (which constitute the research presented in this thesis). In the figure, each chapter is divided into three sections: input, process, and output. ‘Input’ summarizes the principal constructs resulting from the theories that assist in formulating the research question. ‘Process’ describes the approach used to evaluate the research question. ‘Output’ explains the outcome of the process. The circles denote relationships between chapters.

![Diagram](image)

**Figure 1.1: Overview of the Thesis and Relationships among Chapters**
The input of Chapter 2 (Essay 1) in Figure 1.1 is defined as organizational constructs. The constructs at the input level relate to and contribute towards the different types of goals we are investigating in this thesis. These constructs are found at various levels of the organization, for example at the strategic level and operational level. The process level describes the method for integrating the set of constructs into a unified framework. Several techniques from the practitioner and research domains were utilized to determine how the constructs should be integrated and related to each other. A conceptual modelling approach was proposed as a means to unify the constructs and relationships. The difference between this framework and existing frameworks in the RE discipline resides in the inclusion of additional strategic-level constructs to contextualize the strategic domain. Guidelines for operationalizing the framework are also presented as the output.

The input of Chapter 3 (Essay 2) in Figure 1.1 consists of task performance constructs. These constructs are selected mainly from disciplines which describe research on task performance models. In particular, we selected the constructs of motivation, experience and complexity. These constructs were found to be the most common ones in the literature we researched, and are believed to be the most relevant ones to provide insight into misalignments between interpreted and assigned goals. The process level describes the research model and the hypotheses which were derived based on input and supporting theory. Insight for improving the elicitation of requirements, and goals that are aligned to the business strategies, are presented as the output.

The input in Chapter 4 (Essay 3) in Figure 1.1 is the set of organizational goals which are represented in the framework that was derived in Chapter 2 (Essay 1). These goals are used to evaluate misalignments between the information system and the business strategies. Misalignments will be evaluated first between assigned and interpreted goals at the operational level of the organization, and then between the operational and strategic level. At the process level, algorithms were proposed for developing three goal graphs to model the goal constructs at different levels of the organization. At the output level, semi-formal guidelines anchored in these graphs were proposed for systematically evaluating alignment and detecting areas of misalignment between goals representing the information system and strategic business goals.
The output of Chapter 3 as illustrated in Figure 1.1 contributes to the framework which is one of the outputs of Chapter 2. The insights derived from Chapter 3 will assist systems analysts operationalizing the framework in Chapter 2, in particular in eliciting goals and requirements which are more likely to be aligned with the assigned goals and requirements. For example, the insights will reveal whether motivated and experienced users will provide better descriptions of goals and requirements than unmotivated and inexperienced users. Based on these insights, systems analysts will then target the users who are more likely to describe an aligned set of requirements and goals.

The relationship between Chapter 2 and Chapter 4 explains how the framework and the mapping methodology complement each other. The framework Chapter 2 presents the constructs and relationships necessary for a business-IT alignment framework. In that chapter, a high-level unstructured method was presented for evaluating alignment between the different goals. The systematic mapping approach presented in Chapter 4 improves the method prescribed in Chapter 2 for evaluating business-IT alignment and detecting areas of misalignment.

The combination of the three chapters is interrelated with the primary objective, of assisting systems analysts in understanding and identifying accurate links between the activities that a user performs at the operational level, and the strategic goals of the organization.

1.4 Approach for Validating Thesis

Research is defined as an accepted investigation to find answers to a problem. Deciding on the appropriate research methodology is an essential part in defining the steps which must be taken to complete of the research (Leedy 2005). This section outlines two research methodologies used to answer the three research questions posited in the three Essays.

The case study approach was used to evaluate the research questions in Chapters 2 and 4, while laboratory study was used to evaluate the research question in Chapter 3. Several bodies of literature suggest that case studies allow the researcher to get close to the phenomenon, gather insights, ascertain why things happen, and provide deeper explanations of observations. The two case studies seek to confirm the theoretical foundation of the research and to add richness to the
framework and methodology. Both case studies were conducted in an academic setting. The first case study examined the process for employers in various industries recruiting students graduating from a university in North America, while the second investigated the process of staff recruitment within the same university. Admittedly, the framework and methodology lacks industrial testing as well as having the general limitations of the case study approach. Yin (1984) pointed out that the two major limitations of the case approach are generalizability and the lack of rigor. Though the research approach suffered from these limitations, we were still able to use it to gain valuable insights into our investigation.

A laboratory study was used to address the research question and validate the model proposed in Essay 2 (Chapter 3). In an ideal situation, the research model and hypotheses proposed in this chapter should have been evaluated in an organization with employees working on a real project. However, we encountered several issues which prevented us from conducting a study in such a setting (e.g., not finding an ideal project, time constraints). The lab setting was used to compensate for this limitation. To simulate the ideal world setting we ran several pilot experiments prior to the full study. In the pilot experiments, we paid close attention to attributes and scenarios which are reflective of employees working in an organization.

A combination of the two case studies and the laboratory study was used to indirectly answer the broad research question. The importance of both of those approaches has been demonstrated through their adoption by many practitioners and academics alike. The use of more than one method improves the depth and quality of data (Bouma 1996) and the validity of the broad theme proposed in the research.

1.5 Expected Contributions

Through our work, we extend the coverage of conventional goal-based frameworks that model business-IT alignment to include constructs outside of the RE discipline. In addition, we provide insights that may be useful to systems analysts when eliciting requirements and goals. In brief, the expected contributions of this work to current alignment research in RE include:

1. A means of representing business strategy constructs in an RE model.
2. Guidelines for operationalizing strategic constructs in an RE framework.
3. Insights for enabling systems analysts to elicit requirements and goals that are aligned with the business strategies.

4. A means for explicitly mapping and tracing operational level goals with strategic business goals.
1.6 References


DeLisi, P. (2005). IT Alignment Revisited: Why we're no closer to IT alignment today than we were 20 years ago. *CIO Magazine*.


CHAPTER 2
INVESTIGATING BUSINESS-IT ALIGNMENT THROUGH MULTI-DISCIPLINARY GOAL CONCEPTS

2.1 Introduction

The beneficial impact of alignment on business and Information Technology (IT) performance has been corroborated empirically with both qualitative and quantitative evidence (e.g., Chan et al. 1997; Kearns and Lederer 2000; Leede et al. 2002). Findings demonstrated that organizations that successfully align their business strategy with their IT strategy will out-perform those that do not (Chan and Reich 2007). Scholars, in advocating the importance of alignment, stated that alignment: (i) allows companies to link dynamic business strategies and continuously evolving technologies (2006); (ii) increases profits for an organization above and beyond what would be feasible using solely industry and strategy variables (Chan et al. 1997; Cragg et al. 2002); and (iii) correlates significantly with perceived business performance as perceived by business executives and managers (Sabherwal and Chan 2001). Chan and Reich (2007), in their summary of business-IT alignment research, highlighted exemplary companies that have benefitted tremendously from strategically well-aligned technology such as American Airlines, Bank of America, and American Hospital Supply/Baxter. According to the authors, alignment leads to more focused and strategic usage of technology, which in turn leads to enhanced business performance.

Conversely, scholars alluded to the existence of a colossal risk for failing to attain alignment. Yetton (1994) maintained that separating business and technology would compromise organizational performance. Similarly, Sauer and Burn (1997) reasoned that when business decisions are made without consideration of technology, there exists a risk of pathological or damaging outcomes. Researchers (Luftman and Brier 1999; Salinesi and Thevenet 2007) have argued that while alignment is necessary, it is still unclear how to achieve and sustain this synchronicity between business and technology. A critical issue impeding alignment resides in the absence of common understanding between business strategies and information systems.

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1 A version of this chapter has been accepted for publication. Singh and Woo (2008) “Investigating Business-IT Alignment through Multi-disciplinary Goal Concepts” Requirements Engineering Journal (forthcoming).
worlds (Luftman 2000), which may be a consequence of discrepancies in the visualization of the organizational goals between those who define business strategies and information systems engineers (Salinesi and Thevenet 2007).

In general, if alignment is that easy and trivial then it would not have been Chief Information Officers’ (CIO) top concern for the last two decades nor would it have resulted in the publication of over 150 scholarly articles. The non-trivialness of this topic provides the motivation for a closer examination of novel techniques that may incrementally contribute towards improving alignment between business strategies and technology.

Currently, goal-based approaches represent one of the existing techniques adopted in the Requirements Engineering (RE) discipline for investigating strategic alignment. Goal-based modeling has the primary advantage of subsuming distinct concepts such as systems functionalities and business processes. According to Thevenet and Salinesi (2007), goals can be refined and therefore defined at different levels of abstraction. Our research is grounded in the ability of goals to explicitly capture the ‘why’ and ‘how’ of system functionality and organization business. Adopting a goal-based approach, we define business-IT alignment as the synergy between strategic business goals and IT goals. Strategic business goals are goals that directly contribute towards the strategic process and vision of the organization whereas IT goals are those that range from unit task level to the system level of the technology.

As mentioned earlier, one of the reasons attributing to misalignment is the lack of common understanding between business strategies and IS worlds (Luftman 2000). We believe a multi-disciplinary investigation of business-IT alignment presents a viable avenue for understanding contextual differences between business strategies and IS worlds. A multi-perspective investigation draws viewpoints from several domains such that each viewpoint relates to and explains a specific domain. We believe such an approach will offer deeper context that will reveal the similarities and differences of each domain. Arguably, this deep context should improve our appreciation of the issues surrounding business-IT alignment. Embracing the multi-perspective view, we attempt to answer the following research question:
“Would a framework that describes how goals at the operational level align with goals at the strategic level of an organization help systems analysts to understand the links between goals at the operational level and goals at the strategic level?”

In answering the question, we propose to (i) develop a framework to integrate goals from multiple perspectives; (ii) develop guidelines to operationalize the framework; (iii) apply the framework and guidelines to a case study to evaluate whether integrating goals from multiple perspectives would increase analysts understanding of business-IT alignment issues; and, report other findings from the case study that we have not anticipated.

This chapter endeavors to contribute to a multi-disciplinary perspective of business-IT alignment by advancing a goal-oriented framework that bridges Management Information Systems (MIS), RE, and Strategic Management literature. Alignment, as conceptualized in this study, is two-fold in that it reflects stakeholders’ ability to comprehend the task they execute as well as their ability to relate that understanding to the firm’s strategic goals. Stakeholders are referred to as potential users of the system, (i.e., middle managers and line workers) who will effect or will be affected by the intended system. This delineation of the alignment construct is crucial to business success because scholars have countered that not all stakeholders are able to draw the connection between executable tasks and the firms’ strategic goals. This in turn may adversely affect the competitive edge of organizations (Boswell and Boudreau 2001; McDonald and Myklebust 1997). Stakeholders are deemed as one of, if not, the primary source from which to gather business requirements when developing technological systems. We argue that if stakeholders’ task comprehension is limited and/or if they are unable to link that understanding to the strategic goals, then there is a high probability that elicited business requirements will be inaccurate. This argument is substantiated in organizational research where scholars have illuminated that stakeholders who are not aligned to the organization’s goals adversely affect the performance of the organization, for example (Boswell et al. 2006; McDonald and Myklebust 1997; Witt 1998). Consequently, gathering inaccurate requirements is posited to lead to a misalignment of the intended system with firms’ strategic goals.

To this end, we explicitly formalized this view of alignment in order to explore its impact on business-IT alignment during system development. We put forward a framework that embeds both the organizational (as prescribed by the organization) and the stakeholder’s view of how a
task goal contributes to the firm’s strategic goals. Further, the framework comes equipped with a strategy (through a decomposition process) for resolving differences, if any. Utilizing the proposed framework, findings from a case study suggested that goal differences are sometimes in conflict, in obstruction, or inconsistent.

The chapter is organized as follows: Section 2.2 offers an overview of business-IT alignment within the MIS literature. Section 2.3 explores the implications of implementing a technological system that aligns with firms’ business strategies. Section 2.4 argues from, a multi-disciplinary angle, the necessity of aligning stakeholders’ understanding of organizational tasks with their interpretation of firms’ strategic goals. Section 2.5 discusses a literature review of business-IT alignment within the RE discipline. By drawing on concepts covered in previous sections, Section 2.6 unveils our proposed goal-oriented framework of business-IT alignment. Section 2.7 presents a case study conducted at the Business Career Center (BCC) of a large North American Business School. Section 2.8 discusses lessons learnt and Section 2.9 concludes with a summary and directions for future work.

### 2.2 Survey of Business-IT Alignment as seen in the MIS Literature

The premise of our research is founded on the need to synthesize multiple perspectives when examining business-IT alignment, for each discipline is believed to have best its own set of best practices that can complement each other. To support this premise, we present a review of business-IT alignment literature within the MIS and RE disciplines. By surveying literature in the MIS (this section) and RE disciplines (Section 2.5), we intend to uncover the core dimensions being utilized to evaluate alignment in each domain respectively. We will then illuminate how the two domains explore the same paradigm (business-IT alignment) differently, justify the need for multi perspective views and discuss the manner by which these perspectives can be bridged (Section 2.6).

The term “IT alignment” refers to the coordination of a firm’s IT strategy with its business strategy (Delisi 2005). This high-level coordination has received extensive coverage in contemporary MIS literature. For example, Reich and Benbasat (1996) conceived alignment as the degree to which the mission, objectives, and plans contained in the business strategy are
shared and supported by the IT strategy. Luftman (2000) characterized business-IT alignment as applying IT in an appropriate and timely way, which is in harmony with business strategies, goals, and needs. Henderson and Venkatraman (1993) stated that alignment is the degree of fit and integration among business strategies, IT strategies, business infrastructures, and IT infrastructures. McKeen and Smith (2003) argued that strategic alignment of IT occurs when harmony exists between firms’ goals and activities and the implemented information systems. While much of the debate in the MIS discipline seem to revolve around these or similar contextual definitions, there is to-date no consensus among researchers as to what constitutes alignment (Kefi and Kalika 2005).

Chan and Reich’s (2007), in an extensive review of alignment research, classified business-IT alignment along four dimensions, namely strategic/intellectual, structural, social, and cultural. The remainder of this section presents a review of extant MIS research along these dimensions.

2.2.1 Strategic and Intellectual Dimensions
The strategic/intellectual alignment dimension offers organizations an opportunity to enhance its competitive capability (Kangas K. 2003). Reich and Benbasat (2000) asserted intellectual alignment as the state in which a set of high quality, interrelated business and IS plans exist. This state emerges from internal consistencies and external validity between the outputs of business and IT planning. For business and IT planning outputs to be internally consistent, the IT mission, objectives and plans must be consistent with the stated business mission and objectives. For the business and IT planning to be externally valid, the external business and IT environments must be comprehensive and balanced (e.g., if new technology exists that could impact the business strategy, it must be included in the IT strategy) (Reich and Benbasat 2000).

2.2.2 Structural Dimensions
Chan (2002) refers to structural alignment as the degree of structural fit between IT and business. Factors influencing structural fit include IS decision making rights, reporting relationships, the centralization and/or decentralization of IS services and infrastructure (1994), the deployment of IS personnel (Chan 2002), and the alignment of IT structures with competitive strategy (1989). According to Brown and Magill (1994), firm specific factors such as corporate strategy, organizational structure and culture, role of CIO, satisfaction of CIO, utilization of technology
etc. are manifested differently in different organizations and these factors tend to variably influence centralized and decentralized structures.

2.2.3 Social Dimension
The social alignment dimension is the state in which IS and business executives understand, and are committed to the business and IS mission, objectives, and plans (Reich and Benbasat 2000). The authors examined factors derived from the political behavior model, the resource dependency theory, and the social construction theory that either enable or inhibit alignment. In their proposed model, the authors found that shared domain knowledge between business and IT executives and successful IT history lead to increased communication between business and IS executives. The results from increased communication and structured IT planning ultimately leads to long-term business-IT alignment. On the other hand, short-term alignment was influenced mainly by the frequency of structured or unstructured communication.

2.2.4 Cultural Dimension
The cultural alignment dimension can be viewed through several lenses. Pyburn (1983) claimed that successful planning between business and IT is a precondition of cultural fit. Chan (2002) maintained that a strong company culture is a precondition to the type of informal structure that fosters alignment. Tallon (2003) emphasized the need for a mind-set that promotes shared networks and common IT procurement policies, as well as an across-the-board willingness to give up incompatible best-of-breed systems. Business executives, on the other hand, pointed out that cultural alignment pertains to inducing change in managerial behavior and mentality (CIO Insight Staff (2004).), so much so that it is tantamount to building bridges between business and IT personnel by allowing both parties to converse in the same language (1999). Burn (1993) recommended two independent audit checks: (1) to review the alignment of organizational strategy and structure, and, (2) to review the alignment of IT strategy and structure. Together, these two audit checks represent an organizational “cultural” audit framework.

From Chan and Reich’s (2007) classification of goal alignment, we discerned that alignment research within MIS literature shares a propensity for aligning soft tiers (i.e., intellectual, social, and cultural dimensions) between business and IT. Nonetheless, several challenges confront practitioners in attaining business-IT alignment across soft tiers such as an implicit business
strategy or a lack of formal documented plans. Without a clear agenda, managers are often left to muddle through turbulent, unpredictable times (Lederer and Mendelow 1989; Wang and Strong 1996). Other pragmatic issues confronting soft-tier alignment include weak CEO-CIO relationships (Feeny et al. 1992), invisibility of IT staff, communication barriers, history of IT/business relationships, inherent attitudes of organization members to IT, limitation of shared domain knowledge and leadership (Earl 1989).

Clearly, the above discussion demonstrates that while past research has accentuated the importance of top-tier alignment, its actual realization remains a formidable task. Besides, even with top tier alignment, it is insufficient to guarantee that the IT system will aid in achieving firms’ strategic goals.

The next section showcases other fundamental problems, which extend beyond strategic, structural, social, and cultural dimensions, when implementing IT systems that are congruent with business needs.

2.3 Business-IT Alignment beyond Organization Top Tiers

Business and IT strategies often determine the requirements and scope of a new technological system within the organization. The business processes in the organization guide the implementation of the IT systems. Business executives expect that outputs from the implemented IT systems should translate into strategic goals. Figure 2.1 presents a high-level informal overview that depicts the premises for implementing an IT system based on business and IT strategies. The topmost dimension in Figure 2.1 represents the strategy, which encompasses the vision, strategic processes and resources, etc. The second dimension represents the operationalization of the strategy, which entails day-to-day operations. The third dimension is a representation of elicited requirements for developing the IT system. These representations can be specified using an informal method (e.g. use-case diagrams, texts, scenarios) and/or a formal method (e.g., class and state diagrams in UML diagrams, or ERDs).

Ideally, the day-to-day operations of the organization should be a reflection of the operationalization of the strategy dimension (see Figure 2.1). A stream of organization literature
however, provided empirical evidence to the contrary. In many instances, incongruency or marginal congruency exists between the strategy and operation layer (1990; Pfeffer J. 1978). This can be attributed to “loose coupling” among stakeholders and departments to the extent to which business units are accustomed to ‘doing things’ their own way, and their way of ‘doing things’ may not be always congruent with the firm’s vision and goals (1990; Pfeffer J. 1978).

The ‘formal representations’ dimension in the high level overview model (Figure 2.1) should embody, with a great degree of accuracy, the day-to-day operations.

![Figure 2.1: A Pictorial Overview of Implementing a Software System Based on Strategic Intentions](image)

Unfortunately, these representations are not always accurate. As documented in the report by the Standish Group (1994), a clear statement of requirements is one of the prerequisites for success in software project development. Several inhibitors however, may contribute to inaccurate business requirements: (1) system analysts may not be proficient in the application domain; (2) there is inadequate communication between requirements engineers and potential system users due to variations in experience and education; and (3) stakeholders are unable to offer clear descriptions of their roles (Kotonya and Sommerville 1996). If elicited requirements are
ambiguous and inaccurate to the extent to which they are not reflective of the business strategies, the likelihood of developing a technological system, which accurately represents day-to-day operations, is very much diminished.

Arguably, insofar as operations do not reflect firms’ strategies, the development of technological systems from a pure operational perspective will most probably culminate in the provision of sub-optimal outputs, which contributes very little towards business objectives. Further, no matter how aligned the social, structural, strategic, and cultural dimensions are, the eventual developed system will be misaligned with the strategic goals if users are unable to provide clear requirements.

The next section highlights the high correlation between organizational success and stakeholders’ ability to understand and link the tasks they performed with strategic goals.

2.4 Linking Stakeholders to Organizational Goals

This section investigates, from a review of multi-disciplinary literature, the factors affecting stakeholders’ comprehension of organization requirements. Research in various disciplines (e.g., Human Resource Management, Management Decision, Personnel Psychology, and Management Strategy) emphasized the importance of aligning stakeholders’ perceptions of their jobs with firms’ strategic goals. Scholars within these disciplines have proved that stakeholders’ understanding of organizational strategic goals often leads to improved outcomes, as these stakeholders are more likely to do the right thing (Kristof 1996). Conversely, stakeholders who are not aligned with the organization’s goals adversely affect the performance of the organization (Witt 1998), as these stakeholders may develop alternate and perhaps, conflicting goals, which may interfere with firms’ functioning and strategic success (Guzzo and Shea 1991).

Stakeholders’ ability to establish a link between firms’ strategic goals and their actions that contribute toward the realization of these goals is termed ‘line of sight’. Boswell and Boudreau (2001) formally define ‘line of sight’ as the set of ‘accurate actions’ that should be undertaken by stakeholders in realizing firms’ strategic goals. Aligning stakeholders with consensual business
goals produces synergy and compatibility in organizational direction and ultimately, translates to strategic success (Sauer and Burn 1997).

Stakeholders who exhibit high ‘line of sight’ better understand the work they perform, and how that work affects organizational success. Hatch and Dyer (2004), in their study, observed that stakeholders, who are aligned with firms’ strategic goals, become engaged in their tasks and behaviors. Boswell (2001) also found a positive correlation between ‘line of sight’ and stakeholders’ job satisfaction, timely decisions, and commitment. The author found in an empirical survey that whenever stakeholders are able to relate their work to firms’ strategic goals, there are noticeable improvements to business processes in the form of better service behaviors, speed of execution, and general efficiency. ‘Line of sight’ thus mitigates the level of risk experienced by organizations. In effect, if stakeholders lack ‘line of sight’, firms may be subjected to a greater risk of ineffective or inappropriate behaviors.

In the same vein, if a stakeholder is high on ‘line of sight’, the stakeholder should be able to provide requirements to system analysts that are aligned to his/her organization’s strategic goals due to an in-depth understanding of his/her job.

Conversely, McDonald et al. (1997) argued that stakeholders often have varying difficulties seeing the link between what they do and how these actions contribute to organizational outcomes. This discrepancy is attributed to stakeholders’ abilities. Boswell and Boudreau (2001) categorized these abilities into four quadrants: (i) deep and accurate, (ii) deep and inaccurate, (iii) shallow and accurate, and (iv) shallow and inaccurate. The authors maintained that ‘line of sight’ is not merely indicative of whether stakeholders perceive they are contributing effectively, but also whether they are accurate in their assessment and actually understand how they can contribute. In extreme scenarios, stakeholders may believe that they understand the organization’s objectives and deem themselves as effective contributors, yet they may be totally wrong in their assessment. There are also those who may accurately understand the objectives of the organization, but they may not understand precisely how to contribute toward those objectives. Yet there may be other stakeholders, who neither understands nor are aware of how to contribute toward organizational objectives. These classifications were exemplified earlier by
George (1992), who noted an implicit assumption of stakeholders’ behavioral congruency with organizational goals.

Numerous researchers have examined the varying degrees of stakeholders’ understanding of job tasks as well as how this understanding contributes to the organization’s objectives. Scholars for example, (Campion and Lord 1982; Elliott and Dweck 1988) found that when stakeholders are given assigned goals (prescribed objectives) implicitly or explicitly, their level of acceptance varies from total acceptance without modification, to redefinition or reinterpretation, to even total rejection. The concepts of assigned goals, interpreted goals, the variance between the two and its consequences have been widely studied in the personnel psychology, applied psychology, and human resource management literatures. Vancouver and Austin (1996) for example, stated that assigned goals by themselves are meaningless because these goals are often internally represented by stakeholders as desired states. The accuracy of internal representation (‘desired states’) is a consequence of several influencing factors, including stakeholder characteristics such as level, experience, and functional area (Strahle et al. 1996), ability, past success, task complexity, performance constraints, and perceived importance of the job (Hollenbeck and Howard 1987). In many instances, employers are unaware or lack a comprehensive view of the degree of stakeholders’ internal representation of the actual organization goals (assigned goals).

Research in organization science often (i) highlights the variation between stakeholders understanding and their contribution toward organization’s objectives, and; (ii) emphasizes the importance of aligning stakeholders understanding their job tasks with business strategies (Jackson and Schuler 1995; Ulrich 1998). Yet, the management literature is relatively limited in offering solutions to resolve misalignments between individual stakeholders’ actions and larger organizational imperatives.

To close the theoretical gaps noted above in the MIS literature, we illustrate, from an IT development perspective, that gathering requirements accurately from stakeholders is a prerequisite for business-IT alignment. We show through multi-disciplinary research that stakeholders providing requirements alone are not sufficient in ensuring the accuracy of a technological system in reflecting the day-to-day operations of the organization. The ‘line of sight’ paradigm illustrated the vitality of aligning stakeholders understanding of the tasks they
performed with business strategies. In the following section, we will illustrate through a review of goal based frameworks that while the ‘line of sight’ paradigm is a cornerstone of business-IT alignment frameworks, it was rarely if ever examined within the RE discipline.

2.5 Survey of Business-IT Alignment as seen in the Requirements Engineering Discipline

In this section, we examine goal-based frameworks in RE that support mapping between low-level process and high-level organizational context. This review of frameworks focuses primarily on the explicit consideration between assigned goals and interpreted goals, the clarity of goal descriptions, and the direction of goal mappings between the two levels. We advocate that clarity of goal description and direction of mapping will aid in understanding, validating, and explaining variances between goals at different organizational level.

The i* strategic dependency and rationale framework (Yu 1995) models organizational intention and dependencies among actors in realizing goals. Yu stated that “actors are strategic in the sense that they are concerned about the opportunities and vulnerabilities and seek rearrangements of their environments that would better serve their interest” (Yu 1995). Based on Yu’s (1995) explanation, the term strategy in the context of the i* framework refers to the agent’s personal strategy and has very little to do with ‘business strategy’—the means by which an organization provides itself with a unique differentiating advantage over its business rivals (Bleistein 2006). Within the i* framework, elicited goals mirror stakeholder’s interpretations of what best serves their interests. Yet, the i* framework fails to suggest ways of illuminating differences between stakeholder’s best interest (interpreted goals) and that of the organization’s (assigned goals). Additionally, there is no precise way of evaluating whether the goals provided by stakeholders are in alignment with the strategic business goals.

The CREWS-L’Ecrtoire (Rolland et al. 1998) combines goal modeling and scenario analysis as a means of mapping out the requirements of large organizational information system. The CREWS-L’Ecrtoire was developed on the premise that information systems fulfill a certain purpose of the organization, and the primary stakeholders are deemed to be the most suitable candidates to offer realistic and invaluable input in designing the intended system. The
framework adopts a top-down approach that starts with a single highest-level goal and decomposes into successive goals through scenario analysis and goal modeling. The highest-level goal is often construed in the context for the information system, rather than assume the form of strategic organizational goals (e.g., create new markets). While the CREWS-L’Ecritoire offers a top-down decomposition method, it is unclear as to the extent to which business strategies are included in the model and viewpoints provided by stakeholders are consistent with the business strategies. According to Bleistein (2006) (pg. 21), the CREWS-L’Ecritoire is primarily operational in nature and does not address issues of business strategy.

Business Modeling with UML is an extended version of UML for modeling business rather than software (Penker and Han-Erik 2000). To reflect this, several constructs were incorporated into the set of traditional UML constructs (e.g., business vision, business structure, business processes, and business behavior). Nonetheless, in this method little explanation is offered on integrating the business view with traditional constructs. Consequently, the disjoint between the two domains results in the absence of explicit means for either goal tracing or evaluating possible divergence between the goals assigned to stakeholders by managers and stakeholders’ interpretation of those goals.

The e3-Value framework models value propositions that are based on analyses of economic value creation, distribution, and consumption in a multi-actor network (Gordijn et al. 2003). The model describes the consequential impact from economic activity. This framework however offers minimal description on other crucial components within a network of partners (Pigneur et al. 2001). According to Bleistein and colleagues (2005), the e3-Value misses the crucial point of differentiating between value analysis and business strategy. Furthermore, there is no clear path on how economic value creation is linked to low-level system goals.

The INSTAL Method (Salinesi and Thevenet 2007) considers the organization at two broad levels (strategic and operational). The approach is designed to reuse documentations at both levels to create a third kind of document that outlines the synergy between the two levels. The model is operationalized by using MAPs as an intermediate formalism, which provides a unified and purposeful view on strategic alignment through: (1) identifying strategic operational items; (2) constructing a strategic alignment model; and (3) defining links between section and
strategic/operational components. Strategic and operational items are identified namely by analyzing documents (e.g., strategic documents). It is a key assumption of the INSTAL method that documents already exist within the organization or can be created. In either case, it is unclear as to whether the documents reflect an alignment between executives’ perspective and the reality of the organization (i.e., day-to-day operations), or the alignment between stakeholders’ perspective (interpreted view) and those of the executives (assigned view). Furthermore, the INSTAL method offers no systematic guidance on the process of eliciting strategic constructs for alignment. It is also unclear how the method evaluates alignment (e.g., how do we know that the strategic constructs are ‘true’ representation of the organizational needs).

Several other frameworks have been offered to help understand information systems within the context of a larger model of the enterprise, for example, (Bubenko 1994; Campion and Lord 1982). The Strategic-Service-Support (S3) framework (Loucopoulos 2001) for instance, addresses strategic and service oriented issues in business process modeling whereas the Enterprise Modeling Approach (Champion and Moores 1996) includes strategic-level concepts such as the mission statements of the organization as a way of understanding requirements for large information systems. According to Bleistein (2006), these frameworks are limited in adequately reflecting business strategies: “while enterprise modeling approaches recognize a need to address business strategy in requirements analysis for organizational IT, these frameworks ultimately fail to deliver a means of eliciting and modeling business strategy, and then linking requirements to strategy in an explicit and traceable manner”. We contend that a primary reason responsible for failures in linking requirements to strategy is due to the different perspectives or the lack of common understanding between business strategies and information systems (Luftman 2000).

To the best of our knowledge, the B-SCP framework (Bleistein et al. 2006) is the only approach that emphasizes business strategies, business context, business processes, system process when evaluating alignment between business and technology. In this framework, high-level business strategies (content and context) are defined through the Business Rules Group (BGR) and Business-modeling framework. This approach models alignment via a top-down unidirectional view. There is little or no clear distinct guidance for modeling alignment using a bottom-up approach. Goals discovered through a top-down approach are not always realistic for upper-level
management executives as they are far removed from day-to-day activities. Scholars maintained that goals defined and decomposed from such a top-down approach are sometimes overly ambitious and unrealistic (Barney and Griffin 1992). While this framework provides adequate coverage for business strategies, it fails to recognize the distinction between goals assigned to stakeholders by managers and the interpretation of these assigned goals by stakeholders. Furthermore, the B-SCP framework lacks distinctive guidelines on the process of capturing goals which are indicative of both perspectives (i.e., strategic and assigned).

This section summarized the goal-based RE approaches that attempt to address strategy. Our assessment was similar to those of other scholars (Bleistein 2006; Pigneur et al. 2001; Salinesi and Thevenet 2007). Consistent with these other analyses, we found that existing frameworks either make no claim to address business strategy (e.g., CREWS-L’Ecrtoire and Strategic-Service-Support (S3) framework), discuss strategic dependencies but do not explicitly represent business strategy (e.g., i* framework), or fail to contribute to a precise understanding of business strategy (Business Modeling with UML). There are other frameworks that do emphasize business strategies, but they either offer minimal guidance for deriving strategic and operational concepts (e.g., the INSTAL Method with its document based approach) or overlook unique perspectives of business goals (e.g., the INSTAL Method and the B-SCP framework neglect differences between assigned and interpreted goals).

It can be concluded from our review of business-IT alignment paradigm in both MIS and RE fields that for someone to understand clearly the alignment paradigm, it is imperative for him or her to be aware of both business and technology. Unfortunately, the frameworks described in this section are limited in capturing both dimensions. We believe that the RE and the strategic perspectives are rich in content, and this richness arguably will provide a clearer understanding of the domain and of alignment between business and technology. With the exception of the B-SCP framework and the INSTAL method, no other frameworks to-date has explicitly considered a multi-perspective view.

Sections 2.2 and 2.5 discussed a literature review of alignment frameworks within the MIS and RE disciplines. The RE discipline provides frameworks that align business strategies with technology. Nevertheless, none of them addresses any of the concerns (intellectual, cultural,
structural, and social) highlighted in MIS research. We also found that with the exception of the INSTAL method and the B-SCP frameworks, goal-based frameworks rarely exhibit depth of organization strategies. Further, none of the frameworks distinguishes between assigned and interpreted goals. This chapter endeavors to bridge the aforementioned theoretical gaps by subscribing to a multi-perspective view in advancing a business-IT alignment framework. We believe that an understanding of the discrepancies between assigned and interpreted goals will aid in addressing the dimensions of alignment underscored in Section 2.2, such as the social, cultural and intellectual dimensions.

Reich and Benbasat (2000), when investigating alignment from a social perspective, found that shared domain of knowledge and structured or unstructured communication between business and IT executives increases alignment. Arguably, the dual consideration of assigned and interpreted goals will support the social dimension of alignment by aiding in understanding the shared domain knowledge of stakeholders. The cultural alignment pertains to building bridges between IT and business personnel by allowing both parties to converse in the same language (Van Der Zee and De Jong 1999). The utilization of interpreted goals will assist in verifying whether all parties are indeed conversing in the same language and whether there is alignment or misalignment among the parties. With regards to the intellectual dimension, Reich and Benbasat (2000) argued that for business and IT planning outputs to be internally consistent, the IT mission, objectives and plans must be congruent with the stated business mission and objectives. For the business and IT planning to be externally valid, the external business and IT environments must be comprehensive and balanced. Interpreted and assigned goals can help in determining whether IT objectives are congruent with the stated business mission and objectives. In fact, it is our belief that the framework proposed in the following section will be able to model the organization to determine whether business and IT planning outputs are internally consistent. However, it is unclear at this moment whether the proposed framework will be capable of modeling the other two dimensions i.e., the intellectual dimension in terms of external validity and the structural dimension of alignment.
2.6 The 3g Framework (A Business-IT Alignment Framework)

This section presents the systematic process for developing the 3g (interpreted as the 3-goals: strategic, assigned and interpreted) framework. Figure 2.2 illustrates a high-level overview of the process in developing the framework together with the guidelines for operationalizing it.

The 3g framework is developed via a multi-disciplinary perspective. Contemporary literature from three disciplines were synthesized in developing it: (1) research dealing with organization strategy and the strategic goals; (2) research relating to RE and constructs for modeling requirements in an IT system, and; (3) research derived from personnel psychology and human resource management in modeling ‘line of sight’. Constructs from the strategic and RE perspectives were selected from existing academic literature, evidence from practice and consultation with experts. To guarantee consistency in representation, the constructs were defined using the Bunge’s ontology (Wand and Weber 1995) and mapped into a meta-model (Figure 2.3).

![Figure 2.2: Overview for Developing the 3g Framework and Operationalization Guidelines](image)

The 3g framework was then formally mapped from the meta-model (see Figures 2.4 and 2.5). Finally, guidelines were then developed for operationalizing the 3g framework.
Distinctions between the 3g framework versus other frameworks that model software requirements (e.g., i*, CREWS and KAOS) lie in the multi-perspective view of organizational goals, and the embodied constructs and corresponding relationships. As mentioned previously, discrepancies may exist between stakeholders’ perception of how business strategies are operationalized versus their actual operationalization in reality. To clarify the distinction between these two views and its impact on alignment we propose the 3g framework with the primary objective to investigate business-IT alignment unambiguously through the elicitation of system requirements and goals that contextualize business strategies and the incorporation of stakeholders’ perspectives of the operationalized business strategies.

2.6.1 Developing the 3g Framework

Goal concepts within RE, personnel psychology, and strategic management literature form the cornerstone of our proposed 3g framework. Constructs and relationships are derived from two distinct domains within the organization, namely strategic and operations. The strategic domain consists of higher-order elements such as the mission and vision of the organization, business plans, environmental factors, business strategies, strategic goals, and resources. Conversely, the operational domain comprises lower-order elements such as human capital assignments, tasks/activities list, and business rules (i.e., transformation functions). The links between the higher-order elements and the respective lower-order counterparts are established through the operationalization of strategic goals.

Constructs to represent the higher-order domain in the 3g framework were identified by examining current business practices in organizations, and strategic frameworks described in scholarly articles. An initial set of constructs were selected by exploring current business practices. Two business executives, one from a banking industry and the other from an office and electronics store, were interviewed. During the interview session, the business executives were asked questions pertaining to the higher-order domain of the organization such as the vision, short- and long-term business strategies, environment factors, and strategic goals. Prior to the interview sessions, a total of 18 questions (Appendix B) covering different aspects of the strategic domain was developed from published articles and commentaries, (e.g., Boardman et al. 2004). The questions were validated for consistencies in understanding and interpretation via card-sorting exercises Kassarjian (1977). Examples of questions that were presented to the
interviewees are “What is the firm's current short-, intermediate- and long-term strategy?”, “Are these strategies amenable to the external industrial environment and internal firm characteristics?” The goal of interviewing the two business executives was to gather practitioners’ view of the key constructs that are related to strategic goals, and the relationships among the constructs. These people provided expertise and independence to the research.

Following the interview sessions, an initial set of constructs (See Figure 2.4) for operationalizing the higher-order business domain was selected for modeling the framework. The relevance of these constructs and their saliency were discussed with the business executives. The selected constructs were then cross-referenced with scholarly articles affiliated with the modeling of organizational strategies. Representative examples of articles selected for cross-referencing include:

- The Business Rules Group (Kolber et al. 2000) proposes the Model for Organizational Motivation (BRG model), a goal-oriented modeling framework for organizational motivation, which is based on concepts common to strategic planning (Mintzberg et al. 1998). The BRG-Model describes the semantics of a goal model of organizational intention or business strategy. This model distinguishes goal types according to the decision levels of the organization such as the mission, vision and strategy.

- The strategic management process framework identifies mission, goals, external and internal analysis as constructs for contextualizing strategic choices (Charles and Jones 1998).

- The Balanced Scorecard framework builds on dimensions such as communicating, and linking, business planning, feedback and learning to translate organizational vision (Kaplan and Norton 1999).

Following this exercise, a parsimonious set of constructs (vision, strategic choices, strategic processes, strategic goals, resources) was identified, which when taken together, depict a decomposition of the organizational vision. Other than strategic goals and resources, none of the other three constructs was considered in goal-based frameworks, which model business-IT alignment.

Lower-order constructs were selected by exploring the RE and goal-oriented requirements engineering (GORE) literature. Easterbrook and Nuseibeh (2000) characterize RE as a branch of
systems engineering that encompasses not just software, but also hardware, people, and organizations. This field is renowned for its formalization of representative relationships among actors/agents with goals and task/activities. There are over a dozen such frameworks, including:

- The i* framework models organizational intention and dependencies among actors in realizing goals. The approach assimilates goal, task entities expressing intention or action, with contextual entities such as actors and resources, into a single model (Yu 1995).

- The Goal-based Workflow Framework is a methodological approach that views the organization as a three dimensional tuple \((G, A, R)\) where \(G\) is a set of goals, \(A\) is a set of actors, and \(R\) is a set of resources. Actors act collaboratively using resources to attain goals (Ellis and Wainer 1994).

- The KAOS framework formally maps lower-order constructs by defining ternary relationships binding an actor, a master concept (e.g., a goal, an object, an agent, an operation), and a facet of it (van Lamsweerde and Letier 2000).

- Penker and colleagues (2000) extended the standard UML diagrams (which maps relationships between actors and activities) to include process, resources and goal relationships.

Though we only mentioned four frameworks above, it should be noted that we have conducted a thorough analysis of all goal-based frameworks in the RE discipline (see section 2.5 for discussions on some of the other goal-based frameworks). A review of other goal-based frameworks can found elsewhere (Singh 2007). The conclusion of our in-depth analysis yielded a generic set of constructs (agents, tasks, low-level resources, and transformation functions that convert inputs into outputs), which when coupled, offers a clear and formal flow of business activities at different levels of abstractions for the organization. We present Figure 2.4 as a way to formally represent the classification of these four generic constructs. While these constructs are not new to the RE discipline, they are necessary to understand both the context of assigned and interpreted goals and the issues relating to business-IT alignment.

The assigned goals are used as a means of bridging the higher-order constructs (e.g., organization vision, strategic processes and strategic goals) to their lower-order counterparts. This is possible since these goals can be construed as the decomposition (or operationalization) of high-order constructs from a top-down perspective or as emergent constructs that culminate
from the execution of low-level tasks when viewed from a bottom-up angle. ‘Assign goals’ are often implicitly or explicitly assigned to stakeholders who, upon receiving these goals, conceptualize them according to their interpretations. It has been revealed in personnel psychology and human resource management literatures that stakeholders’ interpretation of assigned goals exhibits varying degrees of congruency to the assigned goals, which in turn may positively or negatively impact the realization of firm objectives (Boswell 2006; Boswell et al. 2006; Vancouver and Austin 1996). For this reason, we include both assigned goals and their interpretations by stakeholders in our proposed 3g framework.

Constructs for the 3g framework were validated via a deductive and inductive process. First, we consulted with two scholars who are experts in both strategic management and RE disciplines (each with over 20 years of experience). During several informal discussions, the experts in both disciplines affirmed the selected constructs and offered feedback on how relationships among strategic constructs can be further refined. The suggestions were thoroughly discussed among the researchers of this study, and revalidated with existing literature and business practices to ensure clarity in understanding.

The second validation takes the form of a thorough analysis of goal definitions within contemporary literature in both strategic management and RE disciplines. We examined definitions of goals in scholarly (journal and conference) articles, commentaries, and case studies to assess whether or not our selected constructs were reflected in each definition. Utilizing content analysis (Kassarjian 1977), we analyzed 54 definitions of goals: 32 from RE literature and 22 from strategy literature. Themes or phrases such as “desired states” were chosen for the level of analysis. To measure reliability, one of the principal investigators and an independent person coded the definitions; a score of Kappa 0.94 was obtained for similarity in coding.

Following this validation process, we first categorized the derived constructs and mapped the relationships among them into a meta-model (Figure 2.3). The classification types in the meta-model are grounded on the Bunge’s ontology (Wand and Weber 1995). Constructs adopted from this ontology include: system, thing, conceivable state and transformation. In accordance with Wand and Weber (1995), a system is defined as a set of things where each thing is coupled to at least one other thing in the set, a thing is the elementary unit in our ontological model, a
conceivable state is defined as the set of all states that the ‘thing’ may ever assume, and a transformation is defined as the mapping from a domain comprising states to a co-domain comprising states.

Figure 2.3: Meta-model Illustrating an Ontological Mapping of the Derived Constructs

The Bunge’s ontology, as adapted to this study (see Figure 2.3), offers the theoretical formalization from which to map the derived constructs into a unified system (Figure 2.4) that illustrates relationships among the various goal states within the organization.
As can be inferred from Figure 2.4, each goal state is realized through some transformation function with a specific set of parameters. These parameters are dependent on the organizational context to the extent to which a combination of conditions (e.g., organization size, relative market position, target region, competitors) will tend to emphasize different parameters (e.g., external analyses, threats, strengths and opportunities). While we acknowledged the importance of these parameters, the consideration of its details is outside the scope of our proposed model.
and for that reason, we have not included them into the framework. The relationships among goal states, transformation functions and entities in Figure 2.4 are classified into four categories: ‘is used to determine’, ‘is used to derive’, ‘generic’, and ‘≈ equivalence’. The ‘is used to determine’ relationship reflects an activity between a goal state and transformation function. In this activity, the parameter of the goal state is known and this parameter is utilized to determine any unknown parameters in the transformation function. The ‘is used to derive’ relationship reflects an activity between a transformation function and a goal state. In this activity, the parameters of the transformation function are known and these parameters are utilized to determine the unknown parameter in the goal state. The ‘generic’ relationship reflects an activity (e.g., executes, utilizes, emerges, considers) that represents the invocation of an operation, a step in a business process, or an entire business process. Activities can be decomposed into sub-activities until it reaches the level of an atomic action. The “≈ equivalence” unique relationship states that in an ideal organization, the two constructs joined by the relationship should be comparable in context and representation.

To illustrate the model, we present an example by going through some of the constructs and relationships depicted in Figure 2.4. It should be noted that the constructs being utilized below are meant for demonstrating the example and are not representative of all the model constructs and relationships. For the purpose of completeness, a description of all the constructs and relationships is given in Appendix A.

- **Organizational vision:** In the organization hierarchy, a vision defines an organization’s long-term goals and strategic directions (e.g., one might surmise that Walmart’s vision is to become a worldwide leader in retailing).

- **Strategic choice:** In realizing the vision, a set of choices are defined strategically. For example, emphasizing customers, products or services, technology, and market are feasible strategic options for realizing the vision of becoming a worldwide leader in retailing for Walmart.

- **Strategic process:** The choices are evaluated (based on several factors such as internal and external analysis) before being transformed into statements such as “provide all consumers the best products and services with guaranteed satisfaction under one roof”. Strategic
processes are then derived from a combination of strategic choices, available resources, and strategic goals.

- **Strategic goal:** The strategic goal supports the realization of the organization’s mission and vision. Goals at this level serve several purposes. For example, they may be defined such that they simultaneously impact market position, guide innovation and productivity, introduce reductions in manufacturing costs and boost firm profits. In the case of Walmart, a hypothetical strategic goal may lie in establishing market leadership through ‘controlling 25% of the market share in the United States by the year 2012’.

- **Assigned goal:** The strategic processes and goals are then assigned to respective departmental managers. For example, the IT manager may be assigned the goal of ‘acquiring and maintaining a technological application that supports online shopping’, whereas the procurement manager may be assigned the goal of ‘tracking down the cheapest supplier’. Upon receiving the strategic goals, the managers delineate, operationalize, and assign the decomposed goals, either implicitly or explicitly, to stakeholders (i.e., agents) within each department.

- **Interpretation of assigned goal:** The agent then conceptualizes and interprets each assigned goal according to his/her ability to understand the task based on his/her ‘line of sight’ and other extraneous factors such as motivation.

- **Relates to:** This is the conceptualization of how the assigned goal is affiliated with the stakeholder’s interpretation of the assigned goal. Figure 2.5 decomposes the ‘relates to’ relationship to highlight: (1) the varying degrees with which it may exist, (2) its impact on the organization, and; (3) probable approaches for aligning the two goals to reach a satisficing state.

As illustrated in Figure 2.5, the relationship between ‘interpretation of assigned goals’ and ‘assigned goals’ can exist in three mutual states:

(a) A ‘conflict’ state prevails when the interpretation of an assigned goal is minimally or negatively correlated with the original assigned goal. For example, while a sales clerk’s assigned goal may be ‘to process customers’ transactions in a timeliness and seamless manner to ensure consumer satisfaction’, it can be interpreted in a minimalist fashion as the ‘completion of customers’ transactions’.

[35]
(b) The ‘same as or satisficing’ state is defined as an interpretation of the assigned goal being identical or at the very least, at a satisfying state with the original assigned goal. For example, ‘execute customers’ transactions efficiently and make consumers feel happy with their purchases’ can be deemed to be in a satisficing state with the aforementioned sales clerk’s assigned goal.

(c) The ‘better than’ state refers to a situation where the reinterpretation of the assigned goal adds, refines, or enhances the original assigned goal. Reverting to our above example, ‘process customers’ transaction efficiently and elicit feedback from the customer during the transaction period in order to ensure consumer satisfaction’ can be conceived as a ‘better than’ state than the sales clerk’s assigned goal.

Figure 2.5: Decomposition of the “relates to” Relationship

Soliciting the stakeholder’s interpretation of assigned goals independently of the assigned goals will yield three sets of functionalities for the intended technological system, which will align differently with the strategic goals.

To illustrate this viewpoint, we present the following scenarios for the three goals:
(a) ‘completion of customers’ transactions’ – will lead to a technological system with functionality that fulfills the basic operations, i.e., in such a system, there are no clear indication of whether this process will contribute to the intended strategic process of ‘providing all consumers the best products and services with guaranteed satisfaction under one roof’;

(b) ‘execute customers’ transactions efficiently and make consumers feel happy with their purchases’ – will lead to a technological system with functionalities that fulfill the basic operations and a pop-up window with a suggested set of phrases to remind the sales clerk to greet the customer, and ensure that he/she is happy – there is a clear direction of how this process will contribute to the intended strategic process of ‘providing all consumers the best products and services with guaranteed satisfaction under one roof’ and;

(c) ‘process customers’ transaction efficiently and elicit feedback from the customer during the transaction period in order to ensure consumer satisfaction’ – will lead to a technological system with functionalities that fulfill the basic operations, a pop-up window with a suggested set of phrases to remind the sales clerk to greet the customer, and ensure that he/she is happy, as well as an additional feature for the sales clerk to record customers’ suggestions – thereby offering even better indicators of how the system realizes the intended strategic process of ‘providing all consumers the best products and services with guaranteed satisfaction under one roof’.

The three scenarios illustrate that eliciting agent’s goals without confirming the assigned goals and strategic goals may result in the implementation of a technological system with vastly different functionalities. Though each system may be functionally ‘accurate’ (i.e., conforming to the business processes) the degree of business-IT alignment varies substantially.

In the three scenarios, we illustrated that the ‘is in conflict with’ and ‘is better than’ are relationships that show goals in unresolved states. To modify and refine these states, we propose two approaches:

i. to resolve the ‘is in conflict with’ relationship – consult with the agent who interpreted the goal, and discuss with him/her and other agents (if necessary) until an amicable solution that is closer to the original assigned goal is reached; and
ii. to resolve the ‘better than’ relationship – consult with managers and business executives and examine whether the strategic goals should be altered to reflect the improvement and then modify the original assigned goal accordingly. The managers and business executives are the only ones who are responsible for and have the authority to change an assigned goal.

In section 2.6.2, we present guidelines that system analysts may find useful in operationalizing the framework when eliciting requirements.

2.6.2 Guiding Principles

*Guiding Principle 1: Identification of Higher-Order Constructs*

- System Analysts, in defining higher-order constructs (i.e., vision, strategic choice, strategic goals and resources in Figure 2.4), should first meet with several business analysts and corporate managers who may provide a narrated version and/or documentation of the high-level constructs (i.e., the organizational vision, strategic choice, strategic processes, strategic goals, and the resources that may constrain the strategic processes). The primary purpose of convening with several business analysts and corporate managers is to secure consensus on the elicited constructs.

- Not all organizations have corporate executives or relevant documentation that will provide clear descriptions of the higher-order constructs. If no clear description or documentation is available, we then suggest administering a questionnaire, which we developed and validated, to business analysts and corporate managers. The questionnaire was developed from the Boardman Comprehensive Strategic Analysis Framework (Boardman et al. 2004). Each question in the questionnaire were carefully selected and phrased such that the intended answer provides contextual and additional content, which is related directly or indirectly to the strategic constructs within the 3g framework. Questions were developed and validated for consistency in representation with two independent researchers (Kappa score 0.88). The complete questionnaire is listed in Appendix B. Questions 5, 13, 14, 17 and 18 are directly related to eliciting the strategic constructs in Figure 2.4. Other questions are useful as either supplementary support or guiding principles for executives to come up with the strategic constructs.
After eliciting the requirements for each construct, the system analysts, with the assistance of the business analysts and corporate managers, should clearly define the relationships among the constructs. System analysts should always ensure that business executives and corporate managers are in general agreement regarding both constructs and relationships.

**Guiding Principle 2: Identification of Lower-Order Constructs**

- System Analysts should use traditional approaches as prescribed by requirements engineers for eliciting low-level constructs (i.e., agent, tasks, and resources in Figure 2.4). Examples of these approaches include interviews, observations, and perusing documents.
- System analysts should then categorize and group the agents, tasks and resources before mapping agents to the respective tasks they perform.

**Guiding Principle 3: Identification of Assigned Goals**

- It is assumed that in an organization, the strategic goals would already be operationalized implicitly or explicitly, and for these reasons, the system analysts should first consult with business analysts and corporate managers to identify the assigned goal for each task. Under ideal circumstances, these goals for the tasks should reflect the systematic operationalization of strategic goals.
- Not all organizations have a clear description of the systematic operationalization of the strategic goals. For those organizations without clearly defined assigned goals (i.e., assigned goal construct in Figure 2.4), we prescribe an approach (the next point) that can be embraced by system analysts in eliciting assigned goals. We acknowledge that system analysts are not experts in the business domain and therefore, we strongly suggest that system analysts consult with business analysts and corporate managers to validate the correctness and accuracy of extracted assigned goals.
- The approach for eliciting assigned goals is based on a combination of (a) higher-order constructs; (b) a formal modeling approach that maps the lower-order constructs of agents with tasks reflecting desired states, e.g., Object Oriented Enterprise Modeling-OOEM (Wand et al. 2000); and (c) a consistent view approach for representing elicited goals (Rolland et al. 1998). In eliciting assigned goals, system analysts should use a
formal representation to first model lower-order constructs, and secondly, to elicit assigned goals from the constructed model. The OOEM is one such example of a formal representation that models lower-order constructs. The OOEM represents interactions among objects/agents in form of requests/response. A request is defined as an object asking another object to perform some service. The requested object may then perform the service entirely or may designate aspects of the service to other objects. When the service is completed, a response is provided to the requestor.

After modeling the OOEM, the system analysts should then identify goals (‘assigned goals’) for services. Goals are identified by analyzing the service name, request that triggers the service, attributes relating to the service, neighboring services that relates to the fulfillment of that service, response to the request, and constraints (e.g., time, completeness, accuracy). After the goals are elicited for each service, the system analysts can then formalize the goals for consistency in representation by utilizing the approach advocated by Rolland et al. (Rolland et al. 1998), which recommends that a goal should include a verb and at least, one of four parameters (i.e., target, direction, way, and beneficiary). The formalized goals should then be validated by the business analysts and corporate managers for accuracy and consistency.

**Guiding Principle 4: Identification of Agents’ Interpretation of “Assigned Goals”**

- System analysts should approach an agent in each role within the lower-order construct domain and record the agent’s interpretation of the goals for the tasks that they execute (in Figure 2.4). The tasks executed by the agents are analogous to the services modeled by the formal representation (e.g., OOEM) in Guiding Principle #3.
- Anton (1997) stated that stakeholders usually relate better to requirements than goals. If the agents are unable to provide goals for the task, then we suggest that system analysts administer a questionnaire (Appendix C) which may assist in the elicitation process. The questionnaire consists of 11 questions whereby questions 1 to 9 aim at probing the agents with sufficient details (priming process) that will eventually allow them to provide their interpretation of a goal for a specific task. Questions 10 and 11 are of main
interest relative to the interpretation of the assigned goal (interpreted goal construct in Figure 2.4).

**Guiding Principle 5: Mapping goals to evaluate for alignment of IT requirements with strategic goals**

- System analysts should decompose relevant strategic goals to map assigned goals using Guiding Principle 3.
- For each assigned goal, the corresponding set(s) of agents’ “interpretation of assigned goals” should be attached.
- If the interpretation of the assigned goal is vague in context with the corresponding assigned goal, then the system analysts should first attempt to formalize the prior goal into a consistent representation using the approach advocated by Rolland et al. (1998).
- The agent who provided the goal should be consulted for further clarifications.
- The original assigned goals and agents’ interpretation of assigned goals should then be taken to business analysts and corporate managers for evaluating the degree of alignment between goal types (assigned and interpreted). Alignment can be measured subjectively for example on a Likert rating scale of 1 to 5 (where 1 indicated that the two goals are not aligned and 5 representing alignment between the two goals).
- The evaluation of this alignment will help in determining whether: (1) agents (or stakeholders) have ‘line of sight’ and to what extent elicited IT requirements are the ‘true’ requirements for achieving intended strategic goals, (2) agents’ (stakeholders’) interpretation of the business practices are better reflections of current business needs, (3) redundant tasks that do not contribute to the strategic goals exist, and; (4) agents are unaware of tasks that are integral to the realization of strategic goals. Based on the degree of alignment, agents, business executives, and managers should be advised to adjust their goals accordingly.

So far, we presented in this section, the guidelines for operationalizing the 3g framework. We will demonstrate in the section 6.3 the value of the 3g framework and the guidelines relative to the GORE discipline.
2.6.3 Application of the 3g Framework to Goal-oriented Engineering Discipline

It has been argued that the i* framework lacks systematic goal refinement mechanisms and has no goal-strategy couple to clarify the multiple ways in which a goal can be achieved (Salinesi and Thevenet 2007). We believe that one possible reason for this inadequacy is the minimal consideration of constructs relating to the organization’s strategy. To address this issue, we suggest that by adopting the strategic level constructs (Vision, Strategic Choice, Strategic Goals and Strategic Process) of the 3g framework (Figure 2.4), the coverage and refinement mechanisms of the i* framework will improve. For example, the dependencies among actors in the i* framework can be related to the strategic goal of the organization. That is, positive and negative contributions can be evaluated relative to strategic goals. Similarly, the additional contextual information provided in the questionnaires in Guiding Principle #1 may assist analysts in verifying and validating the optimal way in which a goal can be achieved. Finally, using assigned and interpreted goals in the i* framework may improve the resolution of conflicts in dependency relationships. Assigned goals can be used as a benchmark when negotiating between two actors as well as adding support and rationale to resource dependencies.

The INSTAL Method (Salinesi and Thevenet 2007) considers research documents within the organization for the alignment analysis. However, this approach is compounded with several limitations such as availability, completeness, recency and accuracy of the documents as well as their consistency in representation. Though experts and experience users may not have difficulties in gathering the relevant documents to apply the INSTAL method, this process may pose greater challenges for inexperienced users. Potentially, the 3g framework and the guidelines provided in this chapter can overcome this challenge. For example, if the strategic documents are not available, then the questionnaire presented in Guideline 1 can support the elicitation and rationale for the ‘Organization Strategic Component’ in the INSTAL method. Recursive strategies such as merging, analyzing consistency, matching values to challenges and refinement were identified as means for constructing the alignment map. However, no clear guidance was provided in the approach for these strategies. Conceivably, the assigned goals and interpreted goals paradigm presented in the 3g model can assist in evaluating these recursive strategies and the ‘similarity analysis’ relationship (the process model that document strategic alignment).
In the previous two sections, we explained the potential of the 3g framework and its operationalizing guidelines through the illustration of assigned goals and interpreted goals in two goal-based frameworks (i* – the most recognized framework in the GORE discipline and, INSTAL – the most recent strategic alignment framework). We further argue that the depth of systematic coverage and the paradigm of assigned and interpreted goals, which were utilized in the 3g framework has the potential to minimize the limitations of a number of goal-based frameworks. Detailed support for this argument is beyond the scope of this chapter. However, we demonstrated the feasibility of the approach and its guidelines by presenting in the next section, the analytical findings of a case study utilizing the 3g framework.

2.7 Case Study: Business Career Center Opportunities

A case study was conducted to verify the concepts in our proposed 3g framework. The purpose of the case study is two-fold: (1) to evaluate whether discrepancies truly exist between assigned goals and agents’ interpretation of assigned goals, and; (2) to illuminate through a multidisciplinary perspective, the enhanced contextual understanding that helps analysts in assessing the alignment of potential system requirements with respect to strategic goals. Case findings were developed based on services offered by the Business Career Center (BCC) of a large Business School in North America. The BCC matches employment opportunities by connecting current and former students with prospective employers.

After an initial meeting with executive representatives, we were notified that the technological system for BCC should not only be a service provider for matching employment opportunities between former students and prospective employers, but the system should also relate to the high-level strategic goals of the organization. It was unclear at the time of discussion how the technological system will contribute toward the organization’s strategic goal(s).

This issue was subsequently resolved through several rounds of discussion, and the administration of the questionnaire (in guiding principle #1) for eliciting higher-order constructs to business executives. We were given instructions to elicit requirements from the ‘primary’ users of the intended system. The ‘primary’ users were classified as those who are responsible for managing the services between students seeking careers and employers offering job
opportunities. After reviewing an older version of the system and consulting with the ‘primary’ users, we identified short- and long-term features of the system (Table 2.1), which were corroborated by the business executives.

<table>
<thead>
<tr>
<th>Table 2.1: Short and Long Term Requirements for the BCC System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BCC Short Term System Requirements</strong></td>
</tr>
<tr>
<td>Enable employers and BCC to post jobs, internships, and Co-ops.</td>
</tr>
<tr>
<td>Email alerts to students when a job in their industry area is posted.</td>
</tr>
<tr>
<td>Enable students to apply jobs online by uploading resume, cover letter, transcript, and any additional documents that may be required by the employer.</td>
</tr>
<tr>
<td>Enable BCC to schedule interviews.</td>
</tr>
<tr>
<td>Enable BCC to post career coaching sessions and events.</td>
</tr>
<tr>
<td>Enable students to RSVP for events.</td>
</tr>
<tr>
<td>Enable BCC to track entire student history, which includes jobs applied, sessions attended, and notes by the office.</td>
</tr>
<tr>
<td>Waitlist feature for workshops and events.</td>
</tr>
<tr>
<td>Track events posted in a time frame, list all the applicants who signed up for it and be able to export it to an excel spreadsheet.</td>
</tr>
<tr>
<td><strong>BCC Long Term System Requirements</strong></td>
</tr>
<tr>
<td>Integrating the students’ profiles with the (Integrated Career Management Network) system.</td>
</tr>
<tr>
<td>Implementing a reporting function that track jobs posted by an employer within a time window. A user of the system should be able to list and export in a spreadsheet all the applicants who signed up for the advertised job. The reporting function should be able to report statistics about the employers, job functions and industry types.</td>
</tr>
<tr>
<td>Implementing a survey mechanism similar to Zoomerang (an external online survey tool), with the ability to skip through questions based on the respondent answers to previous questions. The survey tool should able to report the results along with the student’s profile.</td>
</tr>
<tr>
<td>Analyze opportunities to integrate the Alumni office. The Alumni office sends out contacts for business development and hires to the BCC.</td>
</tr>
<tr>
<td>Analyze opportunities to integrate the MBA office. The MBA office sends student profile information to the BCC, but the BCC office would prefer that this information be available on COOL (Career Options Online Login – a job databank that serves to connect job opportunities with current and former students).</td>
</tr>
</tbody>
</table>
Rather than going into a detailed description of the study, we present in this section the elicited higher-order constructs, system operations as perceived by the Co-op Office, the assigned goals for the services executed in the Co-op Office, and the interpretation of the task goals as seen by users in that office. The users in the MBA office execute a similar set of operations.

2.7.1 Eliciting High Order Constructs

Requirements for the higher-order constructs were elicited through interviews and questionnaires that were administered to senior executives and personnel who were responsible for the project. This was done through Guiding Principle #1. Responses were then analyzed. During the analysis, we met with interviewees several times to clarify certain responses that were either vague or inconsistent with responses from other interviewees. Given that it is a new method, we decided to leave the precision, e.g., the total numbers of interviewees to use, of the process open. Following the analysis, we summarized the responses before convening with the interviewees again to go through the summary and identify the strategic goals that map to the technological system. The requirements were finalized after following some discussion (see Table 2.2).

<table>
<thead>
<tr>
<th>Vision</th>
<th>Strategy</th>
<th>Strategic Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>To be a world class business school (i.e., excellent faculty, members and students)</td>
<td>Establish good relationship with employers and alumni</td>
<td>Employers hire more of our students and alumni donate more money to us</td>
</tr>
<tr>
<td>Short Term</td>
<td>Fund raising</td>
<td>Increase the current endowment</td>
</tr>
<tr>
<td></td>
<td>Branding</td>
<td>More people will know about us</td>
</tr>
<tr>
<td></td>
<td>Our faculty members providing more quotes on our success to the media</td>
<td>Be visible in media such as Globe and Mail newspaper</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Increase MBA students enrollment</td>
<td>Close to double the current enrollment</td>
</tr>
<tr>
<td></td>
<td>Improve ranking by international bodies such as Financial Times</td>
<td>To be ranked high enough so that we are in the radar of consideration by most international students</td>
</tr>
<tr>
<td>Long Term</td>
<td>A stable financial base</td>
<td>To be less dependent on government funding</td>
</tr>
<tr>
<td></td>
<td>A stable relationship with employers and alumni</td>
<td>To be the top choice of hiring and donation</td>
</tr>
<tr>
<td></td>
<td>A stable set of high productive faculty members</td>
<td>To be recognized as a top research business school</td>
</tr>
</tbody>
</table>

Table 2.2: A Summary of the Elicited Strategic Constructs for the 3g Framework
2.7.2 Eliciting the Lower Order Level Constructs

Reviewing existing documents and with the help of corporate managers, we were able to determine the collection of ‘primary’ agents who will be utilizing the system. The agents were interviewed on the tasks they perform and the known resources they utilized in performing the tasks. Existing documents (e.g., job descriptions) and observations of their daily work supplemented interview responses. Each agent was then modeled based on the set of tasks they perform and their interactions with other agents. Table 2.3 summarizes the activities performed by three agents within the system.

<table>
<thead>
<tr>
<th>Agent</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCC Co-op Assistant</td>
<td>Scan jobs, post, and mailing applications in bundles.</td>
</tr>
<tr>
<td></td>
<td>Verifying job applications.</td>
</tr>
<tr>
<td></td>
<td>Processing Co-op applications and informing students of job availability.</td>
</tr>
<tr>
<td></td>
<td>Verifying students grades with their transcripts.</td>
</tr>
<tr>
<td></td>
<td>Set up interview slots and rooms and checking schedules.</td>
</tr>
<tr>
<td>ICEMAN System (ICEMAN System)</td>
<td>Scan and verify job types and generate alert of verifications.</td>
</tr>
<tr>
<td></td>
<td>Match jobs and search criteria with jobs posted.</td>
</tr>
<tr>
<td></td>
<td>Bundling all Co-op applications.</td>
</tr>
<tr>
<td></td>
<td>Setting up interview slots and alerting students to sign up for the available slots.</td>
</tr>
<tr>
<td>BCC Assistant Manager</td>
<td>Gathering details for events.</td>
</tr>
<tr>
<td></td>
<td>Provide career service.</td>
</tr>
</tbody>
</table>

2.7.3 Eliciting the Firm’s Assigned Goals

The organization at the time did not have any formal documentation that systematically outlines the assigned goals for identified services. We reverted to the second option in Guiding Principle 3, i.e., to create an OOEM diagram, elicit goals for services in each agent, formalize the elicited goals and validate the elicited goals with business executives. Table 2.4 summarizes the assigned goals for each service identified in Table 2.3.
Table 2.4: Description of the Assigned Goals for the Actors in the Co-op Process

<table>
<thead>
<tr>
<th>Objects</th>
<th>Services Rendered</th>
<th>Services Goals formalized with the Rolland et al. approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BCC: CO-OP Assistant</strong></td>
<td>Scan jobs, post, and mailing applications in bundles</td>
<td>Examine jobs posted by the employers and prepare the jobs in bundles for mailing to students.</td>
</tr>
<tr>
<td></td>
<td>Verifying job applications</td>
<td>Verify that the profile posted online by the students; match the minimum requirements for the job advertisement.</td>
</tr>
<tr>
<td></td>
<td>Processing Co-op applications and informing students of job availability</td>
<td>Ensure that students who have satisfied the requirements for an advertised job are informed with adequate notice.</td>
</tr>
<tr>
<td></td>
<td>Process students grades with their transcripts</td>
<td>Corroborate the students’ grades with the official transcripts.</td>
</tr>
<tr>
<td></td>
<td>Set up interview slots and rooms and checking schedules</td>
<td>Ensure that rooms are available and schedules are optimized to efficiently accommodate all employers.</td>
</tr>
<tr>
<td></td>
<td>Scan and verify job types and generate alert of verifications</td>
<td>Provide a heuristic for verifying job types and output alerts for successful verifications.</td>
</tr>
<tr>
<td></td>
<td>Match jobs and search criteria with jobs posted</td>
<td>Identify the most relevant jobs for the students based on the available jobs posted by the employers.</td>
</tr>
<tr>
<td></td>
<td>Bundling all Co-op applications</td>
<td>Assort and group student applications on demand for the Co-op assistant to process.</td>
</tr>
<tr>
<td><strong>ICEMAN</strong></td>
<td>Setting up interview slots and alerting students to sign up for the available slots</td>
<td>Provide forms with relevant interview details for those students to register, who are shortlisted for interviews.</td>
</tr>
<tr>
<td><strong>BCC Assistant Manager</strong></td>
<td>Gathering details for events</td>
<td>Make available to the employers, the schedule, time and other relevant information of upcoming planned events.</td>
</tr>
<tr>
<td></td>
<td>Provide Career Services</td>
<td>Facilitate as a communication channel and manage inquiries between the business employers and graduates of the Co-op program with intention of satisfying both parties</td>
</tr>
</tbody>
</table>
2.7.4 Eliciting the Agent’s Reinterpretation of Assigned Goals
We interviewed the agents, or in some cases representatives of the agent role, on their interpretation of the goal for the services they provided. All agents are able to come out with a goal interpretation of a service without being primed (i.e., given the questionnaire).

<table>
<thead>
<tr>
<th>Objects</th>
<th>Services</th>
<th>Agent's Interpretation of Goals for Services they perform</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCC: CO-OP Assistant</td>
<td>Scan jobs, post, and mailing applications in bundles</td>
<td>Verify that job is posted.</td>
</tr>
<tr>
<td></td>
<td>Verifying job applications</td>
<td>To perform this task in a limited time.</td>
</tr>
<tr>
<td></td>
<td>Processing Co-op applications and informing students of job availability</td>
<td>Verify that the job posted is done within minimum time.</td>
</tr>
<tr>
<td></td>
<td>Verifying students grades with their transcripts</td>
<td>Ensure all criteria are checked.</td>
</tr>
<tr>
<td></td>
<td>Set up interview slots and rooms and checking schedules</td>
<td>To deliver this service promptly.</td>
</tr>
<tr>
<td>ICEMAN</td>
<td>Scan and verify job types and generate alert of verifications</td>
<td>To provide communication between the employer and the BCC Assistant.</td>
</tr>
<tr>
<td></td>
<td>Match jobs and search criteria with jobs posted</td>
<td>To provide prompt service.</td>
</tr>
<tr>
<td></td>
<td>Bundling all Co-op applications</td>
<td>To perform this task within the desired time frame.</td>
</tr>
<tr>
<td></td>
<td>Setting up interview slots and alerting students to sign up for available slots</td>
<td>To provide prompt service to students.</td>
</tr>
<tr>
<td>BCC Assistant Manager</td>
<td>Gathering details for events</td>
<td>Get the required information for scheduling the event on time and on budget; Event should be hosted in a seamless desired manner.</td>
</tr>
<tr>
<td></td>
<td>Provide career service</td>
<td>Create a rich pool of student –develop students professionally by keeping them updated in their career activities.</td>
</tr>
</tbody>
</table>

We further requested the agents to elaborate on their ‘short answers’ (e.g., to deliver this service promptly). After this, we compared agents’ elaborated responses with their previous answers and questioned the agent as to which response are they more comfortable with. In some instances, the agent expressed that they were more comfortable with the ‘short answers’. In those cases, we
retain the condensed responses. Table 2.5 summarizes each agent’s interpreted goals for the services he/she provides.

Following the elicitation process, we applied Guiding Principle 5 on the elicited goal constructs. Only after applying this guiding principle did we uncover other issues (e.g., the importance of eliciting requirements for reports), which to the best of our knowledge, were never explicated in RE literature. In a traditional setting, corporate executives, after conducting business analyses (e.g., cost-benefit analysis), will determine the feasibility of implementing a technological system. Often these benefits are viewed at an abstract level. Very rarely, are there clear directions of how the IT system will contribute towards strategic goals. The exact same problem was encountered in the study: the executives confessed to difficulties in identifying the exact strategic goal(s) towards which the technological system will contribute.

Conceptually, the business executives were aligning the services provided by the ‘primary’ users with the realization of strategic goals. These low-level requirements were insufficient for explaining how the technological system will contribute towards strategic goals. Employing an adaptation of the i* notation, Figure 2.6 presents a mapping of ‘primary’ agents, agents’ interpretation of the assigned goals, the set of original assigned goals, the strategic goals and the organization vision.

After consulting with business executives, we realized that there were other agents, who are frequent users of the system, but were overlooked by the executives during requirements elicitation. These include managers who will be utilizing the system for forms and reporting purposes as non-essential users. Because the executives were convinced that the bulk of transactions were accomplished downstream, only downstream users were consulted in requirements elicitation as they were believed to be sufficient in supplying the requirements for the system. After we extended the domain to include ‘all’ possible users, we discovered that we were able to close the missing gaps.

After agents’ interpretation of the assigned goals were tagged to the original assigned goals, which were in turn mapped to the strategic goals, we highlighted those goals that appear to be negatively related, i.e., goals that are conflicting, incomplete and/or inconsistent in representation. Executives were consulted, and agents who provided descriptions of their goals
were invited for another round of discussion to resolve negatively correlated goals. Incomplete goals were rewritten following amicable solutions. Conflicting and inconsistent goals were removed or redirected. The discussion also helped in identifying goals that contribute, depend or refine other goals. This process also allowed us to detect relationships between assigned goals and strategic goals. Figure 2.7 outlines an overview (using i* notation) for mapping system requirements goals to the organization’s strategic-level goals.
Figure 2.6: Decomposing Strategic Goal and Attaching Agent’s Interpretation of Assigned Goals to Assigned Goals

Legend for Figure 2.6 and 2.7

- Actor
- Goal
- Soft Goal
- Unclear contribution
- Contributes to
- + Contributes positively to
Figure 2.7: Mapping IT Goals for the Services (Students Applying for Job) to Strategic Goal (Employers Hiring more of our Students)
2.8 Lessons Learned

In the remainder of this section, we present lessons learned from the case study. We believe that these findings will be of interest to both practitioners and researchers.

Lesson Learned #1: Distinction between assigned goals and agents’ interpretation of the assigned goals is more pronounced at middle management than at the high and low levels of the organization.

The 3g framework explicitly helps analysts to detect misalignments between assigned goals and agents’ interpretation of assigned goals at any level of analysis whether at the low level, middle or senior management levels. This is different from approaches in the MIS discipline that tend to focus on detecting misalignments at the higher end of the organization, and approaches in the RE discipline that tend to focus on detecting misalignments at the lower end of the organization. One of the reasons why the 3g framework was able to detect misalignments at the middle management while other approaches have not is because we introduced the concepts of assigned goals and interpreted goals. The case study revealed after the consideration of assigned and interpreted goals that the misalignment phenomenon is especially pronounced at the middle management level.

A probable reason for the apparent discrepancy between original assigned goals and middle managers’ interpretation of those goals may be attributed to managers’ flexibility and autonomy in structuring business processes. We discovered that middle level managers tend to focus on “how” to accomplish a given task in a manner that realizes the associated strategic goal, but in so doing, may alter the initially defined pattern or sequence of tasks. Similar findings have been found in the strategy literature where researchers claimed that business units are accustomed to ‘doing things’ their own way, which may not be always congruent with firm’s vision and goals. The tendency of stakeholders to do things in a partisan fashion, which may lead to incongruency with firm strategy, is referred to as ‘loose coupling’ (Orton and Weick 1990; Pfeffer 1978). At this juncture, it should be clarified that while we are not suggesting that middle managers are engaging in delinquent behaviors, we do point to the need for analysts to place greater emphasis on the middle management level when gathering goals because it is at this level that agent’s interpretation of assigned goals may vary the most from the actual assigned goals. This emphasis
on middle management in eliciting system requirements has never been explicated in the RE field to the best of our knowledge and necessitates further research.

**Lesson Learned #2: To understand business strategy within RE frameworks, the constructs of Strategic Choice and Strategic Process should be included in existing RE frameworks.**

In exploring the strategy literature and current business practices, we uncovered four principal constructs that model and contextualize strategic goals (i.e., vision, strategic choice, strategic processes and resources). While RE scholars have attempted to incorporate strategy components into goal-based frameworks, few if any, have included constructs other than strategic goals. We found that strategic goals alone were limited in their scope to resolve conflicts, obstructions, and inconsistencies among low-level goals. One possible reason for this limitation may be attributed to the level of abstraction and lack of sufficient context within strategic goals. For example, one of the strategic goals in the case study was “To be ranked high enough so that we are in the radar of consideration by most international students”. This goal by itself does not say much as to what the intended outcome(s) should be at a strategic level. In the absence of contextual information, it becomes a challenge in using the strategic goal to resolve conflicts, obstructions, and inconsistencies among low-level goals. This challenge however was minimized greatly after considering other strategic level constructs such as the vision “To be ranked high enough so that we are in the radar of consideration by most international students” and the strategic process “offering MBA courses at geographical locations outside of the main campus”. Analyzing the strategic process, which is related to the strategic goal, we derive what are some of the intended outcomes of the system. An example of an intended outcome in the case study is to make provision within the system to include possible recruitment opportunities outside of the university.

**Lesson Learned #3: Due to differences in the level of abstraction between operational and strategic goals, there exists a need to better organize goals among abstraction level (i.e., better definitions of abstraction levels, and new types of refinement mechanisms) when establishing alignment between system requirements and business strategies.**

When running the case study, we realized that consultations with executives and agents were insufficient for aligning goals across vastly different abstraction levels (i.e., goals existing at the
higher-level strategic level versus goals existing at the lower-level operational goals). We espoused a technique that blends ‘why’ and ‘how’ approaches, as recommended by Penker and colleagues (2000), to map low-level operational goals to high-end strategic goals. This approach however is informal, provides very little structure, and offers limited contextual understanding on how goals can be aligned. Rolland et al.’s (1998) prescribed representation of a goal was instrumental in resolving ambiguities, conflicts, and inconsistencies. Although Rolland et al.’s (1998) approach renders it much easier to map semantics of goals that were consistent in representation (e.g., mapping a target and a direction from one goal mapping to a target and direction of another goal), it is still handicapped in its ability to reveal immediate predecessor and successor goals. From our experiences in practice and in the case study, we discovered that a goal graph is a useful method for mapping process level goals to strategic level goals, where predecessor goals are nodes that precede and contribute to a node \( n_i \) in the goal tree and successor goals are nodes that a node \( n_i \) contributes towards. Many organizations operate on varying degrees of success even when their stakeholders have varying perceptions of the organization’s assigned goals. We believe that it is reasonable to assume some of these stakeholders have a deep and accurate understanding of how tasks are linked to higher organizational outcomes. These stakeholders can potentially overcome the deficiency of others in the organization. Therefore, we argue for an approach that connects each goal with its predecessor and successor goals as well as relating them to a higher level set of predecessor and successor goals. This connection is posited to reduce goal variances by making sense of associated goals across different organizational levels.

Lesson Learned #4: Contributions of low-level system requirements to business strategies are real but often imperceptible, and, for this reason, it is crucial to understand low-level requirements when one seeks a deeper insight into business-IT alignment.

We further observed from the case study that while it is not necessary to elicit every lower-level goal (e.g., the goal for setting up an interview), some of these do offer reinforcement to the eventual realization of strategic goals. For example, in Figure 2.6, the goal “analyze the jobs that were posted by the employers and preparing them in a bundle to be emailed to students” does indicate a relationship to the strategic goal “employers hire more of our students”. Mapping of such detail and granularity offers contribution along several theoretical dimensions. For example,
the approach can be adopted for fostering ‘line of sight’ – the BCC Co-op Assistant will now be able to relate and understand how the simple task of “Scan jobs, post, and mailing applications in bundles” contributes to the firm’s strategic goal. Stakeholders who are aligned with the firm’s goals become more proficient in their tasks and participative in their behaviors (2004), thereby leading to timely decisions, commitment and increased job satisfaction (2001).

From a reengineering angle, the mapping of low-level goals to high-level strategic goals illuminates conceivable traces that will benefit system analysts considerably. Analysts will be able to identify the services that are salient in realizing strategic goals, and be made aware of these services in the reengineering processes. Likewise, if changes are made to the strategic goals and processes, they can be traced to the relevant services for modification. In the study, we further noticed that business executives’, agents’, and analysts’ understanding of the degree of alignment remained high as goals corresponding to system requirements were mapped. This understanding was strongest at the lowest level (i.e., actual system requirements level). As we progressed upwards (i.e., from goals of distinct requirements to goals of sequence of requirements or business processes), the cognitive process required for comprehending how each goal contributes to another remains minimal. This is probably attributable to a maturation effect, i.e., the building blocks of lower-level goals are still fresh in the minds of strategists and analysts, thus facilitating an easy construction of a holistic picture of the organization.

2.9 Conclusion and Future Work

Examining business-IT alignment from multiple disciplines revealed that alignment is conceived differently in the various disciplines, and while there are some overlaps, there are also certain issues that are exclusively investigated by some disciplines while ignored by others. Failing to synthesize alignment concerns across various disciplines was argued in this chapter as a probable reason behind why achieving business-IT alignment is still ranked as a top priority for business executives. This chapter assimilates literature from the MIS, RE, personnel psychology, and human-resource disciplines in an attempt to advance a unified framework (the 3g framework) for evaluating business-IT alignment.
Past literature from each discipline was surveyed through the lens of alignment and/or goals. In the MIS discipline, the dimensions of business-IT alignment research were classified under the four categories of intellectual, social, cultural and structural. These dimensions tend to evaluate alignment at a high-level view within the organization. Though some frameworks in the RE literature claimed to assess business-IT alignment from a high level view, none articulates how or which constructs will address the aforementioned three dimensions (i.e., intellectual, social, and cultural). We were able to address these dimensions by considering both interpreted and assigned goals in our approach. We argued that comparing assigned and interpreted goals will help in determining whether there are misalignments in the organization which are attributed to varying intellectual viewpoints, cultural differences, or social differences.

In the strategic management and human resource management literature, strategic goals are an important construct in strategic planning activities and are employed to guide the realization of the organization’s vision. To better understand the context of this construct, it was necessary to understand the relationships between the strategic goals and other high level constructs (e.g., vision, strategic processes, and resources). While RE frameworks utilized the strategic goal construct, very few included the relational mapping. The ‘line of sight’ paradigm is a predominant theme in strategic management and human resource management literatures for evaluating alignment. However, very little if any, research in RE acknowledges and addresses this issue. If stakeholders are unable to relate to the objectives of the firms and incongruency exists between the firms’ expectations and stakeholders’ interpretation of those expectations, then it is highly unlikely that stakeholders will provide system requirements that are aligned to the organizational goals.

The 3g framework presented in this chapter systematically draws upon modern knowledge from the MIS literature, as well as the restrictiveness of business-IT alignment in the GORE domain. In creating an operational framework that is representative of the ‘line-of-sight’ paradigm and the RE domain, we connect and integrate themes from organizational strategy (e.g., vision, strategic goals, strategic processes), human resource management (e.g., assigned and interpreted goals), and business process (e.g., actors and tasks). An in-depth analysis of the domain allowed us to isolate a minimal set of constructs that explain the context of the strategic goals (e.g., vision, strategic choice, strategic processes and resources). Not all organizations have documents
on these constructs nor are all analysts’ experienced in gathering information pertaining to these constructs. For inexperienced analysts, we offer a questionnaire that will support the elicitation of strategic goals whenever documents are not available within the organization. To represent the RE domain, we present a set of constructs that were selected based on the principal means (actors, tasks, resources) for realizing the achievement of organizational goals. The selection of these constructs generated the additional context within this domain for understanding goals, which are related to the IT system. Constructs within the two domains are bridged by utilizing assigned and interpreted goal constructs. Assigned goals emerging from the business process theme are utilized as the main source of linkages between strategic level and process level constructs.

In summary, the 3g framework is capable of: (i) representing different levels of organizational objectives, and; (ii) comparing organizational goals assigned to agents implicitly or explicitly against agents’ interpretation of those goals. Business practices and multi-disciplinary research (in strategic management, human resources, RE, and personnel psychology) offer the theoretical grounding for the framework’s constructs and relationships. A single case study highlighted the usefulness of the 3g framework. The case study was linked to the framework through the operationalization of five guiding principles, each focusing on a different context representation. For example, guiding principle #1 focuses on the process of eliciting strategic level constructs, Guiding Principle #2 enables the elicitation of low order constructs i.e., agents and activities (tasks), etc. The lessons learned after applying the 3g framework and its guiding principles served as a way of answering the research question that was proposed in the introduction section. In particular, the case study showed:

- by integrating assigned and interpreted goals (guiding principles #3 and #4), we were able to find that misalignments are more pronounced at the middle management level (lesson learned #1);
- by incorporating strategic level constructs (i.e., strategic choice and strategic process) using guiding principle #1, we were able to resolve conflicts and inconsistencies when aligning the operational goals with strategic goals (lesson learned #2);
by incorporating strategic level constructs in the mapping process (guiding principle #5), we were able to discover the insufficiency of existing techniques (e.g., asking how and why questions) in aligning goals (lesson learned #3);

by mapping these strategic constructs to low level operational goals (guiding principles #2 and #5), we were able to identify the importance and relevancy of tasks towards the overall operation of a business or company (lesson learned #4).

The above shows that the distinction of assigned and interpreted goals as well as the strategic level constructs in the 3g framework assisted us in understanding the links between task goals and strategic business goals.

Findings from this research must be interpreted in caution given that they are derived from a single case study. The case was applied in an academic environment and as such, we cannot extrapolate our conclusions beyond this context. Essentially, our proposed framework assumes that business strategies influencing technological systems are either available or can be readily elicited from the organization.

Lessons drawn from the case study generated several viable avenues of future research. First, we need a methodology to understand the coherency of system requirements at different levels of the organization (Lessons Learned #1 and #3). In order to develop this methodology, we require: (1) a deeper understanding of how assigned goals deviate at the middle management level (by reviewing related literature in various disciplines and performing extra case studies), (2) ways of capturing and representing the context of this deviation, and (3) an approach to align technological systems goals onto the strategic goals. Goal graphs, which are widely used in Artificial Intelligence, for example, (Hong 2001; Lesh and Etzioni 1995), can serve as examples of such a methodological approach. The approach for mapping goals can assume three types of goals when mapping goals at the operational level with goals at the strategic level. Goals at the operational level can form into two goals graphs, assigned and interpreted, and goals at the strategic level can form the third goal graph. Corresponding nodes in the two operational goal graphs could be compared against each other as well as against the nodes in a strategic goal graph. This form of comparison could illuminate differences among misaligned goals. The mapping of goal nodes in a hierarchical manner and the discovery of misaligned nodes will
probably offer sufficient context that will deepen our appreciation of alignments and misalignments.

Second, we require a methodology for eliciting assigned goals from stakeholders at different organizational levels (Lesson Learned #3). For the development of this methodology, we need to incorporate frameworks for eliciting goals from disciplines that provide richer descriptions of the different contextual levels inherent within organizations such as performance indicators in a work system scorecard (Alter 2006).

Third, it will be useful to test factors that lead stakeholders to have inaccurate interpretations of IS assigned goals (Lesson Learned #1). Factors such as experience and motivation, which have been studied in psychology and human resource management literature, might serve as valid constructs in future studies. It might also be interesting to consider how different types of information systems (e.g., transaction processing systems, management information systems and decision support systems (Baltzan and A. 2008)) are impacted by the degree of discrepancy between assigned goals and stakeholders’ interpretation of them.

Finally, some organizations adopt a structural approach that is biased towards management directives (top-down), while in other organizations approaches are adopted where the directives are driven differently. We found from the case study that misalignments between assigned and interpreted goals are predominant at the middle management level, where the culture of the organization is biased towards management by directives. In future research we intend to explore whether this phenomena is similar or different in organizations where decision makers define strategies differently and directives are driven heterogeneously (for example, managers adopting a bottom-up approach to define the business strategy).
2.10 References


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CHAPTER 3
ALIGNING BUSINESS-IT REQUIREMENTS: AN INVESTIGATION OF FACTORS THAT INFLUENCE THE ALIGNMENT BETWEEN USERS’ ASSIGNED GOALS AND THEIR INTERPRETATION OF THOSE GOALS

3.1. Introduction
The primary measure of success for an information system in an organization is the degree to which it meets the purpose for which it was intended (Nuseibeh and Easterbrook 2000). Often this purpose is defined at the strategic level of the organization; examples of such purposes include providing competitive advantage, reducing costs and increasing customer service. The technology realizes this purpose through functionalities embedded within the system. These functionalities are derived from the needs of the users of the system. Identifying the users and documenting their needs in a form that is amenable to analysis, communication and implementation is often a challenging task however, and as a result the system may not fulfill the strategic needs of the organization.

Nuseibeh and Easterbrook (2000) stated that users’ requirements may vary and conflict depending on their perspectives of the environment in which they work and the tasks they wish to accomplish. Furthermore, these requirements may not be explicit or may be difficult to articulate due to organizational complexity (which includes core processes, technology, specializations and differences in user’s norms and beliefs). Clearly, the literature suggests that there are several challenges in discovering requirements that are correct. We define correct requirements as those that are aligned with the requirements set by the organization, i.e., requirements set by executives and managers that, if executed as intended, will fulfill the strategic objectives. If users provide requirements to analysts that are incomplete and inaccurate, then the system will likely fail to meet the purposes for which it was intended.

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2 A version of this chapter will be submitted for publication. Singh, Burton-Jones and Woo “Aligning Business-IT Requirements: An Investigation of Factors that Influence the Alignment between Users Goals and their Organization Goals”.

[67]
Vancouver and Austin (1996) stated that when users are provided with a set of assigned goals (i.e., goals that are given to them by executives and managers) they often internalize those goals in varying degrees. The degree of their internalization is a consequence of several factors, including user characteristics such as level, experience, functional area (Strahle et al. 1996), ability, past success, task complexity, performance constraints, and the perceived importance of the job (Hollenbeck and Howard 1987).

In this study, we explore what similar factors might influence the requirements and work goals that users describe to systems analysts. We define requirements as tasks to be automated by the information system, and work goals as the desired outcomes of the task. The requirements are thus the means to an end and both describe and contextualize what it will take to operationalize the work goal. It is our contention that rather than merely investigating what past literature has said regarding the factors that influence work goals, it will also be useful for the RE discipline to investigate factors that influence the description of both the requirements and work goals.

We believe that an awareness of these factors will aid systems analysts in discovering correct requirements and work goals. For example, instead of eliciting requirements and work goals from every user, an analyst could target only those users who are most likely to describe the correct requirements and work goals. In this chapter, we argue that if users are able to perform well on their tasks, then they are more likely to be able to describe the correct requirements and work goals for those tasks. Building off this premise, we intend to examine empirically whether factors similar to the antecedents of task performance will influence the quality of requirements and work goals that users describe to systems analysts.

Traditionally, elicited requirements were used as the main source for determining the needed functionalities of the intended system. Over the last few years, requirements engineers have found that eliciting goals (i.e., requirements and work goals) for the requirements provides additional context to systems analysts when seeking to understand the desired contribution of the technology in the organization. Being able to compare requirements and work goals across the organization helps analysts to evaluate the alignment between the functionalities of the intended system and the strategic intents for that system because requirements and work goals may subsume distinct concepts such as systems functionalities and business processes.
The remainder of the paper is organized as follows. Section 2 reviews past literature and discusses the theoretical foundations of the study while Section 3 describes the task performance models which form the cornerstone for the research question. Our research model and hypothesis are presented in Section 4. Section 5 then outlines the design of our empirical study and explains the constructs and relationships in our proposed model. Section 6 goes on to discuss the results of the experimental study and Section 7 summarizes and discusses the findings from the investigation. Sections 8 and 9 conclude the paper by highlighting the limitations of our experiment and suggesting avenues for future research.

3.2. Challenges of Eliciting Correct Requirements from Users

In this section, we discuss the typical approaches adopted by analysts in gathering requirements from users and we will show that these approaches merely elicit the internalized, not the assigned work goals, and requirements. The consequences of eliciting requirements and work goals that vary widely from assigned requirements and work goals will be shown by reviewing literature in several disciplines. Our discussion of these issues will establish the platform that grounds our investigation of the factors that influence users to provide incorrect requirements and work goals. Requirements elicitation is the process of gathering and modeling information about the required functionality of a proposed system (Browne and Rogich 2001). According to Browne and Rogich (2001), eliciting requirements from users is a critical activity in systems development. While a number of strategies exist for eliciting requirements (Davis 1982), the most popular is interviewing those who will be using the system (Agarwal and Tanniru 1990; Byrd et al. 1992). Kendall and Kendall (1995) stated that structured interviewing is the preferred method for conducting interviews. During such sessions, users are asked about the procedures they follow and the types of information they need to perform their tasks (Davis 1982). Requirements are typically obtained by asking a set of direct questions designed to cause a user to attend to and focus on a particular type of information (Fischoff and Ber-Hillel 1984). The use of direct questions is intuitively appealing because of the natural inclination to ask users what they want or need in a given situation.

During the requirements elicitation process, analysts and users each conceptualize the problem task environment. Newell and Simon (1972) referred to these conceptualizations as “problem
spaces.” When determining requirements, the user’s problem space contains information recalled from long-term memory in response to the needs of working memory. However, the requirements elicited from users long-term and working memories are influenced by factors such as the failure to recall information from long-term memory, cognitive bias, and the inability to articulate routinized procedures (Robillard 1999). These findings are supported by Browne and Rogich (2001), who claimed that for a variety of cognitive, communicative, and motivational reasons, the information (requirements) ultimately received and understood by analysts is generally inconsistent and incomplete.

The challenges of gathering requirements that are aligned with business strategies are further compounded by the inability of some users to explain how their work contributes to the organization for example, a sales clerk explaining how the tasks he/she performs contributes to the organization’s higher goal of making a profit. Business executives are making an increased effort to assist users in understanding and articulating the organization’s mission and to educate those users about their contributions toward the achievement of the organization’s goals (Boswell and Boudreau 2001). Boswell et al (2006) argued that users’ contributions to the larger goals of the organization often depend in part on whether they understand those larger goals. Other studies make similar claims. Kristof (1996) stated that a user understanding organizational goals often leads to improved outcomes as those users are more likely to do the right things. Conversely, users who are not aligned with the organization’s work goals adversely affect the performance of the organization (Witt 1998) because those users may develop other goals which could interfere with the organization’s functioning and strategic position (Guzzo and Shea 1991). Further, Jensen and Meckling (1976) used agency theory to explain that a divergence of interests may exist between users and principal business managers. There are also social, cultural and political reasons to explain why users interpretations of goals maybe different from the assigned goals (for example, employees feeling that managers are exploiting them, or employees deliberately shirking their work). The considerations of the social, cultural and political aspects however are beyond the scope of this chapter.

The user’s ability to see the link between the tasks they perform and the contribution of those actions towards the realization of organizational strategic goals is termed “line of sight.” Boswell and Boudreau (2001) explain that the “line of sight” paradigm not only refers to actions but also
to “accurate actions” that the users should take in realizing the strategic goals. Aligning users with common organizational goals produces synergy and compatibility in organizational direction and ultimately translates to strategic success (Boswell et al. 2006). According to Boswell (2006), the “line of sight” paradigm can be grounded in control theories, where control is defined as any process that helps an individual’s action align with the interests of the organization (Tannenbaum 1962). Users who are high in “line of sight” better understand the work they perform and how that work affects organizational success. Hatch and Dyer (2004) concluded in their study that users who are aligned with the organization’s goals become engaged in their tasks and behaviors. Boswell and Boudreau (2001) found a strong correlation between “line of sight” and user’s job satisfaction, timely decisions, and commitment. Using a survey, these authors found that when users are able to relate their work to strategic goals there are significant improvements in business process activities such as better service behaviors, and greater efficiency and consistency in task execution.

While the underlining concept of “line of sight” may seem simple and the effects of its attainment may be intuitive, there are several factors that strongly inhibit its realization such as hierarchical level, tenure, the number of positions the user has held within the company. There is a wealth of literature in the personnel psychology and strategic management disciplines which, though it does not explicitly address “line of sight,” nevertheless, supports the paradigm. For example, studies show that when users are given assigned goals either implicitly or explicitly, their level of acceptance varies from totally accepting the goal without changing it, to redefining or reinterpreting it, to totally rejecting it (Campion and Lord 1982; Elliott and Dweck 1988). Vancouver and Austin (1996) stated that assigned goals are essentially meaningless because what matters is how these assigned work goals are internalized as “desired states” in users’ minds. In many instances, managers are not aware of the “desired states” of users or whether these internalizations are aligned with their assigned goals.

The importance of understanding how accurately users internalize assigned work goals is paramount for systems analysts when eliciting technology requirements and work goals and when aligning the elicited requirements and work goals with the business strategies of the organization. In section 3.3, we use a literature review to examine the antecedents of task performance in the organization. Task performance can be defined as the quality of behavior
associated with completing a unit of work. Synonymous to task performance is job performance, which is defined by Campbell (1983) as the degree to which an individual helps an organization to reach its goal. The following section will discuss several factors that influence task performance. We believe that these factors correlate with the factors that influence the type of requirements and work goals that employees describe to systems analysts. There is a primary difference however, between the research examining factors that predict task performance and our research. The predictors of task performance focus on the factors that affect the outcomes of executing observable activities, while our research focuses on the factors that affect users’ description of tasks and work goals. It is extremely critical for employees to describe tasks and work goals accurately in the requirements elicitation process, for these descriptions are used to implement the information system. Of course, just because an employee performs a task well, it does not necessarily mean that the employee can explain that task well to a system analyst. The presence of tacit knowledge, or knowledge embedded within us that is not easily accessible to consciousness, is one possible reason why employees may not be able to explain a task and work goals accurately even though they perform that task well. Nevertheless, we suspect that the predictors of task performance are possible factors that influence users’ description of requirements and work goals.

3.3. Task Performance Models
Performance outcomes are measured by researchers in terms of task proficiency, task performance or overall work. In this chapter we make the assumption that a task as a piece of work that when completed contributes to the strategic goals of an organization. The degree of contribution of the task to the strategic goals however, is beyond the scope of this chapter. This definition is consistent with the task categorizations of Card and colleagues (1983). They define a task as a single element or a piece of work of a unit plan and state that a task can be categorized as a basic unit or composite type. In this thesis, we argue that a task is a decomposition of a strategic goal and achieving the outcomes for a task is similar to achieving the goals for that task. Based on this argument and the concept of “line of sight,” we contend that for a user to attain high task performance or high task proficiency, it is necessary for the user to understand the assigned work goals for the task being performed.
In this section, we review literature that examines the predictors of task performance and task proficiency. During our review, we found that ‘task performance,’ ‘task proficiency,’ and ‘performance’ were used synonymously in this context and for the sake of consistency we will use ‘performance.’ In reviewing each of the models, we present the context of the research, the independent variables predicting performance, and the findings (if any) for each study.

3.3.1 Review of Task Performance Models

- Benford and Hunton (2000) presented a theoretical model of performance that considered the impact of task/technology fit. The model expanded the set of individual determinants of decision making in accounting to include task/technology fit and mental workload. Though the authors did not test the model, they claimed that the central theme of the model related to task and technology complexities that can impose high mental workloads on individual decision-makers. The direct indicators of performance as suggested by the model include: Task/Technology Fit, Task Knowledge, Ability, and Motivation (as a moderating variable).

- Libby and Luft (1993) traced the roles of Ability, Knowledge, Motivation, and Environment as determinants of decision performance in accounting settings. In their review, the authors outlined research principles described in an accounting setting and concluded that the determinants of performance interact; they argued that an understanding of those interactions requires an understanding of basic cognitive processes and an examination of task, psychological and accounting theories.

- Motowidlo and colleagues (1997) presented a theory of job performance. Their theory attempted to incorporate Task Habit, Task Skill and Task Knowledge with task performance and contextual performance. Task performance is assumed to be behavioral, episodic, evaluative and multidimensional. The authors stated that there are individual differences in task and contextual performance. In addition to these differences, the authors argued that the frequency and contribution value of behavioral episodes in the performance domain are determined directly by relevant Knowledge, Skills, and Work Habits.

- Lance et al. (1989) tested several hypotheses predicting task-level performance. The hypotheses stretched across individual and situational-level (task-level) variables, as well as interactions between the characteristics of task performers and the tasks being performed.
The indicators used for testing task-level performance included Ability, Experience and Task Difficulty and the authors found that these were indeed predictors of task performance.

- Maynard and Hakel (1997) stated that performance on a task depends on the objective complexity of a task and upon one's perception of the task’s complexity. The study investigated the influence of Cognitive Ability, Motivation, Subjective Task Complexity, and Task Experience on performance for objectively simple or complex scheduling tasks. The findings revealed that when controlled for cognitive ability, both objective and subjective task complexity were significant predictors of task performance.

- Locke and colleagues (1984) examined the effect of Self-efficacy, Goals, and Task Strategies on goal choice and task performance. The authors found that ability, self-efficacy, goals, and task strategies were all related to task performance and that self efficacy was more strongly related to past performances than to future ones.

- Hollenbeck and Howard (1987) developed a model of the goal commitment process. Scholars in organizational literature (Locke et al. 1981) had previously argued that setting goals and employee commitment to those goals lead to a higher level of performance. Using expectancy theory, Hollenbeck and Howard identified several antecedents and consequences of goal commitment. According to the model, goal levels (difficulty or easy) predicts task performance with goal commitment as a moderating variable. The antecedents of goal commitment include: Ability, Task Complexity, Performance Constraints, Past Success and Rewards Structures.

- Schmidt et al. (1986) examined Job Experience, General Mental Ability, and Job Knowledge as predictors of work performance. The authors found that when mean length of job experience is absent there is considerable variance in job performance. Further, they stated that job experience has a substantial direct impact on job knowledge and a smaller direct impact on performance capabilities.

3.3.2 An Analysis of the Variables that Commonly Appear in Task Performance Models

Although our review of the literature concerning performance models in the organization has not been exhaustive, it has consistently shown a set of common predictors of performance. We found that each study mentioned at least two of the three factors of Motivation, Experience and Complexity in their proposed models or reviews of performance.

Those who discussed motivation in their models defined it consistently and made very little distinction between intrinsic and extrinsic motivation. One stream of motivation literature argues that incentives that are offered to extrinsically motivate employees do not always influence performance, while another stream disputes this claim. Kohn (2000) pointed out that “rewards do not create lasting commitment. They merely and temporarily change what we do” (pg. 2). Given that describing tasks is a short-term activity, we suspect that the incentive scheme will work in our scenario.

Conversely, when studies discussed experience and complexity their use of terms varied. For example, when describing experience the terms Task Knowledge and Ability were used by Benford and Hunton (2000); Ability and Knowledge were utilized by Libby and Luft (1993); Task Skill and Task Knowledge were adopted by Motowidlo and colleagues (1997); Ability and Experience were examined by Lance et al. (1989); Cognitive Ability and Task Experience were used by Maynard and Hakel (1997); Ability was taken on by Hollenbeck and Howard (1987); and the terms General Mental Ability and Job Knowledge were chosen by Schmidt et al. (1986). On the other hand, the concept of complexity was discussed either through the use of Task Complexity (Hollenbeck and Howard 1987) or Task Difficulty (Lance et al. 1989).

The varied use of the terms surrounding experience necessitates more discussion on the subject. Ability was defined by Campbell and Campbell (1988) as the stable characteristics of individual that make it possible for people to learn or execute certain cognitive, psychomotor, or physical behaviors characteristics such as general verbal ability, mathematical aptitude, eye-hand coordination, or upper body strength. According to Nicholls (1984), levels of ability are judged in relation to an individual’s own perceived mastery, understanding, or knowledge. The more individuals feel they have learned, the more competent they feel. Schmidt et al. (1986) found that higher ability leads to increased acquisition of job knowledge. Knowledge content may consist of
world knowledge, general domain knowledge, or task-specific knowledge (Bonner and Lewis 1990). The specific task at hand dictates the importance of each of these knowledge subsets, though all consist of both declarative and procedural knowledge.

Bonner and Walker (1994) stated that declarative knowledge (specific factual information) is acquired prior to procedural knowledge. Declarative knowledge may be learned through reading, education and training, while procedural knowledge (how one applies factual information in a given circumstance) is acquired primarily through practice and feedback. Libby (1995) classified experience as either firsthand (e.g., task completion, reviewing work of others, process feedback, and outcome feedback) or secondhand (e.g., education, training, reading audit guides, and discussion with colleagues). The primary determinant of procedural knowledge is firsthand experience, while secondhand experience is the primary determinant of declarative knowledge.

While ability, knowledge and experience are constructs with different properties, the literature has shown that these constructs relate and contribute to each other. This research shows that there is an overarching construct with the potential to influence a user’s understanding of the goals that are assigned to him/her. For the sake of simplicity, we will define this construct as ‘experience’ and will explain its properties in the next section.

Next, we turn to complexity as the variance within the literature’s discussion of this concept also requires more explanation. The complexity of an organization is relative to the structure of the organization and the tasks performed within that organization. Baccarrni (1996) claimed that an organization with a structure that is complex contains a number of differentiated parts-the greater the differentiation the more complex the organization. The author describes two dimensions of differentiation: vertical and horizontal. Vertical differentiation refers to the depth of the organization, i.e., the number of levels (Beyer and Trice 1979), while horizontal differentiation refers to the number of formal organizational units or the division of tasks (Bubshait and Selen 1992).

The complexity of each level is relative to the difficulties of the tasks at that level. Bystrom and Jarvelin found that task complexity or difficulty is one of the most significant factors affecting task performance (Bystrom and Jarvelin 1995). A task’s degree of difficulty can be classified as either simple or difficult. Simple tasks are routine information-processing tasks where the inputs,
process, and outcomes can be determined a priori; difficult tasks are new and genuine decision-based tasks for which these things cannot be determined a priori (Van de Ven and Ferry 1980).

Task complexity can be further conceptualized into three categories: a psychological experience (subjective complexity), a task characteristic (objective complexity), or an interaction between a person and a task (Campbell and Campbell 1988; Maynard and Hakel 1997). Subjective task complexity is thought of as the task solver’s perception of the task’s complexity or their assessment of the task (Braarud 2001). On the other hand, objective task complexity is defined as a function which depends strictly upon the characteristics of the task to be performed (Gill and Hicks 2006). Complexity as a person-task interaction is viewed by Campbell (1988) as a middle-of-the-ground characterization in which a person simultaneously acknowledges their capabilities in performing the task (subjective) and the complexities of the task itself (objective).

Wood (1986) offered a slightly different view of categorizing task complexity as he differentiates it into component, coordinate and dynamic complexity. Component complexity is defined as a direct function of the number of distinct activities that need to be executed in the performance of a task and the number of distinct information cues that must be processed in the performance of those acts. Coordinative complexity refers to the nature of relationships between task inputs and task products. The form and strength of the relationships between information cues, acts, and products, as well as the sequencing of inputs, are all aspects of coordinative complexity. The dynamic complexity of a task is relative to the parameter values of the relationships between task inputs and products which are all non-stationary. Changes in either the set of required acts and information cues or the relationships between inputs and products can create shifts in the knowledge or skills required for a task.

Overall, past literature suggests that complexity is relative to both the structure of the organization and the difficulty of the task. According to these classifications, the task of an executive level employee, such as a vice-president increasing market share, should be more complex than the tasks performed by any employees at the middle management or operational levels that are related to that task. In our review, we have also seen the importance of the constructs of motivation, experience and complexity for predicting task performance. We have argued that there is similarity between indicators of task performance and predictors of the
alignment of users’ interpreted and assigned requirements and work goals. However, it is still unclear whether the predictors of task performance are the same as the predictors of the quality of users’ description of their requirements and goals for that task. This uncertainty forms the premise for our investigation and allows us to propose an investigation of the following research question:

“Do users’ motivation and experience and the complexity of their tasks influence the degree of alignment between the requirements and work goals that users describe to systems analysts and the requirements and work goals the organization has assigned to them”

We believe that users who are motivated with some form of incentives and are more experienced at their job will be able to describe the requirements and work goals of tasks to systems analysts better than those who are less motivated and inexperienced. Experienced users are arguably more knowledgeable and have deeper insights into the tasks they perform and for this reason will able to describe their requirements and work goals better in terms of context and accuracy than the inexperienced users.

Tasks are dynamic and require a varying number of cues (pieces of data) to complete, the more complex the greater number of cues. In order to implement an IT system it is necessary that these cues be explained precisely and in detail. For this reason, we suggest that the more complex a task, the more difficult it will be to achieve alignment between users’ described requirements and work goals and those assigned to them. This form of complexity is similar to the coordinative complexity suggested by Wood (1986); for users to be able to explain requirements and work goals precisely and in detail they will have to consider the relationships between information cues, acts, and products, as well as the sequencing of inputs, etc. This line of argumentation suggests that the complexity of the task of describing one’s requirements and goals would be highest in the top tier of the organization. In the next section, however, we will explain our belief that the complexity of a user’s description of requirements and task goals is the highest at the middle management level of the organization rather than the executive level. This premise allows us to argue that the complexity of describing requirements and goal description has a non-linear relationship with organizational level.
3.4. Research Model and Hypothesis

In this section, we present a research model (Figure 3.1) and three hypotheses to help us answer our research question. A hypothesis and a discussion are presented to explain the relationship between each independent variable (motivation, experience and complexity) and the dependent variable. We believe that the Motivation and Experience constructs will correlate positively while the Complexity construct will have a non-linear relationship with the dependent variable.

![Figure 3.1: Research Model](image)

H1: The motivation of users has a direct positive influence on the degree of alignment between the requirements and work goals that users describe to systems analysts and the requirements and work goals that the organization has assigned to them.

H2: The experience of users has a direct positive influence on the degree of alignment between the requirements and work goals that users describe to systems analysts and the requirements and work goals that the organization has assigned to them.

H3: The degree of alignment between the requirements and work goals that users describe to systems analysts and the requirements and work goals the organization has assigned to them is negatively influenced by the complexity of describing the task. This complexity increases when moving from low levels of the organization to middle management but then decreases when moving from middle management to executive level.
3.4.1 Extent of Alignment

In developing a model to answer the research question, we first must examine the degree of alignment between task goals as assigned to users and task goals as described by users to systems analysts. Scholars have found that users differ in their ability to align their work with the strategic goals of the organization. Our review of this literature suggests that the results will be similar when users are describing their requirements and work goals to systems analysts. The remainder of this section outlines the support for this conclusion.

According to Gagnon and Michael (2003), ‘strategically aligned behavior’ (SAB) refers to “on-the-job actions that are aligned with the strategy” (p.26). On-the-job actions describe task and contextual performance where task performance refers to the activities that support or directly contribute to the transformation of the organization’s inputs to outputs (LePine et al. 2002). For the on-the-job actions of users to be efficient and effective, it is necessary for those users to have a deep and accurate understanding of the goals assigned to them by the organization. McDonald and Myklebust (1997) stated that users often find it difficult to see how their work contributes to organizational outcomes. Such difficulties are frequently attributed to the users’ “line of sight” abilities. Boswell and Boudreau (2001) categorized these abilities into four types: (i) deep and accurate, (ii) deep and inaccurate, (iii) shallow and accurate and (iv) shallow and inaccurate. The authors explained that users may believe they understand the organization’s objectives and are effective contributors, yet they may be mistaken. Others may accurately understand the objectives of the organization, but do not understand precisely how to contribute toward those objectives. Finally, there are users who neither understand nor know precisely how to contribute to the organization’s objectives.

We suspect that the factors that affect users’ “line of sight” will also affect the correctness of requirements and goals that users describe to systems analysts. In requirements engineering (RE, goals and requirements explain why the system is necessary and what the intended system should do. Why the system is necessary is often tied to strategy of the business (hence the term business-IT alignment). What the system should do is described as the processes to be completed in order to achieve the business strategies. The line of sight described above is the distance between the ‘what’ and ‘why’. For users to adequately understand and explain the ‘why’ (goals) of the ‘what’ (requirements), they will require strong “line of sight” abilities i.e., a deep and
accurate understanding of how their tasks relate to the organization’s strategies. We argue that users performing well on their task are likely to have the ability and that this deep and accurate understanding of the task will make it easier for them to describe their tasks correctly to systems analysts. Conversely, if users do not perform well, they are more likely to have a shallow understanding of their task (i.e., poor “line of sight”) and are less likely to describe correct goals and requirements to systems analysts. Based on this premise, we posit that the factors that affect users to perform tasks well will affect them in describing the correct goals and requirements. As explained earlier, these factors include user’s motivation, experience, and task complexity.

3.4.2 Motivation
According to Perry and Porter (1982) motivation usually stands for that which “energizes, directs and sustains behavior” (p.1). In short, it is the degree and type of effort an individual exhibits in a behavioral situation. Several motivation theorists distinguish between extrinsic and intrinsic motivation (Calder and Staw 1975; Deci 1971; 1972; Scott et al. 1988). Extrinsic motivation refers to motivation that comes from outside of the person. This type of motivation often takes the form of incentives and is a key instrumental source for a person to perform well (Lawler and Porter 1967; Mitchell and Biglan 1971). Extrinsic motivation influences behavior due to the reinforcement value of outcomes. Conversely, intrinsic motivation refers to motivation that comes from inside a person. This motivation comes from the pleasure or satisfaction one gets from completing a task. Pinder (1984) argues that intrinsic motivation reflects the effort expended to satisfy an internal need. From a task based perspective, a user’s perception of performance (e.g., quality, competence, significance) is a commonly cited source of motivation. Such perception may be changed either through actual increases in performance or through improving the user’s ability to identify his/her contribution to performance.

Researchers have adopted several techniques for inducing motivation. Monetary incentives are frequently used (Atkinson et al. 2001; Zimmerman 2000) and this form of motivation is widely adopted in organizations (Wall Street Journal 1999). Monetary incentives are also widely used to motivate subjects to participate well in experimental settings (Bonner and Sprinkle 2002). Libby and Lipe (1992) found that monetary incentives influence performance and change the amount of effort people are willing to exert. Similarly, Awasthi and Pratt (1990) found that monetary incentives usually increase the effort that participants put forth on judgment tasks.
Given that there is evidence regarding the effects of monetary incentives on motivation, and that motivation improves performance, we hypothesize that knowledgeable users who are motivated through incentives will expend more effort in describing their requirements and work goals, resulting in a description that more accurately reflects the assigned requirements and work goals. Based on this rationale, we predict that if incentives are employed within the elicitation process it should enhance the quality (i.e., alignment) of requirements and work goals that users describe to systems analysts.

**Hypothesis H1:** The motivation of users has a direct positive influence on the degree of alignment between the requirements and work goals that users describe to systems analysts and the requirements and work goals that the organization has assigned to them.

### 3.4.3 Experience

In Section 3, we argued that the experience construct adopted in this chapter encompasses concepts such as work experience, task knowledge and ability. This section elaborates on these three concepts and their interrelationships and discusses the rationale for hypothesis.

The term ‘work experience’ refers to the events experienced by users during the performance of their job (Benford and Hunton 2000). The relevance of this construct to human resource functions can be illustrated through selection (Ash & Levine, 1985), training (Ford, Quinones, Sego, & Sorra, 1992), and career development (Campion, Cheraskin, & Stevens, 1994; McCall, Lombardo, and Morrison, 1988). It is no surprise that Quinones et al. (1995) found a large amount of research examining the relationship between work experience and job performance. Ford, Sego, Quinones, and Speer (1991) found that some studies measured work experience using time on the job or tenure (e.g., McDaniel et al., 1988). Other researchers have measured work experience by counting the number of times an individual has performed a given task (Lance et al. 1989; Vance et al. 1989), by operationalizing job rotation (i.e., counting the number of lateral moves an individual receives within a specified period of time) (Campion et al., 1994), and by focusing on the actual content of experiences as a critical determinant of job performance (Mumford & Stokes, 1992).
A closer examination of the measures used for evaluating work experience fails to make any explicit distinction between ‘work experience’ and ‘knowledge acquired’ over time. For example, in the study of Campion et al. (1994), the counting of lateral moves could arguably be equated with knowledge acquired across those moves. Quinones and colleagues (1995) stated that “philosophers tend not to distinguish between experience and knowledge. In fact, what we call knowledge is simply meaning, and meaning itself is a stage in experience” (pg. 2).

The type of knowledge that is used interchangeably with experience is called ‘task knowledge.’ Task knowledge is defined as the conceptual or general knowledge structures in long term memory. According to Johnson et al. (1988), knowledge of frequently occurring events is structured into meaningful units in the memory and the knowledge a person possesses about a task is contained within this structure. Motowoldo and colleagues (1997) refined this concept into an organizational perspective and stated that task knowledge is the knowledge of facts and principles related to the functions of the organization’s technical core. It is also knowledge of procedures, judgmental heuristics, rules for processing information and guidelines for making decisions about matters related to the technical core. The authors emphasized that task knowledge is shaped largely by cognitive ability; people with high levels of cognitive ability are more likely to master and remember relevant facts, principles, and procedures.

Through illustrating their interrelationships, we have demonstrated that it is reasonable to consider the three concepts of work experience, task knowledge and ability under the one umbrella of ‘experience.’ Users who are experienced under the described context will either be doing the tasks repeatedly and/or are knowledgeable of the process.

Davenport and Prusak (2000) found that one of the prime benefits of experience is that it provides a historical perspective from which to view and understand new situations and events. We believe that this historical perspective and deep understanding, and the ability to master and remember relevant facts, principles and procedures after repeatedly doing a task, all of which attributes of experienced users, are reasons why experienced users will be more competent in describing to systems analysts the requirements and work goals that are aligned to the assigned requirements and work goals than inexperienced users. This belief allowed us to propose hypothesis H2.
Hypothesis H2: The experience of users has a direct positive influence on the degree of alignment between the requirements and work goals that users describe to systems analysts and the requirements and work goals that the organization has assigned to them.

3.4.4 Organizational Level Task Complexity
We have claimed that the complexity of users describing their task and work goals is non-linear in an organization, and in this section, we present additional arguments and rationale for the support our hypothesis.

Several studies have found significant results considering complexity as a predictor of task performance (Boggs & Simon, 1968; Earley, 1985; Kernan et al., 1994; Scott, Fahr, & Podsakoff, 1988, Taylor, 1981). Our definition of complexity however, is not directly related to the objective or subjective difficulty of an employee’s tasks, rather we are referring to the complexity of describing tasks to systems analysts. To illustrate the difference, we will in the remainder of this section discuss complexity as described by traditional research (i.e., task complexity) and show how this complexity has a different relationship to organizational level than the complexity of the specific task of describing requirements and work goals. The last subsection presents an example in order to further illuminate the differences.

3.4.4.1 Linear Complexity in Organizations
As mentioned in the earlier sections, task complexity is related to organizational complexity. This relationship can be explained through the number of task dependencies that the user needs to take into consideration when performing a given task. According to Payne (1982), simple tasks require a person to process fewer cues than complex tasks. More complex decision-making tasks require a person to manipulate discrete sets of symbols (symbolic tasks) or to establish relationships among those discrete sets of symbols (Vessey et al. 2003). Based on these arguments, it would seem that the tasks at the strategic level of the organization should be more complex than tasks at the lower levels of the organization. For example, one of the tasks at the strategic level of the organization may relate to increasing market share. The discrete set of symbolic tasks and the relationship between these sets will be significantly more complex at the strategic level than at any other level of the organization. At this level of the organization the set of tasks and relationships relating to increasing market share encompasses all the related tasks
and relationships at the middle management level as well as the operational level (lowest level of the organizational chart). The completion of tasks and the realization of goals for the tasks at the middle management level however, are only dependent on the completion of tasks at the operational level (and perhaps some other related tasks at the middle management level). At this level, the number of symbolic tasks and dependencies is less at this level than at the strategic level. At the operational level, the number of dependencies will be even less. The tasks related to increasing market share can be considered a complete set which includes instances, subsets and relationships within the set. This decreasing rate illustrates that the complexity of symbolic tasks in an organization increases as one moves from the operational to the middle management and strategic levels.

3.4.4.2 Non-Linear Complexity in Organizations

In order to describe the non-linear relationship between organizational level and the complexity of describing requirements and task goals, we rely on literature in the RE discipline. According to Nuseibeh (2000), Zave (1997) provides one of the clearest definitions of RE. The definition states that “requirements engineering is the branch of software engineering concerned with the real-world goals for, functions of, and constraints on software systems. It is also concerned with the relationship of these factors to precise specifications of software behavior, and to their evolution over time and across software families” (pg. 1). According to the authors, the definition is attractive for a number of reasons. First, it highlights the importance of ‘real-world goals’ that motivate the development of a software system. Second, it refers to ‘precise specifications,’ which provide the basis for analyzing, validating and verifying requirements.

When this definition is translated into the context of the process of gathering requirements and work goals, it suggests that the linearity of the relationship of organizational level to the complexity of executing a task is dissimilar to the linearity of the relationship of organizational level to the complexity of describing that task. As discussed above, the complexity of executing a task is the highest at the executive level of the organization. However, the complexity of describing a task in such a way as to satisfy the criteria implicit within the discussion of requirement engineering (i.e., precisely specifying the ‘why’ and the ‘whats’) is arguably highest at the middle management level.
Contextual differences between the description of requirements of tasks and the actual difficulty of performing the task is one of the reasons contributing to the dissimilarity of the two types of complexity. The descriptions of requirements are translated into functional modules for the intended information systems, which mean that only certain types of elicited requirements are meaningful during system development. These types of requirements are found namely at the middle management level. According to Smith and colleagues (2008), middle managers are the ones who are responsible for implementing the strategy, while their superiors are responsible for formulating those business strategies. The process of formulating business strategies, while it may be difficult, is not a requirement that will be translated into a functional module of the intended information system. For this reason, executives rarely describe the precise details necessary for implementing an information system to carry out the strategic requirements of the organization (e.g., increasing market share).

To illustrate a case in point, one of the strategic goals may be to increase market share. In order to provide requirements and work goals for an information system that will support the goal of increasing market share, middle managers will have to explain how the organization will sell that product cheaply, what they will do to ensure that the product is sold at a cheap price, and why have they chosen to sell Product A cheaper than Product B. The process of users explaining the ‘hows’, ‘whats’ and ‘whys’ of a task to a system analyst is not simple. Researchers have revealed a number of problems middle managers face when attempting to implement business strategies. These problems include lack of communication, misunderstanding of the strategy, unaligned organizational systems and resources, competing activities and uncontrollable environment factors (Aaltonen and Ikavalko 2002). These factors are sometimes related to the difficulty of describing requirements and work goals. The challenge of precisely describing the ‘hows’, ‘whats’ and ‘whys’ of a task is further compounded with all the dependencies related to a task. These dependencies may come from below (operational level), above (strategic level) or across the same level.

The complexity of describing requirements and work goals at the operational level is not as high as it is at the middle management level. Often the requirements and work goals are day-to-day operations that produce outputs and are made in functional units by managers. To describe the requirements for their task, an operational level employee will only need to consider the tasks
across their level that are related to their task and their manager’s task toward which their task contributes.

The pattern of the non-linear relationship between organizational level and the complexity of the task of user’s describing their requirements and work goals will be as follows: medium to low complexity at the operational level, high complexity at the middle management level and medium complexity at the executive level. This does not change, of course, the general complexity of completing a task, which will follow the pattern of low at the operational level, medium at the middle management level and high at the executive level. This rationale and the discourse on complexity allow us to propose hypothesis H3.

**H3: The degree of alignment between the requirements and work goals that users describe to systems analysts and the requirements and work goals the organization has assigned to them is negatively influenced by the complexity of describing the task. This complexity increases when moving from low levels of the organization to middle management but then decreases when moving from middle management to executive level.**

3.4.4.3 An Example of Non-linear Complexity in an Organization

To further clarify our rationale of non-linear complexity, we provide a simple example to conclude this section. A manufacturing enterprise is divided into three distinct levels: an executive level consisting of chairperson, vice president and directors; a middle management level consisting of managers for the different departments; and an operations level. One of the tasks of the vice president is to increase market share. The employees at the middle management level are responsible for implementing plans for executing the goal of increasing market share. Several middle managers in different departments are responsible for this implementation- e.g., the sales, distribution, and marketing departments. The employees at the operational level are responsible for completing functional tasks that will result in some output which is related to implementation of the strategies (e.g., a clerk responsible for distributing products). The activities performed in each department collectively relate to the task of increasing market share.
When describing their tasks and work goals to the systems analysts, operational level employees only need to consider their own work and the needs of their manager (e.g., preparing and packing the stock for distribution the following day). On the other hand, the middle managers must to take into account activities at all different levels. For example, the manager in the distribution department, when describing the requirements relating to schedule route planning, needs to consider the following: (i) expectations from the executive level (i.e., what they must do to fulfill the task of increasing market share); (ii) activities at the operational level; (e.g., the type of products in stock that need to be given priority in shipping; for example, products with a short shelf life); (iii) activities external to the organization (e.g., the dynamic needs of the market and the different types of available delivery modes (e.g., retail distribution, home delivery, wholesale delivery, parcel/express delivery). Only after being provided with these types of requirements and work goals, can the system analysts be able to design a distribution component module in the intended information system. Ensuring high product quality, setting prices, distribution, advertising and promotion are the strategic requirements that the executives will provide when describing the requirements and work goals. Although the process of identifying these strategies (e.g., considering competitor’s strategies, market growth, customer’s power etc.) maybe very complex, the information described at this level is not granular enough to serve as requirements for the functional modules of the intended information system. As a result, executives actually have fewer requirements for the information systems.

The above example illustrates that describing the requirements and work goals is more complex at the middle management level than at the strategic and operational levels. The core or hub of the requirements and goals for the information system seems to reside at the middle management level.

3.5. Research Method

Conducting our research in an organization would have been the ideal way of evaluating our research question and hypotheses; however, several circumstances prevented us from doing so (namely, not being able to access an organization with an ongoing project that fits our research, and time factor which was a constraint in this research). Instead, we conducted the investigation
in a laboratory setting with undergraduate and graduate students enrolled in a large university in Canada. We created a real-world scenario in which a company has recently started up and is operational but is still hiring new employees. After a short period of time, the executive managers of the organization found the need to implement a new information system. They recruited system analysts to develop the system and asked the employees to assist the analysts in their work. One of the tasks of the systems analysts was to discover requirements and work goals for the intended system. In our real world scenario, the students represent new employees who are solicited to describe the requirements and work goals of the task they perform.

A business case dealing with the sale of new and used vehicles was adopted for the purpose of the study. The case described the typical day-to-day activities for selling new vehicles, used vehicles and vehicle parts. Additionally, the activities performed by the sales manager, business manager, parts manager and vice president were described in the case. Throughout the case, the company’s vision (increasing sales by 4%) and strategic objectives (e.g., increase customer’s satisfaction) were mentioned. The intent of including this piece of information was to make the subjects aware of the direction of the company.

3.5.1 Subjects
In the main study, the 89 subjects were divided into four groups: High Experience/High Motivation, 22 subjects; High Experience/Low Motivation, 26 subjects; Low Experience/High Motivation, 20 subjects; Low Experience/Low Motivation, 21 subjects.

3.5.2 Materials
The materials used in the study include: a narrative of an auto dealership, a narrative relating to the Canadian Dollar, a booklet consisting 25 questions, three Object Oriented Enterprise Modeling (OOEM) diagrams, notes to induce high motivation, notes to induce low motivation, and questionnaires relating to manipulation checks for experience, motivation and complexity.

The OOEM diagram (Wand et al. 2000) was selected as the conceptual model-training tool in this experiment, namely for the reason that it explicitly models business processes and it proved to be a source for identifying goals from services (tasks). The OOEM represents interactions among objects/agents in form of requests/responses. A request is defined as an object asking
another object to perform some service. The requested object may then perform the service entirely or may designate aspects of the service to other objects. When the service is completed, a response is provided to the requestor.

Three OOEM Diagrams were developed by the researchers of this study and validated by two PhD doctoral students who are knowledgeable in OOEM modeling (see Appendices H, I, J for diagrams). The models were used to provide contextualization and clarity and to describe systematically the flow of the business processes in the case. We believed this would be useful for new employees who may not have sufficient understanding of the operations within the organization. Each model represented an organizational tier: a transaction processing tier (TPS level), a management tier (MIS level), and an executive tier (ES) level. These three levels reflect the business processes of the different levels of the organization: the TPS level represents business processes carried out by line workers, the MIS level represents business processes executed by middle managers, and the ES level represents business processes carried out by the executives.

3.5.3 Procedure
A mixed design was used in this study. Experience and motivation were the between group factors while, complexity was the within group factors. The procedure was divided into three sections, a pretest, training and the main experiment where the mixed design was used.

3.5.3.1 Pretest
At the beginning of the study, subjects were asked to complete a questionnaire about their knowledge and experience of auto-dealerships. Questions were rated on a 7-point Likert Scale (1 = Low and 7 = High). Example of questions include: ‘My experience in purchasing a vehicle from an auto dealership is:’, ‘My experience of the business processes carried out in auto dealerships is:’ (See Appendix D for complete questionnaire). The scores for the questions were averaged and those with an average score greater than 3.5 (mean of the Likert Scale) were assigned to a ‘high experience’ group and those with scores less than 3.5 were assigned to a ‘low experience’ group. The objective of this exercise was to identify those subjects who had some prior experience of the business processes of the case they would use in the main experiment. In the real world setting, while employees may be new to the organization, they may have some
prior knowledge (e.g., college degree) or experience (working with some other company before) of the domain. The intent of this exercise was to capture this prior knowledge and experience before providing additional manipulations of experience.

After dividing subjects into low and high experience, we provided subjects in the high experience group with more experience by providing them with a narrative about auto dealerships and giving them one hour to read the narrative and answer 25 questions about the business. The subjects in the low experience group were provided with a case irrelevant to the main study and were asked to read it and answer 10 questions about it. The subjects in the low experience group were also given the last 15 questions about the auto dealership case from the high experience group and were told: Imagine that there is an auto dealership that sells new and used vehicles and vehicle parts. Based on your knowledge and experience of auto dealerships, please answer the following questions. Example questions from this section include: List one activity that the sales manager can perform to improve the customer-purchasing experience. (question #13), and Why is it important to improve customer’s relationship? How does this fit with the auto-dealership’s 5-year plan goal? (question #14).

3.5.3.2 Training
We introduced the subjects to the syntax and semantics of the OOEM. They were taught how to read the diagrams using one that represented a student (external object to a university) requesting to attend a course section in the university. They were also told explicitly that each service in an organization contributes directly or indirectly towards the realization of that organization’s strategic goals. We then presented five questions relating to the services in the OOEM diagram and briefed the subjects on how to use the mini case description and the OOEM diagram to answer the questions. Examples of the questions include: ‘List the actors who are related to this service. (If an actor in the organization triggers this service, then you should also include this actor in your answer)’; ‘List the strategic goals that this service may contribute towards. (Briefly explain your answer)’; ‘Describe the goal for this service.’ In addition to these instructions, we provided guidelines for writing goals for the services in the student’s registration case. The subjects were told to refer to the guidelines when writing goals in the main experiment as well. At the conclusion of the training, the subjects were presented with a handout summarizing the training and were instructed to refer to it when answering questions in the main study.
3.5.3.3 Main Test
In the main study, all subjects were presented with the case relating to the sales of new and used vehicles and vehicle parts as well as the three OOEM diagrams. Subjects were then instructed to complete three online questionnaires, one for each diagram. In addition to the questions relating to the OOEM diagrams, each questionnaire had questions at the end designed to measure complexity (i.e., manipulation check). The questionnaires were administered in a random order to eliminate the effects of learning (i.e., the knowledge gained in the previous survey systematically helping the subjects to answer the next survey). After completing the three questionnaires, the subjects were asked to complete a final questionnaire designed to measure motivation (i.e., manipulation check). On completion of this exercise, the subjects were thanked and paid for participating in the study. Those with the chance of earning an additional $50 were told they would be contacted if they had earned the money.

3.5.4 Pilot Tests
We conducted three pretests with undergraduate students attending a large university. The pretests had three objectives: to calculate the total time needed for completing the experiment (this included inducing different levels of experience and training the subjects to read a conceptual diagram and write corresponding goals), to determine the effect of induced motivation and experience and to evaluate the subjects’ understanding of the experimental process. The time needed to complete the experiment in the first pretest was beyond our projected time of two and a half hours. The case and the training session were adjusted for the subsequent pretest and it lasted the desired two and a half hours. In all of the pretests, subjects reported a positive understanding of the entire process (i.e., at no stage of the experiment were they lost). In addition, we found both that our manipulations of motivation made subjects think of and write goals differently and that the experienced subjects (those who read the main case twice) provided better descriptions of the goals for the services in the conceptual diagram. One of the biggest challenges in the pretest was to prepare the subjects to assume the roles of the actors when describing the requirements and goals relating to the services in the conceptual diagram. Based on the subjects’ feedback, discussions with the other researchers in the study, and subsequent pretests, we were able to design a set of questions that increased the subjects to assume the roles of the actors in the business.
3.3.5 Measuring the Dependent Variable

We engaged the services of two coders with extensive experience reading and writing OOEM diagrams and asked them to read the case and the conceptual models and to answer the five questions about the diagrams to be presented to the subjects in the experiment. These questions were used to measure the dependent variable (see Appendix G). The two coders were proxies for system analysts gathering assigned goals and requirements from the employees in the organization. At the conclusion of the exercise, the answers the coders provided were discussed with the experimenter who was playing the role of an executive in the organization. The answers were checked for consistency and to make sure they accurately represented the organizations needs. After some minor changes, it was unanimously agreed that the answers would be used as the benchmark to evaluate the answers provided by the subjects. At the conclusion of the main study, the two coders marked the subjects’ answers against the correct answers. Their marking scores were checked for consistencies and were then analyzed using SPSS.

Questions 1-3 of the five questions presented to each subject, aim at gathering precise responses for the service (actors who are directly and indirectly responsible for completing the service and the actions performed by the actors). Answers to these questions are representatives of functional requirements or the ‘whats’ for the information system. Questions 4-5 aim at gathering responses relating to the goals or the ‘whys’ of the requirements and its link to strategic goals of the organization (i.e., ‘line of sight’).

Each question is assigned a maximum number of points for which a subject can score. The points were determined relative to the context of the question and the level of the organization that the question is set for. For example, the total points assigned to the question #1: ‘List the actors who are related to this service. (If an actor in the organization triggers this service, then you should also include this actor in your answer)’ is highest at the EIS level, in the middle at the MIS level and smallest at the TPS level. The points are calculated by counting all the actors who are directly or indirectly involved in completing the service.

3.5.6 Manipulating Motivation

Motivation was manipulated primarily through incentives and induced statements throughout the main exercise. At the start of the experiment, subjects were assigned randomly through a coin
toss and number draw to one of two groups (odd or even). Those in the high group were told that after marking their answers, those subjects who scored in the top 25% of the group would win $50 in addition to the amount they would receive for completing the study. Their answers were scored by measuring them against a set of correct answers. Those in the low motivation group were told that they would not be receiving any additional incentives regardless of their performance. To further induce motivation, subjects were given a handout with statements matching their group. Example statements include: Performing well will not (low motivation group)/ will greatly (high motivation group) increase your chances of gaining additional incentives. It is not very (low motivation group)/ very (high motivation group) important for you to determine how the actor’s work contributes to the auto-dealership’s objective. Subjects were reminded of these statements throughout the experiment. At the conclusion of the experiment, the subjects were administered a motivation questionnaire consisting of four questions. Example questions include: ‘To what extent did you feel motivated when describing the goals for the services?’, and ‘To what extent did you try your hardest to perform well in describing the goals for the services?’ (See Appendix E for complete questionnaire).

3.5.7 Manipulating Experience

We manipulated experience by providing one set of subjects with more experience of our particular business than other subjects. In the pretest, all subjects were asked to read a narrative and answer 25 questions. The 25 questions selected for evaluation were based on the results of several pilot tests, which revealed that the average subject completed only 20 questions in the allotted time. Questions 21-25 were meant for those subjects who completed answering questions 1-20 before the allotted time was up and had nothing else to do. Questions 1-10 were different between the two groups (high and low experience). Questions 10-25 were the same in both groups. After marking the questions, we ran statistical analysis on the subjects’ scores for questions 10-20 which were selected for analysis and evaluation in both groups.

Upon completing the questions, each subject was asked to complete a questionnaire (on a 7-point Likert Scale, 1 = Low, 7 = High) relating to the experience of the roles of actors in an auto-dealership. Examples of questions include: ‘My knowledge of tasks performed by the sales associate in an auto-dealership is:’; ‘My knowledge of tasks performed by the business manager
in an auto-dealership is:’, and ‘My knowledge of tasks performed by the sales manager in an auto-dealership is:’ This questionnaire was used as a further manipulation check for experience.

3.5.8 Manipulating Complexity
Task Complexity was manipulated through the use of questionnaires in the main experiment. Each subject was presented with a set of three OOEM diagrams. The subjects were then told to use whatever materials they have to answer five questions which included describing the goals related to the services on each OOEM diagram. The subjects were told that when using the diagrams, most of the information needed for answering the questions related to the services at the TPS level could be found on the TPS diagram. They were also told that when using the diagrams the information needed for answering questions related to services at the MIS and EIS levels were found on all three diagrams. After answering the questions for each level the subjects were given a questionnaire to complete (questions on a 7-point Likert Scale, 1 = Low, 7 = High). Examples of questions include: ‘To what extent did you find the task of describing goals for services to be complex?’, and ‘To what extent did you find it difficult to describe the goals for the services?’ (See Appendix F for complete set of questions).

3.6. Results
3.6.1 Descriptive Statistics
Table 3.1 shows descriptive statistics for the constructs in the theoretical model. The means and standard deviations SD are scores relative to the dependent variables in each group i.e., the extent of alignment between the scores of the users’ interpretation of the requirements and the scores of the goals and the assigned requirements and goals. The descriptive statistics shows that subjects who are high on experience generally outperform subjects who are low on experience for that group. Similarly, subjects who are high on motivation outperform those who are low on motivation. The mean scores in the medium complexity group were the lowest in comparison with those scores in the low and high complexity groups.
In more detailed tests, we examined the normality of each variable and determined that the variables were normally distributed (the degree of skew and kurtosis were non-significant). In addition, we checked for outliers and found that none affected the results.

3.6.2 Manipulation Checks
The results in Table 3.2 highlight the means and standard deviations for the responses of the subjects who completed the pre-test questionnaire regarding experience. Subjects who were placed in the high experience group demonstrated prior knowledge and experience of the business processes of an auto-dealership. The ANOVA results showed that prior knowledge and experience was significant $F(1, 87) = 43.75, p < 0.05$ for those who were placed in the high experience group.

Table 3.1: Descriptive Statistics

<table>
<thead>
<tr>
<th>Experience</th>
<th>High Complexity</th>
<th>Medium Complexity</th>
<th>Low Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Motivation</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Mean</td>
<td>61.12</td>
<td>51.82</td>
<td>54.08</td>
</tr>
<tr>
<td>SD</td>
<td>22.11</td>
<td>16.79</td>
<td>15.09</td>
</tr>
</tbody>
</table>

Table 3.2: Prior Knowledge and Experience

<table>
<thead>
<tr>
<th>Experience</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Experience</td>
<td>3.05</td>
<td>1.01</td>
<td>48</td>
</tr>
<tr>
<td>Low Experience</td>
<td>1.76</td>
<td>0.80</td>
<td>41</td>
</tr>
<tr>
<td>Total</td>
<td>2.46</td>
<td>1.12</td>
<td>89</td>
</tr>
</tbody>
</table>

Table 3.3 provides the means, standard deviations and variances of the responses to the 10 questions about the auto-dealership that were presented in the pre-test. An ANOVA test demonstrated that the subjects’ reported experience of the business processes was significant $F(1, 87) = 279.08, p < 0.05$. This indicates that the manipulation was successful.
Table 3.3: Experience Manipulation Scores

<table>
<thead>
<tr>
<th>Type</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (High Experience)</td>
<td>7.16</td>
<td>48</td>
<td>1.35</td>
<td>1.83</td>
</tr>
<tr>
<td>2 (Low Experience)</td>
<td>2.65</td>
<td>41</td>
<td>1.16</td>
<td>1.35</td>
</tr>
<tr>
<td>Total</td>
<td>5.08</td>
<td>89</td>
<td>2.59</td>
<td>6.70</td>
</tr>
</tbody>
</table>

Table 3.4 illustrates the means, standard deviations and variances of the subjects’ responses to the motivation questionnaire administered at the end of the study. Our results found that the motivation to perform well as reported by the subjects was significant $F (1, 87) = 17.21, p < 0.05$.

Table 3.4: Motivation Manipulation Scores

<table>
<thead>
<tr>
<th>Type</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (High Motivation)</td>
<td>5.37</td>
<td>42</td>
<td>1.06</td>
<td>1.12</td>
</tr>
<tr>
<td>2 (Low motivation)</td>
<td>4.40</td>
<td>47</td>
<td>1.13</td>
<td>1.28</td>
</tr>
<tr>
<td>Total</td>
<td>4.85</td>
<td>89</td>
<td>1.20</td>
<td>1.43</td>
</tr>
</tbody>
</table>

Figure 3.2 clearly suggests that experienced subjects outperformed inexperienced subjects irrespective of motivation when describing the requirements and work goals. The mean values for experienced subjects were 61.40 and 52.89 for high and low motivation, while the mean values for inexperienced subjects were 49.85 and 44.65 respectively.

Figure 3.2: Estimated Marginal Means for Experience and Motivation

At the end of each survey students were asked to answer a questionnaire consisting of questions aimed at checking the manipulation of complexity. Based on the means of the responses (Table 3.5), we found that there were self-reported differences in complexity across the levels and the
differences were non-linear. At the MIS or middle management level the subjects reported the complexity was the greatest while at the ES and TPS level the degree of complexity was approximately the same. The ANOVA tests show that the complexity as reported by the subjects was significant $F (2, 264) = 2.826, p < .05$.

<table>
<thead>
<tr>
<th>Type</th>
<th>Mean</th>
<th>N</th>
<th>SD</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Complexity at the EIS level</td>
<td>4.01</td>
<td>89</td>
<td>1.44</td>
<td>2.06</td>
</tr>
<tr>
<td>2 Complexity at the MIS level</td>
<td>4.46</td>
<td>89</td>
<td>1.17</td>
<td>1.38</td>
</tr>
<tr>
<td>3 Complexity at the TPS level</td>
<td>4.14</td>
<td>89</td>
<td>1.24</td>
<td>1.55</td>
</tr>
<tr>
<td>Total</td>
<td>4.20</td>
<td>267</td>
<td>1.30</td>
<td>1.69</td>
</tr>
</tbody>
</table>

3.6.3 Hypothesis Test

The hypotheses were tested using repeated measures analysis of variance (ANOVA). For a proper use of repeated measures ANOVA, the number of observations should be larger than $a + 10$, where $a$ is the number of levels that each subject repeats in the study (Maxwell and Delaney 1990). This study comprised of three levels (Complexity – high, medium and low) and four scenarios (Motivation – high and low, Experience – high and low). In each level there were 89 data points and in each scenario there were over 22 data points, fulfilling the minimum criteria for meaningful analysis.

Two independent coders (a PhD student and a M.Sc. student) coded the subjects’ responses in the main experiment. They coded the extent to which subjects’ descriptions of their requirements and goals for a particular service were aligned with their assigned requirements and goals. The coding schemes can be considered reliable since the measurement of agreement shows a value of Kappa = 0.749. As a rule of thumb, values of Kappa from 0.40 to 0.59 are considered moderate, 0.60 to 0.79 substantial and 0.80+ outstanding (Landis and Koch 1977).

The purpose of hypothesis 1 was to test whether the motivation factor would significantly affect the degree of alignment between users’ described and assigned requirements and work goals. Support for this hypothesis is evident in Table 3.6, where motivation was found to be significant ($F = 3.94, p = 0.05$). The ANOVA results in Table 3.6 detected no statistical effects.
The objective of hypothesis 2 was to determine whether the experience factor would significantly affect the degree of alignment between users’ described and assigned requirements and work goals. Evidence of support for this hypothesis is found in Table 3.6. Experience was found to be significant (F = 10.82, p = 0.05). Subjects who read the case and answered the questions in the pre-test demonstrated a greater understanding of the business processes and a higher aptitude in describing requirements and work goals.

The intent of hypothesis 3 was to ascertain whether complexity of describing a task would significantly affect the degree of alignment between users’ described and assigned requirements and work goals. The purpose of this hypothesis was to also explore if the relationship was non-linear. The ANOVA results in Table 3.6 strongly support hypothesis 3, for the results of complexity within subjects were (F = 63.91, p = 0.00). The marginal means (See Figure 3.3) confirm that the effect of complexity on the degree of alignment between users’ interpreted goals and their assigned goals was non-linear as expected.

<table>
<thead>
<tr>
<th>Effects</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between Groups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td>10.82</td>
<td>0.02</td>
<td>0.11</td>
<td>0.90</td>
</tr>
<tr>
<td>Motivation</td>
<td>3.94</td>
<td>0.05</td>
<td>0.05</td>
<td>0.50</td>
</tr>
<tr>
<td>Experience X Motivation</td>
<td>1.24</td>
<td>0.25</td>
<td>0.02</td>
<td>0.20</td>
</tr>
<tr>
<td><strong>Within Groups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complexity</td>
<td>63.91</td>
<td>0.00</td>
<td>0.43</td>
<td>1.00</td>
</tr>
<tr>
<td>Complexity X Experience</td>
<td>0.04</td>
<td>0.87</td>
<td>0.00</td>
<td>0.098</td>
</tr>
<tr>
<td>Complexity X Motivation</td>
<td>1.89</td>
<td>0.13</td>
<td>0.02</td>
<td>0.244</td>
</tr>
<tr>
<td>Complexity X Experience X Motivation</td>
<td>0.77</td>
<td>0.46</td>
<td>0.01</td>
<td>0.286</td>
</tr>
</tbody>
</table>

Table 3.6: Results of ANOVA for Between and Within Groups Factors

a. Computed using alpha = .05
As we predicted, the alignment of goals and requirements relative to organizational mean complexities were lower at the middle management level of the organization (45.74 – high experience, 36.23 – low experience, 43.13 – high motivation, 38.85 – low motivation) than the executive level (57.66 – high experience, 45.73 – low experience, 55.77 – high motivation, 47.61 – low motivation) and the transaction process level (68.05 – high experience, 59.77 – low experience, 67.97 – high motivation, 59.85 – low motivation). See Figure 3.4.

Overall, the results suggest that the research question can be answered affirmatively: the experience and motivation of users and the complexity of tasks at different organizational levels...
influence the degree of alignment between the requirements and work goals users describe to systems analysts and the goals the organization has assigned to them.

3.7. Discussion
Several conclusions and implications can be drawn from this study for practitioners and researchers.

3.7.1 Motivation Findings
The findings reveal that motivation does have an impact on the quality of requirements users describe to systems analysts. Several scholars have found similar results. For example, Libby and Lipe (1992) found that monetary incentives influence performance by motivating additional effort. The significant effect seen in our study could be attributed therefore to the extra effort exerted by the subjects who were offered additional incentives.

In two of the pilot studies the experimenter interviewed the subjects after they completed the study in order to get feedback. During those briefings, some subjects with no chance to earn performance based incentives mentioned that knowing that some of the other subjects had the opportunity to earn additional money made them feel unmotivated. The subjects who were in the high experience group and were not offered the possibility of an additional $50 mentioned that they understood the case and what was required from them, but felt no motivation to perform well. Those subjects reported that they would have tried harder if they were in the group with the additional incentive. Though we did not interview the subjects after completing the main study, we suspect that similar behavior was adopted.

In the pretests, the subjects also mentioned that the handouts provided to further induce motivation had a significant impact on their attitude toward completing the surveys. Most of the subjects in the low motivation group stated that they only felt like they needed to accomplish the basic requirements of the task. A few of the subjects in the high motivation group admitted that the handouts did reinforce their attitude in completing the survey: it reminded them that they had to perform well. Others in that group stated that the $50 incentive was sufficient motivation to work harder. No analysis was conducted on this feedback.
While this study only utilized rewards and incentives as motivating factors, we believe that other motivators can be used by managers, executives or systems analysts when trying to elicit requirements and work goals that are aligned with those of the organization. In a literature survey, Sharp and colleagues (2009) highlighted several ways to increase motivation such as assuring job security and a stable environment, allowing the person to exercise autonomy, creating a trusting relationship, providing sufficient resources, offering rewards and incentives, receiving and providing feedback and ensuring that the employee knows they work for a successful company and that they identify with their task.

Building on Kohn’s (2000) argument that “rewards do not create lasting commitment. They merely and temporarily change what we do” (pg. 2), we argue that motivators which are short term and directly influences the user’s description of the requirements and work goals will be more effective than existing long term motivators which do not directly influences the user’s description of the requirements and work goals. For example, offering rewards and incentives, helping user’s identify with their tasks and providing job security after the implementation of the IT system are examples of motivators that will directly impact description of requirements and work goals users provide to systems analysts. Conversely, the availability of sufficient resources for the job, the knowledge that one works for a successful company and technically challenging work do not induce an immediate stimulus and will arguably not increase the motivation of the user to provide requirements and work goals that are aligned with those given by the organization. Our summary of the impact of motivation on employees in general and the results revealed in this study specifically, allow us to conclude that meaningful incentive schemes should be considered as part of RE, specifically when eliciting requirements and work goals. The schemes can be considered during the cost-benefit analysis phase and incorporated as part of the project cost.

3.7.2 Experience Findings
Earlier research includes several different definitions of experience (Lance et al. 1989) but over the last few years there has been a call for a comprehensive definition and a set of appropriate measures for the experience construct. Despite the lack of clarity in definition and measures, Quinones and colleagues (1995) found that the relationship between work experience and job performance was positive regardless of the work measures used (amount, time spent and
organizational levels of specificity). Given that experience is such a strong predictor of work performance, we suspected that it would influence the dependent variable in our model. Consistent with most studies, we measured experience using a time based measure: by differentiating the number of times (two) users were exposed to the task. Admittedly, the time measure used to separate the experienced and inexperienced groups was quite small relative to measures in real world scenarios, but even so we were able to find significance in the results.

Although there was significance in our results, it is difficult to argue conclusively whether experience as represented by “the amount of time spent on a job” is the definitive construct that positively influences the quality of a user’s description of their requirements and work goals. Perhaps other factors, which we encompassed in the experience construct (e.g., knowledge and ability), were the main reasons why there was significance in the results. These types of uncertainties, however, are not unique to this study. In fact, they are consistent with the results and comments provided by other researchers who investigate the influence of experience on job performance. Quinones et al. (1995) questioned whether some research on experience, for example, (Dubois and McKee 1994) was explicitly describing and measuring experience or a combination of experience and knowledge. This grey line between experience and knowledge is a specific concern often raised by others. Sternberg and Frensch (1992) stated that expertise may be nothing more than a judgment we make about someone's level of knowledge. They also suggest the possibility that the quality of experience attributed to an experience event is based on the outcome of that experience and not necessarily on the amount of time spent performing the task.

While ambiguities still exist within the semantics of the literature on experience, it is possible to draw a clear conclusion from this study: namely, the requirements and work goals that experienced users describe to systems analysts are more aligned with the strategic goals of the organization than the descriptions provided by inexperienced users. This finding is significant for the RE discipline at least in two ways. First, there is no need for systems analysts to continue eliciting requirements from all users of the intended system; rather, they should focus on gathering requirements from experienced users who have demonstrated knowledge and ability in performing their tasks. Second, the input of experienced users should be considered as a potential benchmark for resolving conflicting requirements. Thirdly, if systems analysts have to interview
a new user, it would be useful for the managers in the organization to provide the user with documents describing his/her role. This exercise aims at helping the user understand his/her task and goals before describing them to the systems analysts.

3.7.3 Complexity Findings
As expected, the complexities of a user describing their task and goals were non-linear in relation to the levels within the organization. The cognitive complexity of the user does not increase proportionately as one moves up in the organization despite the greater interdependencies of the tasks. The results from the experiment illustrated that the middle management level is where the subjects’ descriptions are furthest from the actual requirements. As mentioned above, offering precise description of the ‘whys’ and ‘whats’ when describing a task to systems analysts requires that middle management level users consider the complete set of task dependencies within the system.

Care must be taken when interpreting the results of complexity for this chapter. We are not contending that complexities of tasks (objective or subjective) in organizations are non-linear and that the tasks of CEOs and vice presidents are not complex; rather, we are claiming that due to the need to express precisely the ‘whys’ and ‘whats’ of specific tasks, the cognitive complexity of describing requirements and work goals is higher at the middle management level than at any other level of the organization. To the best of our knowledge, this finding has never been stated in the RE literature or is ever mentioned as a reason for misalignments between technology and business strategies. The practical implication of this conclusion is a word of caution for systems analysts on their approach for requirements elicitation. We suggest that additional time should be spent, and extra effort and emphasis should be paid, while gathering requirements and work goals at the middle management level. Practical suggestions include having the most experienced analysts on the project team or twice as many analysts work at the middle management level as well as double checking the elicited requirements and work goals to ensure that they are correct.
3.8. Limitations and Future Research

The choice of sample population for the empirical investigation is a clear limitation of this study. In an ideal world, subjects would have been chosen from an organization with an ongoing IT project. Several unsuccessful attempts were made to find real companies that were conducting projects that fit our needs. Eventually, due to time constraints, we resorted to conducting the study in the laboratory. With this limitation and on the basis of one experimental study, we cannot state conclusively that our results will be true across all organizational contexts. However, the findings we drew on and our empirical evidence allow us to believe that the constructs of motivation and experience and the complexities of different organizational levels generally influence the quality of the descriptions of requirements and work goals that users give to systems analysts. Further research is encouraged for it is suspected that these factors will provide similar types of results in an organizational setting.

Another limitation of the study has to do with the two approaches we used to control experience: (i) a questionnaire at the beginning of the study asking the students to rate their experience with the business processes in the automobile industry, and (ii) having the high experience group read the case to be used in the main study and answer 25 questions about it while asking the low experience group to read a non related business case. In hindsight, we recognized that the first method used for controlling experience creates a non-randomization problem for the second control. Due to this limitation, it is difficult for us to state conclusively that the experience construct measured in the study was not confounded by other factors.

Although the complexities of organizational levels are relative to each organization, we can inductively assert that the dependencies of tasks which users need to consider when describing requirements and work goals to systems analysts will be proportionally similar to the complexities we outlined in the experiment (i.e., minimum complexity at the transaction processing and executive level and maximum at the middle management level).

While our study illuminates experience and motivation as two pivotal factors for improving alignment between requirements and work goals elicited from users and strategic business goals, we should be mindful of the fact that the experience construct used in this study encapsulates several other constructs (work experience, task knowledge and ability). Future research can
separate these constructs and examine their independent impact on the degree of alignment between assigned and interpreted goals. Similar separation should be done on the motivation construct, splitting it into intrinsic and extrinsic motivation.

In this study we sought to determine whether certain factors would improve alignment of elicited requirements. A second avenue of research branching off from this study would be to investigate whether distinguishing between a stakeholder’s interpretation of their work goals and the goals the organization assigned to them provides systems analysts with a better understanding of the degree of alignment between the organization’s strategic goals and its technology requirements. Information quality constructs such as understandability, meaningfulness, accuracy, completeness should be taken into consideration for such a study.

Finally, we intend to repeat this study either in organizations with real projects or using the survey approach. The objective of repeating the study is to allow us to generalize our findings. If we conduct this study in organizations, we will ensure that potential threats of people, place and time are controlled.

3.9. Conclusions

One of the intentions of our research was to investigate the types of constructs (individual and organizational) that influence the degree of alignment between the requirements and work goals users describe to systems analysts and those that were assigned to the users by managers and executives. To arrive at these constructs, we researched the antecedents of task performance in several disciplines. We argued that users who perform well on their tasks have a deep and accurate understanding of those tasks and that their description of their requirements and work goals to systems analysts will be more aligned with the business’ stated strategies. This premise allowed us to borrow antecedents from task performance models and apply them to our study. After a thorough literature review, three constructs were selected for investigation: experience, motivation and complexity. This led to our research question: “Do users’ motivation and experience and the objective complexity of their tasks influence the degree of alignment between the requirements and work goals that users describe to systems analysts and the requirements and goals that the organization has assigned to them?” To answer this question, three hypotheses
were developed and tested in a laboratory experiment using subjects from a business school at a large university. The results of the experiment revealed that experience, motivation and complexity at different organizational levels do significantly influence the quality of requirements and work goals that users describe to systems analysts.
3.10 References


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CHAPTER 4
A METHODOLOGY FOR ALIGNING ASSIGNED AND INTERPRETED GOALS WITH STRATEGIC BUSINESS GOALS

4.1. Introduction

Business-IT alignment was ranked as the top issue for practitioners and business executives over the last ten years (Chan & Reich 2007). It is a process of applying technology in an appropriate and timely way and in harmony with business strategies, goals, and needs (Luftman and Brier 1999). According to Chan and Reich (2006), business-IT alignment leads to more focused and strategic use of technology, which, in turn, leads to increased performance.

The phenomena of business-IT alignment has been studied by a number of researchers (Bleistein et al. 2006; Champion and Moores 1996; Chan et al. 2006; Gordijn et al. 2003; Henderson and Venkatraman 1992; Loucopoulos 2001; Luftman 2000; Luftman and Brier 1999; Reich and Benbasat 2000; 1996; Sabherwal and Chan 2001; Salinesi and Thevenet 2007; Tan and Gallupe 2006; Tavakolian 1989) who have formed several schools of thought stretching across all levels of organizations. In many of these studies frameworks were proposed as a way to conceptually assess the strategic role of information systems as a source of competitive advantage (e.g., (Bleistein 2006; Henderson and Venkatraman 1992; Salinesi and Thevenet 2007). Very few of these frameworks, however, address alignment vertically (i.e., between the strategic intention for the IT, or ‘why’ the company has invested in the technology, and the IT system usage, or ‘what’ the IT system should be doing to repay that investment). A vertical alignment investigation enables business and systems analysts to evaluate whether the IT system is fulfilling the goals which the company set forth when they invested in it. Of these few frameworks, only a small set are supported with systematic guidelines or approaches for aligning technology with business strategies. Often, business-IT alignment articles discuss a set of constructs that are potential inhibitors, antecedents, mediators, and/or moderators of alignment. The authors conducting these investigations test the correlations among the constructs, report the findings, and conclude with

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3 A version of this chapter will be submitted for publication. Singh and Woo (2009) “A Methodology for Aligning Assigned and Interpreted Goals with Strategic Business Goals”. [114]
practical implications for both researchers and practitioners. Rarely do these articles explain how system analysts should perform and evaluate alignment.

To address this gap in the literature, we offer a vertical mapping and evaluation approach encompassing a set of operationalizing guidelines which may be used by systems and business analysts to model and evaluate alignment between the strategic intention for the IT system and the technology. The strategic intention for the IT system is represented through strategic level constructs (e.g., strategic goals), while the technology output is represented by the goals of requirements, which are derived from goal-oriented requirements approach.

The mapping and evaluation approach adopts a goal-oriented perspective, which is anchored in the discipline of requirements engineering (RE). Over the last 15 years this discipline has promoted the use of goal-oriented frameworks to explain why IT systems are needed. Goal-based modelling has the primary advantage of subsuming distinct concepts such as systems functionalities and business processes. Goal-based frameworks, such as B-SCP (Bleistein 2006) and INSTAL (Salinesi and Thevenet 2007), adopt several strategies for eliciting goals. Some of these strategies include extracting intentional statements from documents, such as enterprise policies, enterprise mission statements, workflow diagrams, and interview transcripts, and asking ‘how’ and ‘why’ questions about initially identified goals, as well as asking ‘how else’ questions to identify alternative goals (Regev & Wegmann 2005).

Eliciting goals from an organization’s documents can be challenging, for the simple fact that enterprise policies, workflow diagrams and statements, and other documents of that sort are sometimes outdated, incomplete, inaccurate or unavailable. Interviewing stakeholders (users of the system) is an alternative method that analysts sometimes use for eliciting goals. The process of interviewing is consistent with the most popular and general strategies for eliciting requirements (Agarwal and Tanniru 1990; Byrd et al. 1992). This strategy, however, has several weaknesses, which include: (i) the questions used in the interview sometimes reflect the interviewers’ preconceived ideas, which potentially can negatively influence the interviewee’s responses; and (ii) the interviewers are not necessary able to distinguish the differences between goals assigned to stakeholders by managers (assigned goals) and goals stakeholders describe to systems analysts (interpreted goals).
The issue of divergence between assigned goals and interpreted goals, and the negative consequences of this divergence to organizational success, has been widely studied in personnel psychology and human resource management disciplines (Boswell 2006; Kristof 1996; Vancouver and Austin 1996). As a result we designed an approach to account for this problem. We believe that an understanding of the difference between assigned and interpreted goals will assist systems and business analysts in explaining and identifying organizational goals and stakeholders’ understandability of them. Based on this premise we propose to address the following research question:

**Can we develop a methodology to guide systems analysts in using goals to map and align IT with business strategies?**

The remaining sections in this chapter are organized as follows: Section 4.2 discusses goal orientation and its challenges at different organizational levels; Section 4.3 discusses the differences between interpreted and assigned goals; Section 4.4 reviews literature on goal-based frameworks in RE; Section 4.5 summarizes the challenges encountered when mapping and validating stakeholders’ operational goals to strategic business goals; Sections 4.6 outlines the algorithm for constructing goal graphs; Section 4.7 highlights the methodology for mapping operational goals with strategic level goals; and Section 4.8 presents a case study conducted at a large North American business school; Section 4.9 discusses lessons learnt from this study; Section 4.10 concludes with a summary of the chapter and directions for future work.

### 4.2. Goal Orientation and its Challenges at Different Organizational Levels

To address the research question we propose to first highlight the different types of goals found in the organization in question and then show the complexities of eliciting these goals using existing approaches. The intent of this section is to strengthen our argument for the need of a new approach to map elicited operational goals onto the organization’s strategic goals.

Organizational goals are categorized under two broad levels, the strategic level and the operational level. Goals at the operational level are termed ‘operational goals’ while goals at the
strategic level are termed ‘strategic goals.’ At each level, goals are defined with different degrees of abstraction and serve different purposes. Strategic goals are broadly defined to support a mission statement, and are set by and for top management in the organization. Operational goals are defined to address issues associated with strategic goals, and are often set for stakeholders who are associated with realizing outcomes for the products and/or services of the organization. The realization of goals is complex because (i) stakeholders have varying degrees of interpretation and understanding of organizational goals (Vancouver and Austin 1996), (ii) stakeholders may not know how goals contribute to the organizational vision, (iii) stakeholders may not know how to set operational goals that reflect strategic goals (Boswell 2006), and (iv) stakeholders may not know how to define attributes of goals (e.g., specificity, difficulty, acceptance, and commitment).

A literature review in RE, conducted by us revealed that current strategies for discovering goals suggested by Regev and Wegmann (2005) do not address these four complexities. We present four reasons for the restrictiveness of elicitation strategies.

- **Reason 1: Interviewing Constraints** - Systems analysts generally are not experts in the business domain (Sommerville and Sawyer 1997), and for a variety of cognitive, communicative, and motivational reasons, the information ultimately received and understood by analysts is generally incomplete (Browne and Rogich 2001).

- **Reason 2: Abstractness in Strategic Goals** - The approach of asking ‘how’ and ‘how else’, or ‘why’ and ‘how else’ questions for eliciting goals assume a primarily operational-level perspective. Dardenne and colleagues (1993) stated that asking ‘why’ questions drives composition of system goals. This mechanism, according to Anwer and Ikram (2006), provides a solid rationale for every elicited requirement, and helps systems analysts identify requirements that do not contribute to any of the higher level goals. Asking ‘how’ questions drives the identification of sub-goals (Dardenne et al. 1993). While these methods are useful for information systems (IS) development, we found that they are unsuitable for eliciting goals at the strategic level, primarily due the abstractness of strategic goals. For example, one of the strategic goals in the organization may be to increase market share. Simply asking ‘how’ questions might not fully articulate the functional requirement of this goal in the intended IT system.
Reason 3: Eliciting Goals Unidirectionally. Asking ‘how,’ and ‘how else’ or ‘why,’ and ‘how else’ types of questions limit the response to a unidirectional validation. If systems analysts adopt the ‘why’ and ‘how else’ approach alone, more than likely they will start eliciting goals from the lowest level and will move upwards until they reach the highest or the strategic level of the organization (i.e., a bottom-up approach). Conversely, if systems analysts adopt a ‘how’ and ‘how else’ approach alone, they are more than likely to start eliciting goals from the top, thereby determining strategic goals, and will then decompose the goal until they reach the lowest level goals (i.e., a top-down approach). Adopting one approach only inherits the disadvantages of unidirectional mapping. For example, in the top-down approach, business executives are far removed from the day-to-day activities, and for this reason there is a high probability that goals elicited through this approach will be unrealistic. On the other hand, goals discovered from the bottom-up approach are not always in line with the organization's mission. Often, these goals lack clear direction and focus (Barney and Griffin 1992). It was argued by Regev and colleagues (2005) that a combination of these approaches (asking ‘how’ and ‘how else,’ and ‘why’ and ‘how else’ questions) will complement the weaknesses of the other approaches. We believe, however, that asking a ‘why’ question about a goal already discovered through a ‘how’ question will more likely result in conforming to the discovery the same goal.

Reason 4: Lack of Precise Guidelines. Van Lamsweerde (2001), asked: What is a high-level goal? Who says it is high-level? One person's high-level goal is another's implementation detail, so how do we know that the identified goals are really the right goals to be designing the system for? For example, the high-level goal of the ATM is the cash delivery. This goal is a high-level goal for the ATM but not necessarily for the user (van Lamsweerde 2001). A lack of precise guidelines for eliciting goals and justifying their context relative to other goals is one of the reasons for many of the unanswered questions in the field of RE.

While current RE methods may be adequate for technology system development, they are arguably limited in their heuristics and they lack pragmatism in broader context, such as business-IT alignment. In addition to these limitations it is unclear from an alignment perspective whether goals elicited from stakeholders only are sufficient to evaluate alignment between operational goals and strategic business goals. In response to this, we contend that the goals that
are provided by stakeholders alone are inadequate for evaluating alignment. To compensate for this inadequacy, we suggest that assigned goals should also be considered in the process of evaluating alignment. In the following section we discuss the differences between assigned goals and interpreted goals.

4.3. Multi-disciplinary Views on the Differences between ‘Goals Assigned to Stakeholders’ and ‘Stakeholders’ Interpretation of Assigned Goals’

Research in several disciplines (e.g., Human Resource Management, Personnel Psychology, and Strategy) examines the notion of differences between assigned goals and interpreted goals. This research states that strategic goals are operationalized into operational goals, which are assigned implicitly or explicitly to stakeholders. Upon receiving these goals the stakeholders may accept the goals as is, reinterpret the goal, or even reject it. A reinterpretation or rejection of the goal may result in divergences between the stakeholder’s goals and the strategic goals of the organization. Scholars have shown that when stakeholders understand their organization’s goals, they are more likely to act in accordance with those goals, leading to improved organizational outcomes (Kristof 1996). Conversely, stakeholders who do not understand their organization’s goals can adversely affect the performance of the organization because they may develop other, perhaps conflicting goals that may interfere with the organization’s functioning and strategic success (Guzzo and Shea 1991; Witt 1998).

Vancouver and Austin (1996) state that assigned goals by themselves are meaningless because these goals are often internally represented, by stakeholders, as desired states. The degrees of internal representation (‘desired states’) are a result of several influencing factors, including characteristics such as the stakeholder’s experience, level, functional area (Strahle et al. 1996), ability, past success, performance constraints, and the perceived importance of the job (Hollenbeck and Howard 1987). In many instances, the employers lack knowledge of how stakeholders internalize assigned goals.

The differences between interpreted and assigned goals support the argument that eliciting goals from stakeholders only is insufficient for mapping operational goals onto strategic goals. Furthermore, these goals do not guarantee complete, consistent, and accurate requirements.
Instead, the inclusion of the two types of goals in an alignment methodology should help business executives understand variations in alignment, and identify missing criteria and outdated business processes. The premise of including the two types of goals in an alignment methodology is the impetus in this research. To illustrate the novelty of including the two types of goals in our methodology, we present in the next section a review of existing frameworks within the RE discipline, thereby outlining the limitations of other perspectives on business-IT alignment.

4.4 Overview of Goal-based Frameworks Mapping IT Goals to Strategic Goals

To verify alignment between information systems and business strategies, it is critical to understand both the organizational context in which the information system occurs, and the manner in which the information system contributes to the organization (Ould 1995; Rummler and Brache 1995b). Bleistein (2006) proposed the notion of aligning information systems and business strategies using a goal-based approach. He mapped strategic business goals onto operational level goals. Since then other goal-based approaches, for example the INSTAL Method, have emerged as means for aligning information systems with business strategies.

In this section we examine goal-based frameworks, in RE, that support mapping between low-level processes and high-level organizational context. The review of these frameworks focuses on: (i) the explicit consideration between assigned goals and interpreted goals; and (ii) the clarity of goals and the direction of mappings (top-down or bottom-up) between the two levels. We advocate that clarity and direction of mapping will aid in understanding, validating, and explaining differences between goals at different organizational level.

The i* strategic dependency and rationale framework (Yu 1995) models organizational intention and dependencies among actors realizing goals. Yu (1995) states that “actors are strategic in the sense that they are concerned about the opportunities and vulnerabilities and seek rearrangements of their environments that would better serve their interest.” The term ‘strategy’ in the i* framework refers to the agent’s personal strategy, and has very little to do with business strategy, which can be explained as ‘the means by which an organization provides itself with a unique differentiating advantage over its business rivals.’ In the i* framework, goals elicited are
stakeholders’ interpretations, and therefore have the aim of serving the stakeholders’ best interests. No part of the i* framework suggest ways of illuminating differences between the stakeholders’ best interests (interpreted goals) and organization’s interests (assigned goals). Also, there is no precise way to evaluate whether the goals that stakeholders provide are in alignment with the strategic business goals.

The CREWS-L’Ecritoire project (Rolland et al. 1998) combines goal modelling and scenario analysis as a means to map the requirements of a large organizational information system. CREWS-L’Ecritoire was developed on the premise that information systems fulfil a purpose within an organization, and the primary stakeholders are the most suitable sources of viewpoints for the intended system. The framework adopts a top-down approach that starts with one highest-level goal and decomposes it into successive goals through scenario analysis and goal modelling. The highest-level goal adopted in this framework often reflects the context of the information system, rather than the context of the organization’s strategies (e.g., create new markets). In the top-down decomposition method it is unclear to what extent business strategies are included in the model, and to what extent viewpoints provided by stakeholders are consistent with the business strategies.

Business Modelling with UML (Penker & Han-Erik 2000) is an extended version of UML, created to model business rather than software. To reflect this purview, several constructs, such as business vision, business structure, business processes and business behaviour were incorporated into the traditional set of UML constructs. This framework offers little explanation of how to integrate these business views with the traditional constructs. This method offers no explicit means for goal tracing nor does it provide any means for evaluating divergences between goals assigned to stakeholders by managers and the stakeholders’ interpretation of those goals.

The e3-Value framework models value propositions which are based on analysis of economic value creation, distribution, and consumption in a multi-actor network (Gordijn et al. 2003). The model describes the resulting effects of economic activity on this network. This framework offers minimal description of other necessary components in a network of partners (Pigneur et al. 2001). Furthermore, the e3-Value framework does not perform the crucial task of differentiating
between value analysis and business strategy, and moreover there is no clear account of how economic value creation is linked to low-level system goals (Bleistein et al. 2005).

Several other frameworks (Bubenko 1994; Campion and Lord 1982) aim to understand information systems within the context of a larger enterprise. The Strategic-Service-Support (S3) framework (Loucopoulos 2001), for example, addresses strategic and service-oriented issues in business process modelling, while the Enterprise Modelling Approach (Champion and Moores 1996) includes strategic-level concepts, such as the mission statements of the organization, as a way of understanding requirements for large information systems. According to Bleistein (2006) however, these frameworks are limited and do not adequately reflect business strategies. He mentions that “while enterprise modelling approaches recognize a need to address business strategy in requirements analysis for organizational IT, these frameworks ultimately fail to deliver a means of eliciting and modelling business strategy, and then linking requirements to strategy in an explicit and traceable manner” (p. 21).

To the best of our knowledge, the B-SCP framework for strategic alignment (Bleistein et al. 2006) is the only approach that emphasizes business strategies, business context, business processes and system process. This approach models alignment through a top-down view, and there is little or no clear guidance for modelling alignment using a bottom-approach. The unidirectional mapping approach, as mentioned in the previous section, is restrictive and the results from this process can falsely represent the goals of the organization. Furthermore, the B-SCP framework fails to recognize any explicit distinction between goals assigned to stakeholders by managers and goals as interpreted by stakeholders.

The frameworks discussed above are the key ones to date that either discuss business strategies or attempt to align strategic goals with operational goals. As we revealed above, none of these frameworks make any explicit distinction between goals assigned to stakeholders by managers and the goals interpreted by stakeholders. This distinction is imperative. To elaborate on the importance of making the distinction between interpreted goals and assigned goals, and the need to consider this while conducting business-IT alignment, we present in the following section some additional discussion on the two types of goals.
4.5. Summarizing the Challenges when Validating IT Goals and Mapping them onto Strategic Business Goals

In previous sections, we discussed and illustrated how goals are defined at varying levels of abstraction and with different contextualization at the different levels of an organization. For example, at the management level there are several distinct units (e.g., accounting, marketing, human resources, IT). Stakeholders in each unit may define goals differently due to the unit objectives, as well as their educational and cultural background. These differences may potentially create complexities for analysts when they are attempting to map goals across the units (Accounting, Marketing, etc.) even while remaining at the same level (in this case the middle management level). A stakeholder X in one unit may identify the goal of a task performed by stakeholder Y in another unit through its contribution to his own task goal. Stakeholder Y may not be aware of, or may disagree with, this contribution. Several factors may account for this disagreement, such as misunderstanding strategy, unaligned organizational systems and resources, competing activities, and uncontrollable environments. Similar conflict scenarios may exist across organizational levels, for example between the middle-management level and line workers.

The variance between the goals and requirements that stakeholders describe to systems analysts and the actual requirements and goals of the organization can further be explained by work in disciplines outside of RE (e.g., Human Resource Management). Boswell et al. (2006) classify stakeholders’ variations of understanding of their job task into four categories: (i) deep and accurate, (ii) deep and inaccurate, (iii) shallow and accurate, and (iv) shallow and inaccurate. The authors state that stakeholders may believe they understand the organization’s objectives and are effective contributors, yet they can be wrong in that assessment. There are also those who accurately understand the objectives of the organization, but do not understand how to contribute toward those objectives. There may be yet other stakeholders who neither understand nor precisely know how to contribute toward the organization’s objectives.

So far, we have presented the need for and importance of assigned and interpreted goals when performing business-IT alignment. Next we propose an approach for validating elicited, assigned, and interpreted goals, and mapping validated goals onto the organization’s strategic business goals.
4.6. Constructing Goal Graphs

The following two sections present a systematic process for developing a methodology for mapping goals. Figure 4.1 illustrates a high-level overview of the process. Three views of goals are employed (i.e., strategic, assigned and interpreted). Elicited goals are mapped onto goal graph templates (a detailed explanation of graphing and graph relationships occurs in section 4.6.2).

Figure 4.1: A High-level Overview for Developing the Proposed Methodology

Interpreted goals are a stakeholder’s description of the assigned goal and for this reason it is expected that the interpreted goal graph will have the same edges as the assigned goal graph. The difference between the two graphs (assigned and interpreted goals) resides in the difference in the completeness and clarity between the two goals. According to Rolland et al. (1998), a goal definition should include a verb and at least one of four parameters (target, direction, beneficiary, and way). Based on this definition, we define completeness in terms of the number of parameters
mentioned in the goal description. The clarity of the goal is defined as the explanation of how well the parameters are related to each other. The combination of completeness and clarity is referred to as the context of the goal.

Each node in the assigned goal graph is compared with the corresponding node in the interpreted goal graph for context congruency. The degree of congruency is evaluated by experts. Goals which are congruent in context are mapped onto the nodes in the strategic goal graph using a combination of a top-down and bottom-up strategy.

4.6.1 Eliciting Goals (Strategic, Assigned, Interpreted)
Singh and Woo (2008) offered approaches for eliciting strategic, assigned and interpreted goals. The authors stated that eliciting strategic-level constructs (e.g., vision, strategic process) would provide additional contextual information for the strategic-level goals. These constructs can be elicited either by interviewing (where the business executives are aware of or have the details of the constructs) or through the use of a questionnaire (when interviewees are unsure of the context and level of detail of the strategic constructs). Assigned goals are elicited by asking business executives and managers to provide a list of the goals that were assigned for each task a stakeholder performs. This process is often impractical, as business executives and managers rarely know in detail or keep records of the assigned goals in job descriptions. To compensate for this issue, the authors proposed to formally model the organization using formal modelling approaches (e.g., Object Oriented Enterprise Modelling) and then elicit goals for every service (task). The elicited goals are verified, modified and confirmed by the business executives and managers. Interpreted goals are discovered either by directly asking the stakeholders to describe the goals for the tasks they performed, or by administering a questionnaire (Singh and Woo 2008). Both strategies are intended to assist the stakeholders to adequately describe the task goals.

4.6.2 Goal Graphs
This section discusses an overview of goal graphing, which is the cornerstone for our proposed methodology. A graph is defined as a set of nonempty set (e.g., objects) that are linked together by a set of edges. The theory of graphs uses mathematical structures to model pair-wise
relationships between objects from a certain collection. We believe that this theory will help us to model the pair-wise relationships between assigned and interpreted goals, and between operational and strategic-level goals. The goal graph approach has been widely adopted in Artificial Intelligence. For example, Hong (2001) proposed a method for goal recognition through the use of goal graph analysis; Park and colleagues (2008) offered a system using goal graphs to analyze the behavioural levels of self-adaptive modules; Lesh and Etzioni (1995) utilized a goal graph representation (called a consistency graph) which consists of actions and goals, where actions represent nodes and goals represent edges between nodes, for modelling goal recognition problems.

Our study uses directed graph reasoning. A directed graph is one in which the direction of any given edge is defined. A summary of the concepts used in graph theory is provided below to describe the context of the proposed modelling approach.

Graph Concepts:

- A graph $G$ is defined as a pair $(N, E)$, where $N$ is the set of nodes and $E$ is the set of edges.
- A node $n$ is a terminal point or an intersection point of a graph $G$.
- A node contains the description of a goal (strategic, assigned, and interpreted).
- An edge defines the contribution between two nodes.
- An edge $e$ is associated with an ordered pair of nodes or states $(n_1, n_2)$. Node $n_1$ is called the origin and node $n_2$ is called the end of the edge $e$. An edge $e$ is said to leave goal node $n_1$ and come in to node $n_2$. An edge $e \in E$ is a pair $e = (n_1, n_2)$, where $n_1, n_2 \in N$ are nodes.
- Adjacent Nodes: Two nodes $(n_i$ and $n_j)$ are adjacent if they are connected by an edge $(e)$.
- Adjacent Edges: Two edges $(e_i$ and $e_j)$ are adjacent if they have at least one common endpoint $(n)$.
- A directed graph $G$ is a pair $(N, E)$ such that:
  1. $N$ is a finite non-element set, whose elements are called nodes, and
  2. $E$ is a non-element set of pairs of vertices, whose elements are called directed edges.

  The edge $e (n_i, n_j)$ has direction from $n_i$ to and $n_j$. 

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Predecessor and Successor: The relationship between predecessor and successors can only be determined after identifying nodes (\(n_i\) and \(n_j\)). Domain context and domain rules will dictate when a node is a predecessor and when it is a successor.

1. For \(n \in N\), the set \(\bullet n := \{n_i \mid (n, n_i) \in E\}\) is called the predecessor set of \(n\).
2. For \(n \in N\), the set \(n \bullet := \{n_j \mid (n_j, n) \in E\}\) is called the successor set of \(n\).
3. The node \(n\) is called isolated if \(\bullet n = n \bullet = \emptyset\), i.e., if no edge ends in \(n\) and no edge starts from \(n\).

### 4.6.3 Constructing Strategic Goal Graphs

According to Davis (2003), strategies are means by which long-term objectives are achieved and they are stated in terms of growth in assets, growth in sales, profitability, market share, degree and nature of diversification, earnings per share, etc. Each objective is defined by properties that should be measurable, realistic, understandable, hierarchical, obtainable and congruent among organizational units (Davis 2003). The author mentioned that “annual objectives are essential for strategic implementation because they (1) represent the basis for allocating resources; (2) are a primary mechanism for evaluating managers; (3) are the major instrument for monitoring progress toward achieving long term objectives; and (4) establish organization, divisional and departmental priorities” (pg. 238).

Given that we are constructing a strategic goal graph, it was only logical to select strategic goals to be the nodes in the graph. Analyzing Davis’s view of annual and long-term objectives, we found that strategic goals could be clustered by time intervals. At any window of time, the entire organization can be evaluated by the goals that are present within the window frame. The outcome of the evaluation could be compared with expected outcome of the next window frame. Alignment or misalignment relative to the outcomes in the past, current and next window frames could then be detected. For example, expert business executives will be able to evaluate whether the outcome of the current window frame is equivalent to the intended outcome of said frame, by comparing the intended with the actual outcome. Similarly, the actual outcome for the current period can then be assessed against the intended outcome of the next window frame. The intuition behind the timeframe analysis and Davis’s argument on the essentials for strategic
implementation provided us with the leverage to use a time interval concept as a means to define the levels within the goal graph.

Whichever of the organization’s goals will take the longest to achieve will be the parent node of the goal graph. For example, the vision of an organization is to ‘control 20% of the market share in North America in the next 15 years’ and this vision is the organization’s longest-term goal. In the goal graph template, this vision will represent the parent node of the graph. Ideally, the level immediately below the parent node should consist of those goals that are to be achieved in year 14, with the preceding level consisting of goals to be achieved in year 13, and so on.

![Goal Graph Diagram]

**Figure 4.2: A Strategic Goal Graph Representation**

We recognize that many organizational structures do not have yearly systematic goal targets, and for this reason we have relaxed the constraint of having the preceding level of each level being goal targets with a one year difference. Instead, we contend that, in constructing a strategic level goal graph, the expected number of years for achieving level \( L_i \) (where \( i \) is the root node) should be greater than the expected number of years for achieving any other node in the graph, and for the node at level \( L_i \) to be true, all nodes in the tree must be true. Similarly, the expected number of years until achieving the goal nodes at level \( L_{i-m} \) (where \( i > m \)) should be greater than the expected number of years for achieving the goal nodes at level \( L_{i-m-1} \), and for the nodes at level \( L_{i-m} \) to be true, all nodes at all levels below \( L_{i-m} \) must be true. Figure 4.2 illustrates an example of the nodes and levels in the strategic goal graph.
4.6.4 Constructing Assigned Goal Graphs

Assigned goals are operationalizations of strategic goals, which are defined by business executives. These goals are reflected at the operational levels, which consist of functional and divisional structures. A functional structure groups tasks together based on the functions of specific business units in the organization (e.g., production/operations, marketing, finance/accounting, research and development) (Davis 2003). A divisional structure groups tasks together based on central structures, and at an individual level (e.g., by geographic area, product or service, customer, market). To represent granularity, consistency and simplicity in flow, we contend that assigned goal graphs should be constructed using the functional structure approach, and should be supported if necessary with the divisional structure approach. We propose that the nodes of the assigned goal graph should describe the goals of a task in a business process, while the edges should be determined via the flow of the business process (representing nodes across the same level). The levels of the graphs are represented using a hierarchical structure template, for example several levels are depicted in the organizational chart, and these levels can be used to depict the levels in the assigned goal graph. It should be noted that if the assigned goals are derived from the business processes (e.g., when not readily available), then they must be verified by executives and managers who have the freedom to change or modify the goals according to their interpretations. Only after executives and managers are comfortable with the description and context of these goals will they be called assigned goals.

The assigned goals are mapped into a goal graph through a preceding-succeeding hierarchical approach. Preceding nodes are defined as those nodes that contribute to the realization of the goal node \( N_i \), while succeeding nodes are defined as the immediate node(s) that the goal node \( N_i \) contributes towards. The parent node(s) of the goal graph is/are defined as the node(s) that contribute(s) only to the strategic level goals. For a goal node \( N_i \) at a level \( p \) to be true, it implies that all goal nodes that contribute towards \( N_i \) must be true. Stakeholders performing tasks may achieve the assigned goals independently (i.e., by completing the tasks on his/her own), or through dependencies (depending on other persons to complete their tasks before completing his/own task). A leaf node is a goal that is achieved from an independent task. No other task contributes towards the goal for that task. Leaf nodes may be represented at different levels.
within the goal graph. Figure 4.3 provides an illustration of the template of the assigned goal graph that consists of nodes, edges and levels.

4.6.5 Constructing Interpreted Goal Graphs

An interpreted goal is the stakeholder’s interpretation of an assigned goal that is derived from a task. By deduction therefore, an interpreted goal is also directly derived from a task. Given that this is the same task from which the assigned goal is derived, it follows that there is one-to-one relationship between every assigned goal and its corresponding interpreted goal. This one-to-one relationship means that the structure of both graphs will be the same, with the primary difference being the distinction in clarity and context between the two goal descriptions. Although it is possible a stakeholder may unconsciously describe two separate goals into one goal description, the stakeholder will still be required to describe a goal for the second task which he combined with the task in his earlier description. The rigidness of having the stakeholder describing goals for every task from which an assigned goal was derived forces the structure of both graphs to be the same. Figure 4.4 illustrates an example of an interpreted goal graph template that is identical in structure to the assigned goal graph in Figure 4.3.
This section discussed approaches for constructing strategic, assigned and interpreted goal graphs. In the following section, we present the methodology for mapping assigned and interpreted goals onto strategic goals.

4.7. Mapping Methodology

4.7.1 Summary of Methodological Approach

This section presents a methodology for evaluating congruencies between assigned and interpreted goals and mapping operational goals onto strategic goals. At the operational level, assigned and interpreted goals are evaluated for alignment by comparing the context of a node in the assigned goal graph with the context of the corresponding node in the interpreted goal graph. This process can begin either from the root nodes or the leaf nodes of both graphs. The point of reference from which to start comparing the two nodes will not affect the outcome of evaluating the congruencies between the two nodes because the process only compares descriptions inside the nodes and does not compare the contributing edges.

Business executives with the appropriate and relevant knowledge will be asked to be experts in evaluating congruencies in context between the assigned and interpreted goals. For example, experts in the IT department will evaluate goal congruencies for the IT division, while experts in the marketing department will evaluate goal congruencies for marketing division. To minimize bias, at least two experts with similar background knowledge are required for each division. To
assist them in their rating, the experts will be provided with the goal template constructs developed by Rolland and colleagues (1998). Congruencies will be evaluated by comparing the context of the template parameters in the assigned goal with context of the template parameters in the interpreted goal. Experts will rate the congruency between the two goals context on a 5-point Likert Scale (scores 1-3 represent low congruency and scores 4-5 represent high congruency). If the scores are low then an iterative negotiating process is suggested between the stakeholders and systems analysts to resolve discrepancies. Negotiating is necessary, because stakeholders are not always able to describe the goals for the tasks they perform (Anton 1996). In the negotiation process, the systems analysts are expected to provide additional information to stakeholders to help them to better contextualize their goal descriptions if it conflicts with the assigned goal descriptions. If the stakeholder changes his/her description of the interpreted goal then the experts will re-evaluate that goal’s congruency with the corresponding goal in the assigned goal graph. Goals that are congruent at a satisfactory level (e.g., 4-5) are mapped onto an aligned goal graph through successor and predecessor mapping. The aligned goal graph is then mapped into the strategic goal graph by asking ‘how’ questions about the context within the leaf nodes of the strategic goal graph, and decomposing the answers to derive the context description for the parent nodes of the aligned goal graph.

The remaining sections discuss the process for evaluating assigned and interpreted goals at the operational level for alignment, and mapping aligned goals onto the strategic-level goals.

4.7.2 Evaluating Goal Congruencies between Assigned Goals and Interpreted Goals
Using set theory, alignment between a goal node in the assigned goal graph and the corresponding node in the interpreted goal graph is defined as an intersection between the two sets of goals (A ∩ B, where A are the goals assigned to stakeholders by managers, and B are the stakeholder’s reinterpretations of the assigned goals). In this exercise, the goals are not expected to be dichotomous, for stakeholders will be asked to provide corresponding descriptions for tasks that the assigned goal describes. Goals that are not aligned are defined as the ‘difference’ i.e., either A - B (assigned goal not aligned with interpreted goal) or B - A (interpreted goal not aligned with assigned goal). Figure 4.5 illustrates the three categories of goals. Those goals that are not aligned should be stored temporarily in a bin until the completion of the entire mapping
process, since they may still show strong contribution to the strategic level goals at later stages in the mapping process.

Dardenne (1993) suggested the approach of asking ‘how’ and ‘why’ questions repeatedly as a method of elaborating existing goals. Asking ‘how’ questions directs the decomposition of the goal, while asking ‘why’ questions focuses on the reasons that drive the composition of the goal (Penker and Han-Erik 2000). To increase the number of aligned goals (A ∩ B), we suggest repeatedly asking the stakeholders ‘how’ and ‘why’ questions relating to A – B goals (i.e., the assigned goals that they did not interpret correctly), as shown in Figure 4.6.

The objective of this method is to increase the stakeholders’ understanding of the task and to trigger other long-term memories that may assist in providing deeper and more accurate descriptions of the assigned goals (A – B). Additionally, this process should help analysts to identify new or hidden goals that were not mentioned initially by the stakeholders or revealed in the assigned goal set.

4.7.3 Mapping Aligned Operational Goals onto a Goal Graph

Goals that are still not aligned are once again temporarily stored to be compared later with the strategic-level goals. The aligned set of goals is constructed into a new goal graph. At best this new graph should be the same as the original assigned goal graph, however this may not occur at
all times because nodes may be deleted (the A – B goals) or nodes may be added to the aligned set of goals (due to the discovery of new goals that were not represented in the original assigned goal graph or initially identified by stakeholders). The new goal graph is constructed from the core of the assigned goal graph, using the nodes and edges in the assigned goal graph so that the new graph matches the nodes and edges in the set of aligned goals. New nodes or deleted edges (nodes that are not in the aligned set of goals but in the assigned goal graph) are constructed into the new goal graph by mapping the immediate predecessors and successors onto a specific goal Gᵢ. This is achieved by identifying each principal stakeholder who owns a goal (centre diamond on the extreme left of Figure 4.7) and asking that stakeholder the question ‘who receives the output of the goal?’ in order to identify the successor goal (top left diamond in Figure 4.7). To identify a predecessor goal, the stakeholder is asked ‘was there an input goal, and if so who is the owner of that goal?’ (bottom left diamond in Figure 4.7).

The challenge of identifying predecessors and successors is the assumption that a goal (Gᵢ₋₁), which an agent X state as a predecessor goal, is indeed the same goal that another agent Y state as the successor goal of the first goal of agent (X). To address this issue, our methodology suggests that systems analysts revisit each stakeholder to verify whether the contributions were successful or unsuccessful. If conflicts arise in confirming predecessors and successors to an instance goal Gᵢ, then it is suggested that the analysts provide the stakeholders with additional information to clarify the contribution of the goal, for example the importance of the task from the organization’s perspective. Goals that are confirmed successfully are inserted into the new goal graph (Figure 4.8a – representing aligned goals only). The misaligned goals (A – B) and (B – A) (Figures 4.8b and 4.8c) are kept for further evaluation using the strategic goals.
4.7.3 Mapping Strategic Goals onto the Aligned Goal Graph

A mapping approach is suggested to bridge the gaps in the aligned goal graph using the nodes in the strategic goal graph. Leaf node goals in the strategic goal graph (Figure 4.2) are mapped onto the parent node(s) of the new assigned goal graph (Figure 4.8a). The edges between the two hierarchical sets of nodes are determined by asking ‘how’ questions and traversing the context of the goal descriptions in the strategic goal nodes using a tracing approach. A simple heuristic is suggested for the path tracing approach. Business executives and managers evaluate the context of each operational goal for its contribution towards: (i) the immediate successor, (ii) the successor above the immediate successor, (iii) and the strategic goal(s) to which the immediate successor contributes. As we move upwards in the goal graph, the strength of the contribution of a goal node will tend to fade possible due to confounded contributions of other goal nodes. For this reason, we suggest only to consider the two successor levels in the evaluation process.

If the contribution is evident for these three conditions then the goal is considered to be a node that contributes to the strategic goal. For contributions which are not evident, the evaluators should include in their evaluation criteria other successors of the successor in (ii). If contributions are still not clear, then that operational goal should not be considered a contributor to the strategic goal.

A strategic goal decomposed into an operational goal may also be mapped onto one of two goal categories (A – B) or (B – A) (Figure 4.8b and 4.8c). If a decomposed strategic goal is in the (A – B or B – A) category, then the methodology recommends that business executives evaluate the contribution the goal to the overall mission and vision of the organization. If the goal is deemed important in realizing the overall mission and vision of the organization, then the business executives should suggest reengineering the graph to include, for example, the goal as a node in the aligned operational goal graph. If the goal is not deemed important, then a decision should be made to either discard the goal or save it for further analysis.

Following the decomposition process, the goal graph is extended by including the strategic-level goals as the parent nodes, adding the nodes from the (A – B and B – A) categories that are deemed important, and excluding nodes that offer no contribution to another operational goal or strategic goal.
4.7.4 Methodology Summary

Goal nodes in the assigned and interpreted graphs are evaluated for alignment by executives and managers acting as experts. Misaligned goals are explored (through revisiting the stakeholder, providing additional context, and asking ‘how’ and ‘why’ questions) with the intent of changing the goal description of the interpreted goal such that it is aligned with the goal description of the assigned goal. Aligned goals are plotted onto a goal graph using the assigned goal graph as anchor template. A successor-predecessor approach is adopted as a way of inserting new goals, or bridging the gaps in the assigned goal graph template that were created because of the exclusion of misaligned goals. This approach is conducted by asking stakeholders to explain which other goals contribute to their goals, and to which goals their goals contribute in turn. The misaligned goals which are not nodes in the aligned goal graph are stored temporarily to be compared with the strategic goals.

The strategic goal graph is decomposed until the leaf nodes are equivalent to the parent nodes in the aligned goal graph. A tracing method is applied to determine the aligned goals that contribute to the strategic goals. Misaligned goals that were temporarily stored are evaluated directly against the strategic goals in order to establish their contribution. If the goals show some form of contribution, then they are inserted into the aligned goal graph, otherwise the misaligned goals are either stored for further analysis or discarded.

To demonstrate the feasibility of the methodology and approach, we present a case study in the following section.
4.8. Case Study

To validate the methodology, we test its usefulness and usability in practice. We applied the proposed methodology at a large public university in Canada. The objectives of the case study include: testing the methodology when evaluating pairs of goals at the operational level; mapping goals through predecessors and successors; resolving conflicts in mapping; and, mapping and tracing operational goals onto strategic goals.

The case discussed in this study examines the recruiting process of support staff. By 2010, the university’s vision is to improve its ranking among the top universities in North America. To realize this vision, the business executives identified several high-level strategic goals. One such goal is to attract outstanding staff. The human resources leadership models this goal in a framework with corresponding initiatives to attract, develop, and retain the best staff. According to the business executives we interviewed, this framework represents a radical shift in the hiring process (e.g., moving towards online hiring and appointment and away from paper-based application processes; this university has not yet adopted online recruiting). The new design aims to attract and seek out potential employees internally and externally, and to build a pool of qualified candidates regardless of current openings. The hiring personnel will no longer collect and process traditional resumes for individual openings (the university currently receives over 54,000 staff resumes per year), but instead the candidate’s resume will be processed automatically and made available online. The university’s business executives believe that the online hiring and appointment process will empower departments to act independently and engage the human resource department when only necessary.

A high-level overview for hiring a support staff is as follows: department determines the need for staff $\rightarrow$ department prepares details for an advertisement (Ad) $\rightarrow$ applicants apply for position $\rightarrow$ through a matching algorithm, the system prepares a list of potential applicants for the department $\rightarrow$ department forms an interviewing committee $\rightarrow$ applicants are interviewed $\rightarrow$ best candidate is selected $\rightarrow$ hiring manager acknowledges the selection $\rightarrow$ selected candidate is provided with an employee ID and enter into the payroll system.

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4 We would like to thank Niran Subramanian for providing the time and resources to allow us to complete this case.
4.8.1 Eliciting and Representing Strategic Goals

Mapping operational-level goals for hiring support staff onto the strategic goal of becoming a top university in Canada by 2010 is preceded by the process of eliciting strategic-level goals, goals assigned to stakeholders by managers, and goals interpreted by stakeholders. In this case, a business executive (one of the university directors) provided us with access to some company documents and allowed us to interview him and other stakeholders who were responsible for hiring staff. During the interview session, we realized that the business executive was unable to readily provide us with all the information required for plotting the goal graph. To compensate for this limitation, we asked him to complete a questionnaire following the interview. The questionnaire developed by Singh and Woo (2008) was used to elicit additional information which he was either unsure of or did not know at the time (e.g., the intermediate strategic goals). The questions, developed from the Boardman Comprehensive Strategic Analysis Framework (Boardman et al. 2004), were intended to capture any additional information which was related to the strategic goals. A combination of the two elicitation strategies provided us with the information that was necessary for constructing the strategic goal graph (e.g., long-term, intermediate-term, and short-term goals and time frames). A summary of the information is presented in Table 4.1. The strategic-level goals from Table 4.1 were mapped into a strategic goal graph (Figure 4.9). The organization’s vision of becoming a top-tier university in North America by 2010\(^5\) represents the parent node. The long-term, intermediate-term, and short-term strategic goals presented in Table 4.1 are related to this vision.

We were told by the business executives that these goals are a subset of the entire university’s strategic goal set. The goals in this subset, however, are the ones relevant to the implementation of the intended system. With a vision to be realized within the next three years, the business executives stated that the time expected for the long-term goals to be realized is three years, for the intermediate-term two years and for the short-term one year.

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\(^5\) The study was conducted in 2007.
Table 4.1: Summary of Elicited Strategic Goals

<p>| Vision | The University aspires to be one of the world’s best universities by preparing students to become exceptional global citizens, promoting the values of a civil and sustainable society, and conducting outstanding research. |</p>
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Strategic Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long Term</strong></td>
<td>Emerge as a global leader by retaining top-ranking staff and attracting stronger students.</td>
</tr>
<tr>
<td><strong>Intermediate</strong></td>
<td>Promote a sustainable and healthy workplace.</td>
</tr>
<tr>
<td><strong>Short Term</strong></td>
<td>Enable students to become exceptional global citizens.</td>
</tr>
<tr>
<td><strong>Long-term Goals</strong></td>
<td>Enhance global influence by attracting top-ranking staff.</td>
</tr>
<tr>
<td>Average Time to Complete: 3 years</td>
<td></td>
</tr>
<tr>
<td><strong>Intermediate-term Goals</strong></td>
<td>Provide diverse learning opportunities for students, a rich environment for research and providing services to the alumni and wider community.</td>
</tr>
<tr>
<td>Average Time to Complete: 2 years</td>
<td>Define and support the very best practices in undergraduate, professional and graduate teaching and co-curricular experiences.</td>
</tr>
<tr>
<td><strong>Short-term Goals</strong></td>
<td>Provide the resources and conditions that will allow faculty and staff to fulfill their academic and professional goals</td>
</tr>
<tr>
<td>Average Time to Complete: 1 year</td>
<td>Recruit the best faculty and staff members for any available position.</td>
</tr>
</tbody>
</table>

**Figure 4.9: Strategic Goal Graph Representing Elicited Business and IT Goals**
4.8.2 Eliciting and representing assigned and interpreted goals

In an ideal organization, goals assigned to stakeholders by managers should be made readily available to any members of the organization who need them. We asked the university’s business executive for a document outlining the assigned goals for each task in the business process. He explained to us that, to the best of his knowledge, there is no available document at that time consisting of the information on the assigned goals. In reverting to a second alternative, we decided to map the business processes using a formalized Object Oriented Enterprise Model (OOEM) developed by Wand and Woo (1999). The OOEM represents interactions between objects/agents in form of requests/responses. A request is defined as an object asking another object to perform some service. The requested object may perform the service entirely or may delegate parts of the service to other objects. When the service is completed, a response is provided to the requestor. For example, the Department Head (Department Object in Figure 4.10) performs the tasks of ‘Process Hiring Need’ in response to the request ‘Request for Hiring Needs’ from the Vice President (VP).

![Figure 4.10: A Snapshot of the OOEM Diagram Representing the Staff Hiring Process](image-url)
Assigned goals are discovered for every service in every object by analyzing: the service name, the request that triggers the service, attributes relating to the service, neighbouring services that relate to the fulfilment of that service, the response to the request, and the constraints which work against that service (e.g., time, completeness, accuracy). The elicited goals were formalized for consistency and representation using a goal template described in the CREWS-L’Ecritoire Project (Rolland et al. 1998). Acknowledging that analysts are not experts in the business domain (Anton 1997), the elicited goals were taken to the business executives for verification. The business executives reviewed, modified and added to the initial sets of assigned goals after evaluating the OOEM conceptual diagram, the strategic level goals of the university, and their personal interpretations of the goals. The conclusion of this exercise offered a set of assigned goals which were verified by business managers and executives.

In order to elicit the stakeholders’ interpretations of the assigned goals, we first identified the stakeholders in the organization who would be directly working with the system. These stakeholders were identified by the executives and from the roles they fulfilled in the OOEM diagrams (see Figure 4.10 for a snapshot example). Each stakeholder was asked to validate the subset of tasks (services in the OOEM) that correspond to recruiting a new staff. Many of the tasks were verified successfully; a few services required some clarifications but were eventually verified after meeting again with the stakeholders. Following an acknowledgement of the tasks (service), each stakeholder was asked to describe their interpretations of the goals for each service they performed. There were situations in which the stakeholders were unable to explain the goals of the services. In these instances, each stakeholder was asked questions which were adopted from the questionnaire proposed by Singh and Woo (2008). These questions aimed to supply stakeholders with enough details to enable them to provide their interpretation of a goal for a specific service. Some of the questions included: ‘how does the task outcome which immediately precedes yours contribute to the performance of your task?’ and ‘how does your task outcome contribute to the performance of the task which immediately succeeds yours?’

The goals which the stakeholders described were formatted for consistency and representation using a goal template proposed by Rolland and colleagues (1998). The formatted goals were presented back to their respective stakeholders who were then asked to verify whether the context of their initial goal descriptions was represented in the formatted goal. All of these goals
were successfully verified with the stakeholders. Table 4.2 summarizes a subset of the services, assigned goals and stakeholders’ interpretations of the assigned goals.

<table>
<thead>
<tr>
<th>ID</th>
<th>Agent</th>
<th>Service Name</th>
<th>Assigned Goal</th>
<th>Goal Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Admin</td>
<td>Process request to advertise available position.</td>
<td>Prepare details for Ad that accurately reflects the requirements and benefits of the position.</td>
<td>Post the job vacancy with job boards, recruiters and newspapers.</td>
</tr>
<tr>
<td>3</td>
<td>Dept. Committee</td>
<td>Establish guidelines and selection criteria for hiring new staff.</td>
<td>Determine a specific and credible set of guidelines for recruiting high-quality candidates.</td>
<td>Make sure the departmental guidelines for hiring for new positions are adhered to.</td>
</tr>
<tr>
<td>4</td>
<td>Dept. Committee</td>
<td>Interview shortlisted candidates.</td>
<td>Identify the candidate who is most qualified and who best fits the culture of the department.</td>
<td>Determine how the candidate is suited to the position requirements.</td>
</tr>
<tr>
<td>5</td>
<td>Dept. Committee</td>
<td>Rank and select candidates for interviewing based on guidelines established by the committee.</td>
<td>Identify and rank any of the candidates who met the minimum requirements from the specific and credible set of guidelines.</td>
<td>Compare each candidate's suitability evaluated against the set criteria.</td>
</tr>
<tr>
<td>6</td>
<td>Dept. Committee</td>
<td>Review applications and create shortlist of candidates.</td>
<td>Prepare shortlist of candidates who best fit into the culture of the department for the Interview phase.</td>
<td>Determine if the candidate is suited to the position requirements.</td>
</tr>
<tr>
<td>7</td>
<td>Dept. Committee</td>
<td>Process request to become a member of the selection committee.</td>
<td>Review requests to participate in a selection committee.</td>
<td>Determine availability and commitment to participate in a selection committee</td>
</tr>
<tr>
<td>8</td>
<td>Hiring Manager</td>
<td>Evaluate candidate following the interview process.</td>
<td>Determine suitability for the posted position.</td>
<td>Confirm that the chosen candidate is the best fit for the position and the department.</td>
</tr>
<tr>
<td>9</td>
<td>Hiring Manager</td>
<td>Negotiate salary and benefits with selected candidate.</td>
<td>Acknowledge and sign off a complete and accurate summary of the job.</td>
<td>Make sure compensation is agreeable to both the university and the candidate.</td>
</tr>
<tr>
<td>10</td>
<td>Hiring Manager</td>
<td>Review advertisement for hiring new staff.</td>
<td>Form a selection committee to determine the requirement details for proposed Ad.</td>
<td>Ensure position requirements are captured in the advertisement.</td>
</tr>
<tr>
<td>13</td>
<td>HR Admin</td>
<td>Process application submitted by the candidate for the advertised position.</td>
<td>Facilitate hiring process by ensuring that the candidates’ paperwork is complete and accurate.</td>
<td>Ensure candidate details are communicated to the hiring manager for consideration.</td>
</tr>
<tr>
<td>15</td>
<td>HR Admin</td>
<td>Arrange interviews for candidates shortlisted by the</td>
<td>Determine an appropriate time for selecting and interviewing candidates from the pool, and</td>
<td>Hope that the shortlisted candidates are still available and can be</td>
</tr>
<tr>
<td>ID</td>
<td>Agent</td>
<td>Service Name</td>
<td>Assigned Goal</td>
<td>Goal Interpretation</td>
</tr>
<tr>
<td>----</td>
<td>-------</td>
<td>--------------</td>
<td>---------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>16</td>
<td>HR Admin</td>
<td>Process hiring manager's request for additional info, such as references for shortlisted candidates.</td>
<td>Contact candidate for additional info and ensure that the submitted additional info is complete and accurate.</td>
<td>Seek reference information and perform reference checks where necessary.</td>
</tr>
<tr>
<td>18</td>
<td>HR Admin</td>
<td>Match candidate’s profile to the requirements of current position.</td>
<td>Provide information on matching candidates to current positions.</td>
<td>Provide system with match between candidate and current position.</td>
</tr>
<tr>
<td>19</td>
<td>HR Admin</td>
<td>Match position requirements with candidate profile for future position.</td>
<td>Provide information on matching applicants with future position.</td>
<td>Copy candidate profiles into the system for future consideration.</td>
</tr>
<tr>
<td>23</td>
<td>System</td>
<td>Match candidate profiles with the requirements of future position.</td>
<td>Match candidate profiles against position selection criteria of any positions which become available in the future.</td>
<td>Match selection criteria and send notification to the candidate.</td>
</tr>
<tr>
<td>24</td>
<td>System</td>
<td>Match candidates profile to the requirements of advertised position.</td>
<td>Ensure that the candidate’s profile corresponds at minimum with the current position selection criteria.</td>
<td>Match selection criteria with candidate profile.</td>
</tr>
</tbody>
</table>

Assigned goals in Table 4.2 are used to construct the assigned goals graph (Figure 4.11 illustrating a sub-section) while interpreted goals are used to construct the interpreted graph Figure 4.12).
Due to the number of nodes and the sizes of the graphs, we are unable to present graph representations for the entire organization, however we have presented sections of the assigned goal graph and interpreted goal graph to illustrate the mapping among the goals. The assigned goal graph was constructed using the functional structure (i.e., specific groupings/business units) and the hierarchical approach described in Section 4.6.4. The nodes were mapped onto each other based on predecessor-successor contribution. Predecessors are all the goals that contribute towards goal $G_i$, while successors are defined as all those goals to which $G_i$ contributes.
The interpreted goal graph was constructed by mirroring the edges of the assigned goal graph and replacing the description of the goal in each node with the corresponding description of the interpreted goal. Figure 4.12 presents a sub-section view of the interpreted goal graph.

![Diagram](image)

**Figure 4.12: Sub-section View of the Interpreted Goal Graph, which Corresponds to the Assigned Goal Graph**

The constructed goal graphs (assigned and interpreted) were presented to the business executive (who works in the organization and is knowledgeable about staff hiring protocol) and the hiring manager. The systems analyst, having some knowledge of the business processes, was asked to serve as an additional expert (required in the mapping process so as to eliminate bias in the rating scores). Each person (called a ‘rater’) was asked to independently rate the degree of congruency between a node (description of the goal) of the assigned goal graph and the corresponding node of the interpreted goal graph using a 5-point Likert scale (5 = strong equivalence, and 1 = weak...
equivalence). Prior to the rating, the raters agreed on a set of keys for rating one goal node against another. The raters agreed that goal congruency scores of 4/5 and 5/5 signified aligned goals, while goal congruency scores of 1/5, 2/5 and 3/5 indicated misaligned goals. The raters’ scores were recorded, compared against other scores, and score consistency was discussed. The raters provided a rationale for any inconsistent scores. These explanations were then discussed, and if a new score could be agreed upon then the rating was changed, otherwise the inconsistency score remained as it was.

Goal #15 is an example of one such rating conflict: the assigned goal ‘determine an appropriate time for selecting and interviewing candidates from the pool, and informing the shortlisted candidates’ and the interpreted goal ‘hope that the shortlisted candidates are available still and can be interviewed’ were scored differently by one of the three raters. The systems and business executives both rated the goal congruency as 4, but the human resources manager rated the goal congruency as 1. She explained that, from her experience, while the departments have the flexibility to hire the best candidate, their positions are sometimes compromised, since in many instances the ‘best’ candidates have other organizations competing to hire them. In those situations, interviews may be conducted separately or the administration may have to change the interview dates to accommodate the interviewee. In her view, although there are subtle differences in the way the goal is described, the misalignment with the strategic goal (hiring the best candidate) is significant. The human resources manager’s viewpoint was confirmed after meeting with past members of the hiring team. At the conclusion of this discussion, both the systems analyst and the business executive changed their scores to 1. In total, we found that initially 22 of the 28 goals were rated with congruency scores of 4 and 5.

Goals with congruency scores of 4 and 5 were stored as \((A \cap B)\) goals, while the others were stored as \((A - B)\) or \((B - A)\) goals. Goal IDs(#3, #4, #13, #24, and #26 are instances where the three raters gave congruency scores of 4 and 5 (see Table 4.3 for descriptions of the goals).

Employing the proposed methodology and through discussion with the stakeholders, the predecessors and successors goals of the aligned goals (i.e., \(A \cap B\)) were discovered and their contribution directions were validated. For example, in ascertaining Goal #3, ‘Establish guidelines and selection criteria for hiring new staff’, we found that Goal #2 ‘prepare details for Ad that accurately reflects the requirements and benefits of the position’ and Goal #7 ‘review
requests to participate in a selection committee’ are predecessors to Goal #3. Goal #5 ‘identify and rank any of the candidates who met the minimum requirements from the specific and credible set of guidelines’ and Goal #14 ‘select only those candidates who meet the specific guidelines set down by the committee’ are successors to Goal #3. In many instances, the stakeholders verified the direction of contributions.

The very few goals which were in conflict were resolved after a discussion with the business manager and stakeholders. During the discussion the stakeholders were presented with additional information, such as explanations of the business process’ flow and supported diagrammatic overviews of the business processes. Following this exercise, the stakeholders were again asked to define their interpretations of the goals. Any definitions that were different from the original goal definitions were re-evaluated by the experts for goal congruency. Goals that were equivalent in context were added to the set of aligned goals, which were then constructed into a goal tree following the guidelines presented in section 4.7.2.

Following this exercise, the strategic and IT system goals were decomposed to map the operational goals. During the process of mapping the strategic goals onto the operational goals (which involved meeting with the business executives and managers), the managers started providing us with a number of sub-goals which we termed ‘tactical goals.’ We had not expected these goals yet they played an important role in the mapping process. An example of a tactical goal, as described by one of the managers, is: ‘advance the recruitment and hiring of members of equity groups by providing education and support for those responsible for hiring staff.’ We were told that this goal supports the short-term strategic goal ‘recruit the best staff members for any available position.’ The executive manager explained that tactical goals are departmental goals which are used to bridge operational goals with the strategic level goals. Given that this distinction was only discovered while conducting this study, there were no formal procedures in place at that time to elicit these types of goals. We relied only on the descriptions that business managers (e.g., a hiring manager) provided. A summary of the tactical goals (department-level goals) that contribute to the strategic-level goals can be found in Table 4.3.
### Table 4.3: Tactical Goals Associating to Strategic Goals

<table>
<thead>
<tr>
<th>Strategic Goal</th>
<th>Tactical Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Term: Retain staff through incentives and positive opportunities</td>
<td>TL1: Continue to provide, and wherever possible increase, funding for professional development, finding the balance between the needs of staff.</td>
</tr>
<tr>
<td></td>
<td>TL2: Ensure that compensation frameworks are communicated transparently and are available to staff.</td>
</tr>
<tr>
<td></td>
<td>TL3: Celebrate individual and team-based achievements at the departmental level.</td>
</tr>
<tr>
<td>Intermediate-term: Provide the resources and conditions that will allow staff to fulfil their academic and professional goals</td>
<td>TI1: Ensure that the university culture is maintained by promoting activities that foster inclusion of staff members.</td>
</tr>
<tr>
<td>Short Term: Recruit the best staff members for any available position.</td>
<td>TS1: Advance the recruitment and hiring of members of equity groups by providing education and support to those responsible for hiring staff.</td>
</tr>
<tr>
<td></td>
<td>TS2: Analyze data on recruitment issues annually at both campuses in order to address “hot spots” (i.e., finding prospective hires, future needs and developing strategies).</td>
</tr>
<tr>
<td></td>
<td>TS3: Analyze data on staff compensation salaries, benefits and leaves of absence at appropriate intervals to ensure that the university is not falling behind relevant markets.</td>
</tr>
</tbody>
</table>

The process of decomposing strategic-level goals into operational goals as a means of bridging the two domains was then revisited after identifying the tactical goals. For each strategic goal (column 1 in Table 4.4), the short term tactical goals (column 2 in Table 4.4) were identified. Based on the context of each tactical goal and the context of the strategic goal, a list was identified of which operational goals contribute to specific tactical goals (column 3 in Table 4.4). The business executive and hiring manager were involved in the process of asking ‘how’ questions and applying the heuristics discussed in Section 4.7.3 to determine the operational goals that contribute towards the tactical and strategic goals.
Table 4.4: Operational Goals Associating to Tactical and Strategic Goals

<table>
<thead>
<tr>
<th>Short Term Strategic Goal</th>
<th>Tactical Goal</th>
<th>Operational Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruit the best staff members for any available position.</td>
<td>TS1: Advance the recruitment and hiring of members of equity groups by providing education and support to those responsible for hiring staff.</td>
<td>(3,5,6,8,10,13,14,18)</td>
</tr>
<tr>
<td></td>
<td>TS2: Analyze data on recruitment issues annually at both campuses in order to address “hot spots” (i.e., finding prospective hires, future needs and developing strategies).</td>
<td>(3,5,6,8,10,13,14,18,19)</td>
</tr>
<tr>
<td></td>
<td>TS3: Analyze data on staff compensation salaries, benefits and leaves of absence at appropriate intervals to ensure that the university is not falling behind relevant markets.</td>
<td>(9,10,11,16,17,18,19)</td>
</tr>
</tbody>
</table>

To illustrate the relationships between the operational goals and the tactical goals, and between the tactical goals and the strategic goals, we present in Figure 4.13 a snapshot of the goal graph. The nodes of the graph are taken from Table 4.4, while the edges are mirrored and modelled from the strategic and assigned goal graphs (Figures 4.11 and 4.12).

It should be noted that the tactical nodes had to be inserted into the new graph as a way of bridging the strategic and assigned goal graphs. While there is no formal approach to adding the edges to the tactical goal nodes, we found that the task was fairly straightforward; the business executive and managers were the ones who defined the tactical goals related to the process of hiring an employee. These goals were defined based on the decomposition of the strategic goals, and the decomposition rationale was used to create edges between the strategic goals and tactical goals. The predecessor-successor approach discussed in Section 4.7 was used to create the links between the operational goals and the tactical-level goals.
Figure 4.13: Aligned Goal Graph that includes Strategic, Tactical and Operational Goals
4.8.3 Summarizing the case

The methodology which we applied to the case was useful when evaluating the interpreted goals using the assigned goals, and mapping the operational goals onto the strategic goals. The averaged rating scores for many of the elicited goals were consistent among the three raters, even though two of the raters were not working in the human resources department. The few unresolved goals which were deemed misaligned were eventually resolved after discussion between the three raters and the stakeholders. Mapping the rated goals onto an aligned goal graph using the assigned goal graph as a template was fairly straightforward since many of the goals were rated ‘congruent.’ Mapping the aligned goal graph onto the strategic goal graph was not as straightforward as thought. In developing the mapping methodology, we had not anticipated the inclusion and importance of tactical-level goals. As explained earlier, the process of incorporating them into the current goal graph was not difficult, however considerations will be made to include them in the future when refining the mapping methodology.

While we used graphs to map low-level operational goals to strategic level goals during the case study, we made no explicit distinction between AND and OR relationships, which are used in AI when mapping nodes in a graph. In the AI discipline, the AND relationship is used to merge two or more overlapping goals, while the OR relationship splits a goal into two or more alternatives. This research focuses primarily on evaluating alignment between descriptions of two corresponding nodes in two goal graphs (the assigned goal graph and the interpreted goal graph), rather than merging two or more overlapping nodes or splitting a node into two or more alternatives. The edges between two nodes in each type of graph indicate a contribution from node \( N_{i-1} \) to node \( N_i \). The degrees of contribution or the types of contribution between the two nodes are also not within the scope of this thesis and for this reason we believe it was not necessary to make explicit distinctions between AND or OR relationships in the proposed goal graphs. Future research will examine the contributions of predecessor nodes to the node currently in question. For example, we will examine to what extent does the description of a predecessor node \( N_{i-1} \) help systems analysts understand the alignment between an assigned goal and its corresponding interpreted goal which are successors of node \( N_{i-1} \). In such a study AND and OR relationships will be considered, where AND will infer that the system analyst needs to consider at least two predecessor nodes before he understands the degree of alignment between an
assigned goal and an interpreted goal, and OR will imply that the systems analyst understands the degree of alignment between an assigned and interpreted goal after considering one or the other predecessor goal.

4.8.4 Challenges of including tactical goals in the current mapping methodology

We suspect that there will need to be a new approach for eliciting tactical-level goals. Some research in this area reveals that managers use tactical goals as a tool to streamline high-level strategic goals into low-level operational goals. Tactical goals are sometimes referred to as strategic goals that are operationalized by middle managers at the departmental level, and they serve mainly as department performance indicators. Briand and colleagues (2002) stated that tactical goals lead to measurement goals. The Balanced Scorecard is an example of a tool used to evaluate tactical goals (Kaplan and Norton 1999).

Eliciting tactical types of goals requires a specific kind of elicitation strategy, one which is different from the ones we offered for eliciting strategic and low-level operational goals. This strategy for eliciting tactical goals should be flexible enough to elicit constructs such as performance indicators. Often, the performance indicators help to explain the tactical goals. Alter (2006) suggested a set of performance indicators in his work system framework that can be utilized to understand tactical goals. These include: quality of decision, completeness of understanding, individual or group output rate, clarity of work, etc. As of now, neither of the two approaches we suggested for eliciting strategic and operational goals in the mapping approach is comprehensive enough to elicit these types of constructs. It should be noted, however, that though we did not formally elicit tactical goals we were still able to use a semi-formal approach to link the strategic goal graph with the aligned goal graph. In the future we intend to propose a formal approach for eliciting tactical goals and incorporate this approach into our current methodology.

4.9. Lessons Learned

The only valid test of a practical method is in its use in several projects. While the work reported here does not yet provide that level of validation (e.g., completeness, appropriateness and
consistency), it does provide some insights. Below, we present lessons we learned from the mapping methodology.

**Lesson Learned #1: The methodology helps to understand the coherence of and congruency among operational, tactical, and strategic goals.**

Strategic and operational goals are set at different organizational levels to serve different purposes. Business executives explained that while they advocate business-IT alignment, they view the process as an uphill battle since, prior to this study, there were no clear guidelines for how to evaluate congruency at such a detailed level. At the strategic level, the vision, concepts, and ideas are abstractly defined, and manifested differently (according to the units – e.g., IT, Human Resource, Marketing departments) than at the operational level, leaving plenty of room for interpretation. Stakeholders at the operational level are attached to the day-to-day activities, and will define goals that are more realistic, but these goals may sometimes deviate from the strategic goals. The methodology proposed in this chapter provides support to systems analysts in understanding whether the goals defined at the operational level contribute to or deviate from the strategic goal. This understanding of contribution or deviation could have only been achieved through the depth of the methodology, i.e., the capability of mapping low level IT goals to high level strategic goals. If the operational goals and tactical goals show very little or no contribution towards strategic goals then it can be assumed that either there is a misalignment or the strategic goal is overly ambitious and unrealistic. The level of understanding of the goals and the coherence of the links between the operational and strategic levels were revealed in the results of the case study. For example, goal nodes #1, #9 and #11 (which address negotiating compensation for the successful candidate) provided the clarity and helped in explaining how the tactical goal TL2 ‘Ensuring that compensation frameworks are communicated transparently and are available to staff’ relates to the strategic goal of ‘retaining staff through incentives and positive opportunities.’ This approach can be used by middle managers to justify to senior business executives their definition of the tactical goals.
Lesson Learned #2: Mapping tactical goals requires an understanding of emergent contributions from their sub-goals.

The contributions between goal node and its predecessors and successors were clear at the operational level. At the tactical level, however, the contributions were not always evident. It is possible that a tactical goal could be defined according to a broader focus than the operational goal that is defined for specific and traceable business processes. The business executives found that the tactical goal TS1 ‘advance the recruitment and hiring of members of equity groups by providing education and support to selection committees and others responsible for hiring staff’ could be decomposed as far as goal node #18 in the goal graph: ‘provide information on matching candidates to current positions.’ Goal node #19 ‘provide information on matching candidates with future position,’ #23 ‘Match candidate profiles against position selection criteria of any positions which become available in the future,’ and #24 ‘ensure that the candidate’s profile corresponds at minimum with the current position selection criteria’ are predecessors of node #18. According to the business executives, there were no clear and explainable rationales for the contribution of these nodes to node TS1.

A possible explanation for this fade in the lower-level goals’ contributions could be that the contribution emerged collectively through goal node #18, rather than directly from the nodes below goal node #18. In our analysis, we found several other tactical goals that did not decompose to the leaf node goals in the goal graph. This finding may also help to explain why some stakeholders’ ‘line of sight’ (their ability to explain how their work contributes to the strategic goal) is minimal at the operational level. A methodology of this nature should help show the contributions of task goals to strategic business goals. The task goals achieved by line workers (e.g., handymen, cleaners, security personnel) can be traced through propagation to specific strategic goals, even though those contributions may be faded due to the utilization of their goals by other stakeholders at a higher level in the organization. To understand business-IT alignment, it becomes necessary to understand not only the semantics of the links between nodes, but also internalization within the nodes.
Lesson Learned #3: The methodology identifies critical goals at the operational level that directly contribute to multiple strategic-level goals.

We found some operational goals show direct and strong contributions to both the short-term and intermediate-term strategic goals. For example, we found that goal nodes #3 ‘Determine a specific and credible set of guidelines for recruiting high-quality candidates,’ #10 ‘form a selection committee to determine the requirement details for proposed Ad,’ and #18 ‘provide information on matching candidates to current positions’ contributed directly to two different levels of goals at the strategic level. The business executive and hiring manager both agreed that the goal nodes #3, #10 and #18 show a direct contribution to the short-term goal TS2 ‘analyze data on recruitment issues annually at both campuses in order to address “hot spots” (i.e., finding prospective hires, future needs and developing strategies)’ and intermediate-term goal TI1 ‘Ensure that the university culture is maintained by promoting activities that foster inclusion of staff members.’ Intuitively, the contribution of operational goals to intermediate- and long-term strategic goals should have been mediated through the short-term strategic goals.

Current goal-mapping approaches in the RE discipline (e.g., the B-SCP, CREWS approach) fail to explicitly illustrate multi-tier contributions between the operational level and the different strategic levels. A multi-tier contribution is defined as a goal at the operational level that contributes to another goal that is at the same level, a level immediately above the current level or a goal several levels above the current level. Furthermore, the approaches that adopt a top-down mapping method only (e.g., the B-SCP) will not necessarily illustrate this multi-tier contribution, especially in the scenario where a goal at one level contributes to another goal several levels apart. Top-down decomposition often starts with the strategic goals and decomposes to reach the leaf nodes. Strategic goals, however, are abstract in nature, and decomposition would tend to identify only those goals immediately under them, rather than those several levels below (e.g., at the operational level).

The operational goals that contribute to multiple strategic levels are deemed important within the organization. Prior to applying our methodology, the clarity of such links was not evident. Therefore the significance of the proposed methodology is its ability to identify the important operational goals that contribute directly to different levels of strategic goals. By highlighting
these goals, analysts will be advised to place more emphasis on ensuring that these important requirements are elicited accurately and completely.

**Lesson Learned #4: Systems analysts should be aware that goal decomposition in business has a slightly different connotation than the one commonly used in the Artificial Intelligence field.**

Intuitively, operational goals should contribute to short-term goals, which should then be contributing to intermediate-term strategic goals. The results from the case study revealed that goals between the operational and strategic levels are not always propagated sequentially. For example, goal node #7 ‘determine availability and commitment to participate in a selection committee’ at the operational level showed no direct contribution to the short-term goals, but rather showed a direct contribution to the intermediate-term strategic goal ‘ensure that the university culture is maintained by promoting activities that foster inclusion of staff members.’

We also found that the long-term strategic goals TL1 ‘Continue to provide, and wherever possible increase, funding for professional development, finding the balance between the needs of staff,’ TL2 ‘ensure that compensation frameworks are communicated transparently, and are available to staff,’ and TL3 ‘celebrate individual and team-based achievements at the departmental level,’ had a clearer link to the short-term tactical goal TS3 ‘analyze data on staff compensation salaries, benefits and leaves of absence at appropriate intervals to ensure that the university is not falling behind relevant markets,’ than any of the intermediate-level goals (TI1, TI2 and TI3).

Similar findings were observed between goals at the operational level and goals at the strategic level. For example, we found goal node #4 ‘identify the candidate who is most qualified and who best fits the culture of the department,’ and goal node #12 ‘ensure that the prospective hires understand their job responsibilities through signing a contract,’ show no logical contribution to the tactical level goals, but demonstrate obvious contributions to the short-term strategic level goal ‘attract outstanding staff.’ This lack of evident contribution was raised with the business executives, who stated that these goals are not directly related to tactical goals, but they are imperative in understanding the alignment between technology and business strategy. The executives further stated that goal nodes #4 and #12 serve as ‘checkpoints’ or milestones, for example, knowing whether the system can enable the completion and signing off on a job.
description for the staff to be hired in goal node #12, and whether the system can assist in choosing the best candidate for that job description in goal node #4. Following an extended discussion, the executives eventually agreed that there is an implicit intermediate-term goal (provide guidelines to define ‘best candidate’), which for the purpose of clarity could be made explicit, but is not a common practice for them. Though the explanation is acceptable and understandable to the executives in the business domain, it contradicts the suppositions of mapping nodes in the artificial intelligence (AI) field (i.e., when completing all the sub-goals of a goal, that goal is also achieved). These findings are useful for systems analysts in that they make them aware that goals at different levels of the organization are sometimes defined implicitly or embedded in tacit knowledge, and it is not common practice for business executives to communicate key information that may be related to the strategic goals.

**Lesson Learned #5: Stakeholders are willing to convey their interpretations of assigned goals because this helps them in their work**

The stakeholders, after evaluating the findings of the case, stated that the approach of eliciting assigned goals and explaining the differences between these goals assisted them in ensuring that there is logical contextualization in the assigned goal descriptions. The human resources manager stated that this methodology forces her to think through the goals in depth, and revise the goal descriptions to align with the strategic intent set down by the executives.

**4.10 Conclusion and Future Work**

A number of articles offer and highlight the significance of approaches for addressing business-IT alignment. However, very few of these approaches consider in-depth alignment analysis between low-level IT system goals and strategic business goals. In-depth alignment analysis helps to address organizational issues such as differences between operational and strategic business goals. The few approaches that do examine alignment fail to explicitly validate whether the goals elicited from the stakeholders for alignment are indeed accurate in contextual representations (i.e., similar to the goals that were assigned to the stakeholders by managers).
The consequences of eliciting misaligned goals may include diminished performance of the intended IT system (e.g., failing to realize or support the strategic goals).

We presented a methodology for mapping lower-level IT goals onto high-level strategic goals. In developing the methodology, three goal graphs were developed. A goal graph was developed with nodes representing goals in the strategic domain. The second graph consisted of nodes representing the operational goals (assigned goals) that managers assigned to stakeholders, while the third goal graph encompassed nodes representing operational goals (interpreted goals) that stakeholders described to systems analysts. The three graphs were utilized in the mapping methodology. Nodes from the assigned goal graph were evaluated for congruency with corresponding nodes in the interpreted goal graph. Nodes which were high in congruency were termed ‘aligned goals’ while those that had low or medium in congruency were termed ‘misaligned goals.’ Aligned goals were assembled into a new goal graph using a predecessor-successor approach. A top-down approach was then employed to map the aligned goal graph onto the strategic goal graph. Misaligned goals were compared with the strategic goals for potential evidence of strategic contribution. The goals which showed evidence of contribution were inserted into the goal graph. The resulting methodology offers two major contributions:

1. It helps bridge the gap between operational-level and strategic-level goals, and allows for tracing between these levels. The methodology also illuminates the paths between any given operational goal and the strategic goals of the organization.

2. It distinguishes between goals assigned to stakeholders by managers and goals interpreted by stakeholders. This is the first approach in the RE discipline to do so explicitly.

Through a case study of a systems development project, we learned that this methodology helps to identifying critical contributing goals at the operational level, and is useful in understanding the coherence of and congruency between operational and strategic goals. In addition we discovered that there are differences between goal decomposition in the business world and goal decomposition described in the Artificial Intelligence field. Systems analysts who are biased towards computer science rather than business disciplines should be aware of this difference because this will enable them to identify goals at the operational level which do not contribute to short-term strategic goals but which do contribute to long-term goals.
This research was limited in that only one case study was applied in an academic environment. The methodology assumes that businesses strategies that influence IT systems are either available or can be elicited from the organization. Our future work will concentrate on testing the methodology on several other projects, and seeking formal measures to validate its usefulness and usability to practitioners and research.
4.11 References


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CHAPTER 5
CONCLUSIONS

5.1 Concluding Summary
The research in this thesis addresses the need for improving alignment between information systems and business strategies. Business-IT alignment is still rated among the top two issues facing CIOs (Hoffman 2007). Several scholars have attempted to address this issue but to the best of our knowledge, none has investigated this concern using a multi goal-based approach (i.e., using goals from different levels of the organization and considering the issues surrounding these goals).

By adopting a multi goal-based approach, this thesis sought to more accurately identify areas of misalignments between early system requirements and business strategies. Primarily, the investigation is concerned with clarifying the differences, and showing the need to make an explicit distinction between, the role of requirements and goals assigned to users by managers and executives, and the users’ interpretation of those requirements and goals when described to systems analysts. Misalignment between the two types of goals and requirements can result in misalignment between information systems and business strategies. Chapters 2, 3, and 4 highlighted the importance of making a distinction between assigned goals and interpreted goals, proposed an approach to evaluate their alignment, and illuminated factors that may influence variations in alignment. The primary objective of this thesis is to demonstrate that the goals and requirements that users describe to systems analysts are not always aligned to the strategic goals.

The thesis set out to address the following broad research question:

“How can a better understanding of goals assist systems analysts to detect misalignments between information systems and business strategies?”

To answer this question we have presented a conceptual framework that integrates goals from multiple levels of an organization, identified factors that impede the alignment of these goals, and proposed a methodology to map and validate goals from the operational level against goals at the strategic level. To arrive at this framework, we drew upon literature and practitioners’
experiences from several disciplines, including requirements engineering, strategic management, personnel psychology, and human resource management. The salient factors that impede alignment between the identified goals were drawn from literature addressing task performance in an organizational context. Concepts found in the directed graph domain were used to explain the guidelines for mapping and evaluating goals. The results and findings of the framework, the factors influencing goal alignment, and our methodology are detailed in Chapters 2, 3 and 4.

The findings from the three chapters illustrate that current approaches utilized in the requirements engineering discipline tend to elicit requirements that are aligned with business needs. The lessons learned from all three chapters suggest that there is a need to verify alignment between elicited requirements and goals, and business strategies. To address this issue we proposed a combination of framework, methodology and influencing characteristics, which together should help systems analysts to gather requirements and goals that are accurate, complete, consistent, and aligned.

Traditional systems development lifecycles echo the need to conduct economical, technical and operational feasibility analysis before designing and implementing an information system. After conducting the research in this thesis, we believe that there is also a need to conduct alignment analysis in the early phases of the systems development lifecycle, and that this should be included as part of the feasibility analysis. This type of analysis is practical and should not pose significant challenges in the developmental stages of the new information system. Eliciting requirements and goals is a necessary activity in the systems development lifecycle, so ensuring that the elicited requirements and goals are aligned is simply an added step in the process. This thesis can contribute to and support this process. Although this thesis may not readily integrate into all the requirements elicitation frameworks which support the extension of this process, the framework and methodology proposed herein can provide a starting point.

5.2 Summary of Contributions

The principal contribution of this work is making the explicit distinction between assigned and interpreted goals and requirements. This section summarizes specific contributions of the research in the thesis to research and practice.
1) **A means of representing business strategy constructs in a Requirements Engineering model.**

   To date, very few frameworks in the Requirements Engineering discipline adequately represent the strategic domain. Understanding business strategies and their relating constructs is pivotal for Requirements Engineering research that examines alignment between information systems and business strategies. Traditionally, the frameworks in the Requirements Engineering discipline encompass only strategic goals and strategic-level constructs. We found that the strategic goal construct alone lacks adequate context to explain the domain and is not sufficiently representative of the strategy domain. In this thesis, the proffered 3g framework integrates a minimal but representative set of strategic constructs (i.e., vision, strategic choice, strategic process, strategic goals, and resources).

2) **Guidelines for operationalizing strategic constructs in a Requirements Engineering framework.**

   Bleistein (2006) stated that the models presented in Requirements Engineering research often lack a systematic approach for identifying and operationalizing business strategies elicited from templates (e.g., structured interviews). This argument was supported earlier by (van Lamsweerde 2001) who stated that in goal modeling literature, several goal-based approaches have been explored as a way of simultaneously representing high-level strategic concerns and low-level technical ones, but to date very little has been offered to systematically elicit and represent high-level strategic constructs. In this thesis, a questionnaire is presented for eliciting business strategies and constructs and operationalizing them in a RE framework. The questionnaire was developed from models in the strategy disciplines (Boardman et al. 2004) and was validated by coders.

3) **Insights for enabling systems analysts to elicit requirements and goals that are aligned with the business strategy.**

   A major assumption that systems analysts make when discovering requirements and goals is that stakeholders can accurately describe these requirements and goals. The research presented in Chapter 3 suggested that this is not the case. The results from an experimental study revealed that the motivation and experience of users and the complexity of the task
influences the type of requirements and goals that stakeholders describe to systems analysts.

4) **A means for explicitly mapping and tracing operational level goals onto strategic business goals.**

As stated earlier, the Requirements Engineering discipline rarely considers the difference between goals assigned to users by managers and executives, and goals interpreted by users. The methodology in Chapter 3 is the first approach in the Requirements Engineering discipline to map assigned goals and interpreted goals onto strategic-level goals.

5.3 **Limitations of Studies in Chapters 2, 3 and 4**

The two main methodological limitations to the research presented in this thesis are discussed below.

1. The 3g framework, model and methodology presented in Chapters 2, 3 and 4 respectively are not rigorously tested. In Chapter 2, we tested the 3g model using a single case. In Chapter 3, the research model was tested in a laboratory setting. The methodology for aligning operational-level goals with strategic goals presented in Chapter 4 was evaluated through a single case study in an academic environment. The 3g framework and methodology in Chapters 2 and 4 require additional testing (i.e., more cases and industrial testing in private sectors). Ideally, the research model presented in Chapter 3 should also be tested in an organization with a real project.

2. The primary researcher was directly or indirectly involved with other persons (coders and evaluators) throughout the testing of the 3g framework, model and methodology. His involvement may therefore have directly or indirectly assisted the coders in making their tasks easier. For example, the experience he gained while running pre-test exercises for the laboratory and case study in Chapters 2 and 3 was utilized in the negotiation process when attempting to resolve conflicts among the coders in the main study in Chapter 2. There were no tests to determine whether a totally independent group of people using the same model and methodology would yield similar results. As mentioned earlier, this
thesis makes few claims regarding the usability of the 3g framework and the mapping methodology, so it was not necessary at that stage to ensure that other persons using the approach and methodology would yield the same results.

5.4 Directions of Future Research

The work presented in this thesis addresses some of the fundamental problems of business-IT alignment when adopting a goals-based approach. Work still remains to be done to make the research more meaningful to practitioners.

One means of extending the research in Chapters 2 and 3 is to test the framework and methodology in industrial settings. At this moment, it is unclear whether the outcomes and lessons learned will be consistent in the industrial setting with those from the academic setting, or whether the framework and methodology will need alterations and improvements.

In Chapter 3, we categorized constructs into a broad context of experience and motivation. Future work can investigate the influence of antecedents with more specific context, for example knowledge, ability, and years of work experience. Additionally, future work on the research model should be validated in an organization.

To demonstrate the importance of this research to the RE discipline, it will be useful to extend and incorporate the new concepts proposed in this thesis to connect to other pre-existing RE frameworks. For example, (i) comparing the 3g framework with other popular frameworks like i* to determine better understandability of the domain, (ii) integrating assigned and interpreted goals into the i* framework and comparing the outcomes with the traditional i* outcomes, and (iii) extending the 3g framework to the formal design and implementation phases in the system development life cycle.

Researchers in the RE discipline (e.g., Cysneiros and Yu 2003) have stated that the deployment of information systems is sometimes influenced by socio-political factors, for example, organizational politics, power, and culture. As a result such factors may also impact the alignment between information systems and business strategies. Although this issue was not explicitly investigated in this thesis, we indirectly accounted for socio-political constructs in
Chapters 2 and 3. In Chapter 2, we argued that the interpreted goal in the 3g framework will be able to detect whether business and IT planning outputs are internally consistent, and if not, whether it is impacted by socio-political constructs. In Chapter 3, we tested for the impact of employee’s motivation on the degree of alignment between assigned and interpreted goals. Employee’s motivation can be influenced by several socio-political factors, such as, poor management, lack of trust towards managers and internal politics. The direct impacts of these factors and their degrees of influence on motivation are however beyond the scope of this research. Future research will explore social, political, cultural, and personal antecedents of motivation to examine the extent of its impact on employees’ motivation when they describe their work goals and requirements to systems analysts.

Finally, developing a CASE tool, which is a computer-based product aimed at supporting one or more software engineering activities within a software development process, is another avenue of future research. CASE tools are generally noted for ensuring consistency, completeness and conformity to standards, for speeding up the development process, and for increasing productivity. An automated 3g framework and methodology will be useful when investigating business-IT alignment in large projects.
5.5 References


## APPENDICES

### Appendix A: Constructs and Relationships Definition in the 3g Model

<table>
<thead>
<tr>
<th>Construct</th>
<th>Construct Definition (defined based on the context of the model)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agent</strong></td>
<td>An agent is referred to a person who performs a task. The agent may assume several roles and possess capabilities such as autonomy, social and learning abilities and personal desires. An example of an agent is a sales associate.</td>
</tr>
<tr>
<td><strong>Task</strong></td>
<td>A task is referred to as a single element or a piece of work of a unit plan. Tasks are either of type unit, basic or composite (consisting of basic (e.g., a key press); unit, (one or more basic task) and/or composite tasks) – Card, Moran and Newell. An example of a task is ‘prepare invoice for reordering of stocks’</td>
</tr>
<tr>
<td><strong>Resource</strong></td>
<td>Resource is defined as an available asset (e.g., raw material, supplies, capital equipment, office, labor, management, and entrepreneurial skills) that is used in a task to produce goods and services. An example of resource is a computer.</td>
</tr>
<tr>
<td><strong>Task Transformation</strong></td>
<td>A task transformation is defined as an output state which emerges from the execution of a task. An example of a task transformation is ‘An invoiced prepared for reordering stocks’.</td>
</tr>
<tr>
<td><strong>Interpreted Goal</strong></td>
<td>An interpreted goal is referred to an agent’s interpretation of an organizational goal that was implicitly or explicitly assigned to him/her. Their interpreted goal may be subjected to the agent’s personal traits such as their experience, motivation and their perceived conception of the task.</td>
</tr>
<tr>
<td><strong>Assigned Goal</strong></td>
<td>An assigned goal is an operational level goal that is decomposed from a higher order strategic goal. Executives and middle managers define assigned goals.</td>
</tr>
<tr>
<td><strong>Strategic Goal</strong></td>
<td>Strategic level goals are broadly defined to support the realization of the organizational vision, and are set by and for top management of the organization. Examples of strategic goals are: coordinating more efficiently with existing customers.</td>
</tr>
<tr>
<td><strong>Strategic Choice</strong></td>
<td>Strategic choice is a subset of choices (defined strategically) that an organization chooses to ‘optimally’ realize its vision. For example, focusing on customers, products or services, and market are choices for realizing the organization’s vision of increasing sales by 10% in the next 5 years.</td>
</tr>
<tr>
<td><strong>Strategic Process</strong></td>
<td>The Strategic Process is the operationalization of the strategic goals. The strategic processes are a set of means defined for realizing a strategic goal. Example of a strategic process may be to develop a 24-hour accessible website that is customer centric.</td>
</tr>
<tr>
<td>Construct</td>
<td>Construct Definition (defined based on the context of the model)</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Organizational Vision</td>
<td>In the organization hierarchy, a vision is defined as the organization’s long-term goals and directions. For example, the organization’s vision is to increase sales by 10% in the next 5 years.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Relationship Definition (defined based on the context of the model)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is used to determine</td>
<td>An activity where a known variable for a goal is used to determine unknown parameters in a transformation function.</td>
</tr>
<tr>
<td>Is used to derive</td>
<td>An activity where all the parameters in a transformation function to be used to determine the unknown parameter in a goal.</td>
</tr>
<tr>
<td>Decomposes into</td>
<td>An activity of breaking down a strategic level goal into smaller units of goals (assigned goal), and adding context to the assigned goals.</td>
</tr>
<tr>
<td>Executes</td>
<td>An activity where the agent completes all the actions in a task in the order they were defined.</td>
</tr>
<tr>
<td>Is assigned to</td>
<td>An activity where an organizational goal (assigned goal) is delegated to an agent. The delegation may be either implicit or explicit.</td>
</tr>
<tr>
<td>Utilizes</td>
<td>An activity that specifies the resources to be consumed in a task.</td>
</tr>
<tr>
<td>Emerges from</td>
<td>An activity where a new state “task transformation” is realized through the transformation of a task, which utilizes resources and is executed by an agent.</td>
</tr>
<tr>
<td>Considers</td>
<td>An activity that examines set of available resources.</td>
</tr>
</tbody>
</table>
Appendix B: Strategic Form for Eliciting Strategy Constructs

<table>
<thead>
<tr>
<th>ELICITING THE STRATEGIC INFORMATION OF A FIRM</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>(Questions that will aid in the elicitation of strategic requirements relating to the acquisition of a potential IT System)</em></td>
</tr>
<tr>
<td><em>The objective of this section is to capture a description and an analysis of the current situation of the firm. It focuses on the external environment, the firm's internal characteristics, and its current strategy.</em></td>
</tr>
</tbody>
</table>

| 1. | What are the firm's products and/or services? |
| 2. | Who are the stakeholders? |
| 3. | What business is the firm in? |
| 4. | What are the dynamic forces facing the firm that leads it into considering a change? |
| 5. | What is the mission/vision of the firm? |
| 6. | What are the opportunities and threats in the industry? |
| 7. | What are the strengths and weaknesses of the firm? |
| 8. | What are the firm's sources of competitive advantage (if any), and are they sustainable and for long? |
| 9. | What is the firm's current short-, intermediate- and long-term strategy? |
| 10. | Are these strategies amenable to the external industrial environment and internal firm characteristics? |

| The next two (2) questions aim at summarizing the problems/issues and attempt to deduce an explanation for these problems and then seek a strategic direction to move toward. |

| 11. | What is the real problem facing the firm? |
| 12. | Is there a motivation for change, and if so, what is it and does the firm possess the capability to do so? |

| The remaining questions (13 - 18) attempt to elicit the strategic intent for the strategic direction that the firm is moving toward. |

| 13. | For the short-, intermediate- and long-term strategy (mentioned in #9), what are the respective strategic goals? |
| 14. | How do these strategic goals contribute toward achieving the firm's mission/vision? |
| 15. | Will these strategic goals translate to sustainable competitive advantage(s) for the firm and if so, how? |
| 16. | What are the issues being considered in arriving at these strategic goals? |
| 17. | What are the firm resources being devoted to the attainment of these strategic goals? |
| 18. | Are these resources adequate to attain the targeted strategic goals and if not, what can be done about it? |

A form use to elicit high level strategy constructs
# Appendix C: Agent Form for Eliciting their Reinterpretation of the Firm’s ‘Assigned Goal’

## ELICITING AGENT’s GOALS

(Questions for eliciting personal requirements related to the intended IT system of the organization)

The questions in this interview are designed to help the stakeholder relate to the tasks that they do in the organization. It also helps the stakeholder to identify their personal goals for each task that they do in their day to day activity.

1. Can you describe the task you perform in the firm?
2. How does the task outcome, which immediately precedes yours, contribute toward the performance of your task?
3. How does your task outcome contribute toward the performance of the task, which immediately succeeds yours?
4. What are the firm resources being allocated to the performance of your task?
5. What purpose does the performance of your task serve in the firm?
6. On a personal level, what do you expect from performing your task?
7. On a personal level, what inhibits you from performing your task?
8. What are the personal resources you will devote to the performance of your task?
9. Are these firm and personal resources adequate for you to perform your task and if not, what can be done about it?
10. Do you perceive any conflicts between your expectations and those of the firm in performing the task and if so, what are they?
11. With the resources provided to complete a task, what are the firm’s expectations of you in utilizing these resources?

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**A form use to elicit agent’s redefinition of the ‘firm’s assigned goal’**

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## Appendix D: Experience Questionnaire Used at the Beginning of the Study

1. My experience in purchasing a vehicle from an auto dealership is:
   - Low 1 2 3 4 5 6 7 High
   - [ ] [ ] [ ] [ ] [ ] [ ] [ ]

2. My experience of the business processes carried out in auto dealerships is:
   - Low 1 2 3 4 5 6 7 High
   - [ ] [ ] [ ] [ ] [ ] [ ] [ ]

3. My knowledge of the business processes carried out in auto dealerships is:
   - Low 1 2 3 4 5 6 7 High
   - [ ] [ ] [ ] [ ] [ ] [ ] [ ]

4. My awareness of the work practices followed in auto dealerships is:
   - Low 1 2 3 4 5 6 7 High
   - [ ] [ ] [ ] [ ] [ ] [ ] [ ]

5. My ability to work successfully in an auto dealerships is:
   - Low 1 2 3 4 5 6 7 High
   - [ ] [ ] [ ] [ ] [ ] [ ] [ ]
Appendix E: Motivation Questionnaire

(Questionnaire that was administered to the subjects after completing the experiment)

1. To what extent did you feel motivated when describing the goals for the services?

   **Low** 1 2 3 4 5 6 7 **High**
   [ ] [ ] [ ] [ ] [ ] [ ] [ ]

2. To what extent did you try your hardest to perform well in describing the goals for the services?

   **Low** 1 2 3 4 5 6 7 **High**
   [ ] [ ] [ ] [ ] [ ] [ ] [ ]

3. To what extent did you make a strong effort to describe the goals for the services?

   **Low** 1 2 3 4 5 6 7 **High**
   [ ] [ ] [ ] [ ] [ ] [ ] [ ]

4. To what extent did you feel motivated to describe goals accurately for each service?

   **Low** 1 2 3 4 5 6 7 **High**
   [ ] [ ] [ ] [ ] [ ] [ ] [ ]

**Notes for Inducing High Motivation** (Notes were given to the respective subjects during the main experiment)

AS YOU ADOPT THE ROLE FOR EACH ACTOR IN THE OOEM, PLEASE REMEMBER THE KEY POINTS

When you adopt the role of each actor in the OOEM model, please remember that:

   a. It is **VERY** important for you to determine how the actor’s work contributes to Vision Quest’s objectives.

   b. Performing well **WILL GREATLY** increase your chances of gaining additional incentives.
Notes for Inducing Low Motivation (Notes were given to the respective subjects during the main experiment)

AS YOU ADOPT THE ROLE FOR EACH ACTOR IN THE OOEM, PLEASE REMEMBER THE KEY POINTS
When you adopt the role of each actor in the OOEM model, please remember that:

a. It is NOT important for you to determine how the actor’s work contributes to Vision Quest objectives.

b. Performing well will NOT increase your chances of gaining additional incentives.

Appendix F: Complexity Questionnaire

(Questionnaire that was administered to subjects after they completed the survey relating to the conceptual diagram. This questionnaire was administered 3 times to each subject).

1. To what extent did you find the task of describing goals for services to be complex?

   Low 1 2 3 4 5 6 7 High
   [ ] [ ] [ ] [ ] [ ] [ ] [ ]

2. To what extent did you find the task of describing goals for services to be mentally demanding?

   Low 1 2 3 4 5 6 7 High
   [ ] [ ] [ ] [ ] [ ] [ ] [ ]

3. To what extent did you find it challenging to describe goals for services?

   Low 1 2 3 4 5 6 7 High
   [ ] [ ] [ ] [ ] [ ] [ ] [ ]

4. To what extent did you find it difficult to describe the goals for services?

   Low 1 2 3 4 5 6 7 High
   [ ] [ ] [ ] [ ] [ ] [ ] [ ]
Appendix G: Questions that Subjects had to Answer for each Service in the Main Experiment

1. List the actors who are related to this service. (If an actor in the organization triggers this service, then you should also include this actor in your answer).

2. List all the actors who benefit from this service directly or indirectly. State the benefits of each actor you have listed.

3. Based on your reading of the OOEM and the case, what actions or requests are undertaken to complete this service?

4. List the strategic goals that this service may contribute towards. (Briefly explain your answer).

5. Describe the goal for this service.
Appendix I: OOEM #2: Additional Services performed by Managers

- **Parts Manager**
  - Price and quantity
  - Update parts Information
  - Request quotation on parts
  - Quotation provided
  - Suppliers
  - Order parts from selected supplier
  - Parts shipped

- **Suppliers**
  - Negotiation range provided
  - Methods to improve customer's relationship

- **Sales Manager**
  - Generate contact list and offerings for new and existing customers
  - Process request to improve sales relationship
  - Process Sales Commission Figures
  - Market analysis and customer details
  - Vehicles to process for retail
  - Price, age & model for selected vehicles AND profit margin
  - Methods for improving customer relationships
  - Sales commission values, vehicle types

- **Business Manager**
  - Process sales-commission update
  - Review supplier's record and their quotations
  - Evaluate the different Financial Subsidiaries
  - Request sales commission figures
  - Sales Commission Figure
  - Commission target updated
  - Request for commission target to be updated

- **Business Associate**
  - Request status updates on financial subsidiaries

- **Parts Sales Associate**
  - Request to increase stock level
  - Parts info updated
  - Request to review suppliers' quotation
  - Suppliers Reviewed

- **Sales Associate**
  - Request to contact new and existing customers with offering to buy vehicles

- **External Market**
  - Monitor external market
  - Request price negotiation range
  - Methods to improve customer's relationship
  - New contact list provided

- **Parts**
  - Parts info updated
  - Request to review suppliers' quotation
  - Suppliers Reviewed
  - Request price negotiation range
  - Methods to improve customer's relationship
  - New contact list provided

- **Parts Sales Associate**
  - Request to review suppliers' quotation
  - Suppliers Reviewed
  - Request price negotiation range
  - Methods to improve customer's relationship
  - New contact list provided
Appendix J: OOEM #3: Services performed by Executives

- **President**
  - Request to increase sales
  - Sales Value
  - Increase Sales
  - Sales target

- **Vice President**
  - Request to get new customers
  - Request to retain loyal customers
  - Request to optimize inventory level
  - New customer's report
  - Loyal customers list

- **Sales Manager**
  - Sales Value
  - Request to optimize purchases from parts suppliers
  - Selected supplier's report
  - Payment options report

- **Business Manager**
  - Sales Value
  - Request to improve customer's payment options
  - Selected supplier's report
  - Payment options report

- **Parts Manager**
  - Sales Value
  - Request to optimize purchases from parts suppliers
  - Inventory level optimized
Appendix K: Ethical Review Certificate Obtained for the Empirical Study in Chapter 3

![Certificate Image]

The amendment(s) and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.