Understanding Misalignments of Enterprise Resource Planning System

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Abstract

Adopting an enterprise resource planning (ERP) system has become a symbol that represents both business and IT capabilities, as all ERP systems have inherent best practices of business models for diversified industries. However, misalignments between the functionality offered by the package and that required by the firm are common problems when adopting an ERP system. Moreover, implementing packaged software necessitates disruptive organizational change and the degree of change is determined mostly by the resolution of misalignment problems. This study draws upon data from a case study to understand the change dynamics and the misalignments of adopting an ERP system from a stage view. The results reveal that industrial-, company-, and regulatory-specific misalignments often occurred in the chartering phase; misalignments of input, control, data, process, output, and schedule are the major problems in the project phase; misalignments of information and new business requirements are the main concerns in the shakedown and onward and upward phases. Cascading effects of misalignments and change actions are also illustrated from case analysis. The findings suggests that different change drivers dominate different stages. The transition of change drivers represents a fundamental change in strategies of misalignment resolution.

Keywords: Enterprise Resource Planning Systems, Misalignments, Organizational Change, Cascading Effects

1. Introduction

Recently, enterprise resource planning (ERP) software receives substantial attention from both practitioners and academics (Hitt et al., 2002; Robey et al., 2002; Stratman & Roth, 2002; Jacobs & Bendoly, 2003). The fast growing market of ERP is expected to exceed $30 billion in 2006 (AMR research, 2002). The key selling points of ERP are the integration across enterprise, the inherent best practices of business models for diversified industries, and the flexibility to meet the diverse requirements of multiple organizations (Davenport, 1998; Soh et al., 2003). Thus, adopting an ERP system becomes an enthusiastic movement to raise both IT and business capabilities (Scott & Kaindl, 2000).

ERP systems are beneficial because they can provide not only IT and operational benefits but also strategic advantage (Shang & Seddon, 2002). Many IT managers view their ERP systems as the most strategic computing platform to support business growth and build business innovations. Although ERP systems have these benefits, the hidden costs in implementation may hinder the claimed advantages (Robey et al., 2002). The implementation costs are reported to be several times the cost of software licenses and often exceed $100 million (Davenport, 2000; Scheer & Habermann, 2000; Shang and Seddon, 2002). Moreover, ERP investments are risky as the projects often escalate budgets and the failure rate is reported to be three quarters high (Griffith et al., 1999; Robey et al., 2002).
The high cost and failure rate of ERP implementation may stem from the mutual adaptation between the ERP system and the organization it supports (Hong & Kim, 2002; Soh et al., 2003; Luo & Strong, 2004). Although the extent of business processes that ERP systems claim to support comprehensively covers a broad range in a firm’s value-added chain (Scott & Kaindl, 2000), the misalignments between the functionality offered by the package and that required by the firm are still very common (Soh et al., 2000). As ERP systems require organizations to adapt their business process to the software (Gattiker & Goodhue, 2002), underestimating the efforts of change management may cause ERP systems failing to achieve anticipated benefits. Recently, researchers have considered combining both ERP customization and organizational change as mutual adaptation approach of technology and organization (Leonard-Barton, 1988; Hong & Kim, 2002; Ho et al., 2004; Luo & Strong, 2004). These resolutions may not just adopt the system’s functionality or customize the system. There are different considerations in different contexts and phases (Hong & Kim, 2002). Besides, the resolution of misalignments also influences the extent of organizational change. Therefore, the nature of misalignment and its influence on organizational change need to be further explored.

This paper reports on the findings from a case study of ERP implementation. The objective is to understand the misalignment problems and change actions from a dynamic process view. From the analysis, we report findings about misalignment problems and ways that they may be overcome in each phase of ERP implementation. Moreover, we report the cascading effects of misalignment and change actions across different phases or within one phase. The causes of cascading effects from the dominant change drivers in each phase are also identified.

2. Conceptual Background
2.1. Misalignments and Organizational Change in ERP Implementation
Implementing packaged software necessitates disruptive organizational change. The degree of change is determined mostly by the resolution of “misalignment” problems when adopting a package. Misalignments represent gaps between the functionality offered by the package and that required by the adopting organization (Lucas et al., 1988; Soh et al., 2000). They arise from company-specific, public sector-specific, or country-specific requirements that the capabilities of the package do not match and can be clustered into data (either format or relationship), process (functional access, control, or operational), and output (format or content) (Soh et al., 2000). Misalignments are important as the evaluation criteria in selecting an ERP system (Everdingen et al., 2000) and have critical impact on ERP implementation success (Robey et al., 2002; Hong & Kim, 2002). Resolving misalignment problems becomes the major task in ERP implementation. However, this is a complicated task involving the mutual adaptation of the ERP systems and organization processes and structures (Hong & Kim, 2002; Soh et al., 2003; Luo & Strong, 2004). Choices in the continuum between the extreme sides of misalignment resolution strategies, adopting the new process of best practices in ERP and customizing ERP to achieve required functionality, determine the content of change stemming from adopting ERP.

Research has investigated the possible misalignment resolution strategies focusing on business process change (Gattiker & Goodhue, 2002), tailoring types of ERP systems (Breihm et al., 2001), or both (Soh et al., 2000; Hong & Kim, 2002; Luo & Strong, 2004). Business process customization can be incremental or radical change (Luo & Strong, 2004). The incremental change results from workarounds with ERP systems or compromising on the requirements of the organizational (Soh et al., 2000). The radical change stems from adopting
the new operating process embedded in ERP systems (Soh et al., 2000). When business process change increases the alignment between ERP systems and organization, either incremental or radical change enable successful ERP implementation (Hong & Kim, 2002). However, business process change can improve positive impact of ERP systems only when the change increases process-strategy alignment (Gattiker & Goodhue, 2002). This stream of research mainly focuses on business process change, but other aspects of organizational change (for example, change strategy, individual/role change, etc.), which may also be changed associated with information system implementation (Hsiao & Ormerod, 1998), are not studied as misalignment resolution strategies in the ERP research.

Customization to achieve the required functionality has the lowest impact on organizational change (Soh et al., 2000). ERP system customization is categorized as module selection, table configuration, and code modification (Davenport, 1998). The more detailed tailoring choices include configuration, bolts-ons, screen masks, extended reporting, workflow programming, user exits, ERP programming, interface development, and package code modification (Brehm et al., 2001). When ERP customization is high, misalignment problems are reduced and the ERP implementation is likely to success (Hong & Kim, 2002). Nevertheless, the technology changes of ERP may affect future maintenance, upgrade, and conversions of the system (Luo & Strong, 2004). As such, companies use different combinations of technology change and organizational change to resolve misalignment problems.

2.2.A Stage View of ERP Implementation

Regarding organizational change as a continuous process in context, considering a time frame of analysis is the key to understanding the dynamics of change (Pettigrew, 1990; Van de Ven & Huber, 1990). Process researchers have proposed stage models to investigate issues of ERP implementation (e.g. Markus & Tanis, 2000; Holland & Light, 2001). Holland and Light (2001) purposed a three-stage model of ERP systems use by evaluating five theoretical constructs: strategic use of IT; organizational sophistication; penetration of the ERP system; vision; and drivers and lessons. According to their research, most firms are in the second stage of post implementation exploitation of the ERP system. Some are still in the stage of implementing the new ERP system. ERP system adoption involves different phases in the whole life cycle. Markus & Tanis (2000) suggested four phases of the enterprise system experience cycle: the chartering phase; the project phase; the shakedown phase; and the onward and upward phase. The chartering phase is the stage of selecting, evaluating, and budgeting in the initial conditions to consider the use of the ERP system. The project phase is the main stage to conduct a formal ERP project with a well-established project team. The shakedown phase is the painful stage to get the ERP system into normal operations after going live. The onward and upward phase continues from normal operation until the system is replaced with an upgrade or different system, and this phase is the stage in which the organization can ascertain the benefits of the ERP system. This emergent and process view is better able to account for the dynamic nature of ERP implementation projects (e.g. Markus et al., 2000; Besson & Rowe, 2001).

As process models can provide rich information for analyzing problems and outcomes both retrospectively and prospectively, many ERP researchers adopt this view to investigate ERP projects (Markus et al., 2000; Besson & Rowe, 2001; Stefanou, 2001; Rajagopal, 2002; Somers & Nelson, 2004). Markus et al. (2000) defined the success metrics by phases and found that successes at different point were only loosely related. Besson & Rowe (2001) focused on the enactment process that taking place with in the ERP phases and demonstrated the changing perceptions of each new actor involving in ERP projects. Stefanou (2001)
developed a framework for the ex-ante evaluation of ERP systems and identified potential costs and benefits associated with ERP lifecycle phases. Rajagopal (2002) used a stage model to study contextual factors influencing ERP implementation and explored factors of antecedents, facilitators, and barriers to ERP implementation. Somers & Nelson (2004) investigated the role of key players and activities across ERP project life cycle. These studies reveal that issues of ERP implementation in each phase may be different.

From the stage view, misalignment problems experienced at all phases of the ERP system life cycle may also be different. Certain type of resolution strategies may be prevalent in one phase than the others. Moreover, as decisions and actions in one phase may influence starting conditions for the next (Markus & Tanis, 2000), misalignment problems can be accumulative and cascading. Therefore, this study intends to understand the dynamic nature of misalignments and organizational change in ERP implementation based on the emergent process view of Markus & Tanis (2000)

3. Methods
3.1. Sample and Data Collection
To explore the dynamic nature of misalignments and organizational change in ERP implementation, we conducted a single case study to clarify it since the boundaries between ERP systems and their contexts are difficult to draw (Robey et al., 2002). A qualitative approach was chosen due to the lack of prior research on dynamics of misalignments, the desire to understand organizational change within the ERP implementation life cycle, and the sensitive nature of the data needed (Yin, 1984). Moreover, the focus of the study was on the events associated with changes in misalignment over time. Comparisons across time are essential in study of single case.

The case site was selected based on a combination of accessibility (to IS and key user managers) and interestingness. The organization chosen to conduct this case study is an electronic manufacturing company, with headquarters in Taiwan Science Parks. We use the pseudonym ElectronicCo to represent the company. ElectronicCo is one of the world’s leading contract manufacturers providing foundry service in the electronic industry. It has three main goals to achieve with its initial SAP (version 4.6) implementation: (i) to replace the legacy system, which is developed in-house, (ii) to integrate business process across functional units, (iii) to provide managers with easy access to decision-quality information. Key department users in this project are logistics- and finance/accounting- related staffs, e.g. accounting, material management, purchasing, etc. The company has adopted modules of FI, CO, and MM of SAP and has been in the onward/upward phase. The periods of chartering, project, shake down, and onward/upward phases were about three, six, three, and fourteen (till the month we interviewed) months each.

Data collection method used in-depth interview with the managers of information department and key user departments. To minimize single respondent bias, interviews were conducted with six managers in this study. They are from departments of information systems, accounting, purchasing, and material management. Respondents have worked for the company for more than 5 years. The average interview time is about 2 hours for each person. The same investigator conducted all interviews at the company site from May 2 to May 21, 2002. Preprinted interview guide were prepared and used by the interviewer during each interview. Following each interview, the notes were summarized and captured in a central data repository for later analysis.
4. Research Findings: The Misalignments and Change Actions of ERP
4.1. Chartering Phase
Evaluating and selecting an appropriate ERP package are the main activities in this phase before the budget and implementation schedule can be set. Key players in this phase are competing vendors, consultants, company executives (including chief officers of information, operation, and finance), user representatives and IT specialists. The executives form a steering committee as a mechanism to facilitate cross-functional integration and communication and provide directive statements. Consultants, key users and IT specialists examine both the functionalities offered by ERP and that required by the company to deliver a gap analysis report. The key dimensions the team concerns include friendly operation screens, functions, procedures and, processes, flexibility, extendibility, and support of global operations.

Misalignment problems in the chartering phase are often industrial-, business- or regulatory-specific ones. For example, after deciding the ERP system, ElectronicCo found some serious industrial- and business-specific misalignment problems between the system and their business requirements. A respondent said that the ERP system does not have the “best practice” for their industry and business model: “The system is originally designed for assembly manufacturers, and thus cannot be applied to our build-to-order business model. For example, it does not have the flexibility to support the simple request of two quantity units for the same product.” Another respondent remarked how complicated their manufacturing processes are and the insufficient support from the ERP system. “Some module like asset management can only be partially utilized, because the cost calculation function does not fit our requirement. Our current cost function provides greater visibility for decision makers because we control and analyze cost for every working operation of a manufacturing process that might comprise, at least, hundreds of working operations”, he said. Implementing these unfitted modules is unlikely in such circumstances.

In addition to the industrial- or business-specific misalignment problems, ElectronicCo still considered other problems related to regulation and infrastructure. For example, the different regulation rule of joint credit loan forced the company to give up PA (Profit Analysis) module: “In Taiwan, the interest of joint credit loan is calculated with and paid to individual bank, but the rule in SAP is decided by the leading bank, which represents the whole.” Another problem related to infrastructure is the workflow module. As ElectronicCo already use workflow system for purchasing requisition on Notes workflow, it is difficult to transfer to SAP workflow. A respondent noted that login to Notes is the first thing to do while every employee turns his/her personal computer on. “You can check your email and also check your approved list on Notes. SAP can’t provide the same convenient way to do things easily and it even can’t put all the approved documents on one list”, she said.

The resolution strategies for the misalignment problems in the chartering phase are to select a most appropriate ERP system and adopt modules that the extent of misalignment is within an acceptable scope. At this stage, the strategy of chartering team in ElectronicCo is to make minimum change of their business processes. Instead, the change focus is on ERP system, which are capable of change or configuration to best fit the current business processes. For example, a respondent noted that the criteria to select ERP systems is the ratio of system functionalities that can meet the requirement of their business: “Oracle provides a fantastic windows-like features that we all like it very much, but most of its modules cannot fit to our business processes as SAP can do.”
After selecting the most appropriate ERP system, the next step is to decide which modules are to be adopted. The misalignment problems forced ElectronicCo to implement only selected modules to avoid unnecessary process change and too much customization. For example, all modules related to production should not be implemented, as SAP does not have best practice for the complicated manufacturing processes of the industry of ElectronicCo. This also influences the adoption of other modules, which is highly related to or based on the unselected production modules. A respondent remarked that SAP-SD and SAP-PP modules do not provide many specific functions for the production processes of foundry service and they decide to retain current legacy systems. “We are also like to use SAP-PA module but it is dependent on SAP-PP module, which we do not select”, she said. Therefore, only modules related to purchasing, material management, accounting, and cost management are selected for ERP system implementation.

Based on the goal to select the most fitted ERP system, the charting team concentrates on the possible change of ERP system instead of change of business processes. Efforts were devoted to select an ERP system that is the most compatible with current organizational structures and processes so as to minimum organizational change. In the same vein, those unfitted modules of the adopted ERP are not adopted. The charting team then examined the explicitly identified misalignment and found possible ways of workarounds and modifications on the part of the ERP system. The extent of organizational change is seemed to be limited at certain extent and the resolutions are the optimal results at this stage. However, these resolutions taken at ElectronicCo are for the holistic consideration but do not resolve all of the misalignment problems in the detailed level. Thus, many unanticipated problems may occur in the subsequent phases. For example, implementing only selected modules of the ERP system may cause incomplete information in the ERP system, reduce the degree of system integrity, and require extra coding efforts of add-on programs to interface with legacy system. These results will turn into the context of next stage: the project phase.

4.2. Project Phase

In the project phase, a formal team consisted of consultants, IS specialists, programmers, and key users is formed and response for getting the ERP up and running. ElectronicCo requires fulltime involvement of the key users from different departments. The misalignment problems reported by Soh’s et al. (2000), i.e. data, process, and output categories, occurred in this phase. However, ElectronicCo has to finish the implementation within half year set by the top managers and this seems to be a tough work. Under such time pressure, they tend to use the standard processes of the ERP system and to change their business processes. The company strictly controlled requirements that were not supported by standard SAP functionalities and needed to be coded as add-on programs, some of them were excluded in the half-year project scope and planned to implement them after the system has gone live.

The misalignment problems frequently found in the project phase are related to data input screen, reports, and functions. As the ERP package can be configured to numerous business cases, the data input screens designed for general purpose are not very friendly and often inconvenient for ElectronicCo’s users. A respondent noted that purchasing price master records could be updated by entering multiple items on one screen before, but the ERP system just allowed users to enter one record at a time. From the user’s perspective: “it’s unacceptable to implement a new system for reducing my working efficiency.” Another problem is the screen format, which contains many unused fields. Users may enter five or six fields on one screen, then switch to next screen to enter another five fields and keep going on
this pattern. “I just can’t understand why the ERP system cannot put all the fields together for data entry. It often needs to switch five to seven screens for entering one record”, a respondent said. The incompatibility between input requirements and the ERP system input functions is the major concern of many users.

Project team members also encountered the misalignment problems in data and report format. The shorter length of some specific field and the lack of similar business fields in the ERP system are common problems in the project phase (Soh et al., 2000). It is time-consuming to find out a matched field from the complicated table definitions in the system. A respondent noted that it is very important to use candidate fields carefully as the field name should be understandable for users to avoid mistakes. Another big problem is that the ERP system just provides standard reports, which are incompatible with the required format. Hundreds of reports are insufficient to support current usage, either in presentation format or in information content as the output misalignments described in Soh et al. (2000).

Missing functionality in the ERP system is the most critical problem in the project phase. The system does not have the functionalities related to some important business operations including commercial investment offset management, import management, and management of bonded goods. As these processes are part of the integrated operational scope related to purchasing and material management, the transactions should be linked together in the ERP system. “It is important to receive goods that already have import records, then match them back to the original purchase orders”, a respondent said. The insufficient functionality influences not only business processes but also flow control mechanisms. ElectronicCo needs to set control points and criteria in the ERP system and validate whether a transaction can be preceded or not. However, the system cannot configure to meet many requirements of flow control.

ElectronicCo set six months as the target schedule date to go live the ERP system. This target is hardly to achieve according to the estimation of ERP consultants. As time of implementing an ERP package becomes a key indicator of success in Taiwan, top managers of ElectronicCo do not allow the extension or delaying of the schedule. The misalignment between organizational target schedule and consultant estimated one (schedule misalignment) has turned into a constraint in the project phase.

As ElectronicCo intended to adopt standard ERP practices in the project phase, the resolution strategies for the misalignment problems determine the extent and types of organizational change. According to respondents, the change can be categorized to technology, strategy, structure, process, or individual and role (Hsiao and Omerod, 1998; Yetton et al., 1994). One kind of misalignment problems may take several actions inducing different types of change. The trade-offs between technology change and other organizational change are not absolute zero-sum game. It sometimes changes ERP system in a large extent while also associated with other types of organizational change.

Technology Change. Different ERP tailoring choices to overcome certain type of misalignment problems are used. These tailoring choices are based on the research of Brehm et al. (2001), which identifies configuration, bolt-ons, screen masks, extended reporting, workflow programming, user exits, ERP programming, interface development, and package code modification as possible choices to customize the ERP system. At this stage, although ElectronicCo preferred to adopt standard ERP functions, it is still difficult to avoid some degree of technology change. However, it is obviously that the highest impact type of
tailoring choice, i.e. package code modification, is not used in ElectronicCo. ElectronicCo keeps the ERP source-codes unchanged for gaining the benefits of the system.

To reduce the degree of technology change, ElectronicCo applied add-on ERP programs only when the functions were not provided in the ERP system and they were highly interdependent on the implemented modules. For example, ElectronicCo developed its own modules of commercial investment offset management, import management, and management of bonded goods in the computer language of SAP. At the same time, many other alternatives were adopted instead of ERP programming. A third-party module that was tailored for the specific requirements of the industry and certified by SAP was adopted to resolve some industry-specific misalignment. Other operations applied the functions of the ERP system with appropriate configuration and workarounds. For those functions independent from the integrated transaction flows may create programs of additional applications in other computer language (e.g. Visual Basic) and interfacing with the ERP system. For example, ElectronicCo created a front-end program and related interfaces allowing users to process master structures of purchasing price by batch.

Extended reporting and interface development are two frequently applied change practices. ElectronicCo developed more than one hundred of programs to rewrite reports to provide a variety of output contents, reporting formats and options. While most of technology change for output misalignment involved reproducing currently used reports, there are some newly created reports for resolving control problems induced by the ERP. For example, the ERP system allows receiving goods without corresponding importing records. As such, ElectronicCo requires staffs to run an importing record report to manually verify related importing records before they receiving goods. In additions, as ElectronicCo implemented only selected modules, interface development is very important to link with other existed information systems, e.g. sales order management, cycle count management, and so on. Programming of interfaces to is also another heavy loading because most of approval workflows are Notes-based.

For problems of data length and lack of required field, the only resolution is to use a substitution field. For example, ElectronicCo requires a “format code” field used in one module and the consultants suggested to record the information in a referent field. On the other hand, the rounding problem occurred in partial receive or partial payment is not so easy to resolve. As the ERP system provides only three digits in decimal fields, ElectronicCo just can add a monitoring report to check the data consistency of purchase order and payment.

*Organizational change*. Different organizational change took place to overcome certain type of misalignment problems. Changing process to fit ERP system is promoted as an approach to enhance business capability from the best practice of the system. ElectronicCo has a high degree of process change in the project phase. In many cases, the unlinking processes have been changed to be integrated parts of a seamless process. For example, purchase order (PO) and payment processes did not link before as many manual works existed, but these processes could be integrated together in the ERP system. Similar case can apply to receiving goods (RG) and the expense account in general ledger. Nevertheless, sometimes process change is just to compromise for adapting to the ERP system. For example, the organizational requirement is to reject PO when the amount of PO is over budget. But it just wants to show warning message instead of rejecting RG when the amount of RG is over budget because it may be due to the change of currency rate. However, the ERP system treats these processes as a whole and the action can only be set as either “reject” or “warning” for both PO and RG.
ElectronicCo has no choice except to set “warning” for both PO and RG while they are over budget and creates a post-checking report to monitor the status of budget using. This case also represents that it needs both technology change and organizational change to resolve the misalignment problem.

Implementing the ERP system actually is a cultural change. A respondent noted that the concepts embedded in the ERP system are very different from those currently used in ElectronicCo. Another respondent remarked how the mind-set changed over time in the implementation process. “In the beginning, we tried to fit our current business operations into the ERP system and encountered many difficulties. Then, we started the thinking imposed from the system gradually and much more solutions were presented in front of us”, he said. Key users in the project team are managers of sections and departments and they are responsible for disseminating the new concepts and knowledge learned from the ERP system. New knowledge and concepts in the ERP system are the major reason why almost every type of misalignment problems requires the organizational change of individual/role. Also, adaptation to the ERP system may influence employees’ job content, responsibility, and behaviors. For example, the new styles of system input functions change the data entry behaviors of employees and the flow control problems increase manual checking points with monitoring reports. Moreover, the responsibility of a work may transfer from one department to another. For example, accounting department owned the responsibility to ask investment offset information from vendors before and it is the responsibility of purchasing department to do this after implementing the ERP system. This responsibility change is not reallocated by the organization officially, but enabled by the ERP implementation.

The schedule problem can only be resolved by delaying to roll out the module of commercial investment offset management in next phase. This decision changes the original implementation scope as shown in Table1. Under the time pressure, rolling out by phases seems to be a good choice to maintain the reputation of quickly adopting the ERP system in this phase.

4.3. Shakedown/Onward and Upward Phases

Because the shakedown phase lasts only three months and is not easily separated from the onward and upward phase, these two phases are analyzed in combination. According to the respondents, the shakedown phase is about three months and the onward/upward phase after that and till the date we interviewed them is about fourteen months. The goals of these phases are to achieve normal operations with the ERP system and benefit from the system by utilizing it.

The major misalignment problems in the shakedown/onward and upward phases are deficient decision-support information for managerial use and insufficient functions to support the new business requirements and regulatory rules. One of the accounting managers described:

“The information for decision-making needs to be accurate and timely, but this should depend on the users in the process flows. The system requires the users to update data once events occurred, so the users in the first stage of any process flows may get heavy loading to entry the data for the use of other departments. It is hard to know whether they have already updated the data or not and this uncertainty makes the information unreliable.”

The problem of insufficient, inaccurate information for decision makers resulted from the decision to adopt selected modules and the needs to interface with many existed information
systems. On one hand, selected modules determine what information available in the ERP for
decision-making, one the other hand, the needs to interface with other systems determine the
quality of information. In the company, too many interfacing programs result in the
inaccurate and untimely information because of data loss in the transferring processes. For
example, the information of purchase requisition (PR) is not available until it has been final
approved and then transferred from the Notes workflow system into the ERP system.

The misalignment problems of functionality still can be found in the phases after rolling out.
Although the new business requirements and regulatory rule change (e.g. tax rules) make the
incompatibility of the ERP system, many problems are not resolved in the previous phases or
emerged in normal operations. Some of the problems were unanticipated or unnoticed
because the project team does not have the knowledge to discover them, or the knowledge
has long been embedded in organizational rules and systems and has been taken for granted. .
For example, ElectronicCo requires that a transaction can span two years, but the ERP system
does not support this and inhibits to reverse the data of last year. The misalignment problem
has not been proposed until the system is in operations. Some other misalignment problems
are resulted from the fear of end users. For example, account payable documents can be paid
automatically by using due date as criteria in the ERP system. However, ElectronicCo
decided to do this manually. The reason is that users are afraid of producing wrong payment
by the system.

The resolution strategies for the misalignment problems in the shakedown/onward and
upward phases rely on the enhancement of the ERP system, extended reporting for control,
add-on ERP programming, and individual/role change. The information problems for
decision-making are partially resolved after the vendor provides tools of on line analytical
processing (OLAP) and data warehouse functions in other extended systems that can be
upgraded and integrated with the ERP system. Meanwhile, clear job definition and
conceptual change are the possible ways to encourage users updating data in a timely manner.

Extended reporting and add-on ERP programs increased in an explosive rate. An accounting
manager noted that the programs increased from one hundred to two hundreds. “Before going
live the ERP system, the rules to add a program were very strict for adopting standard ERP
system as first priority, but things became different later. The first few months to use the
system were really in a mess. In that situation, any requirement of adding programs for bugs,
urgent problems, and improper operations was allowed easily”, she said. The total add-on
programs (including reporting) finally become six hundreds and largely exceed the number in
the project phase, i.e. two hundreds and more.

4.4.Cascading Effects of Misalignment and Change
Markus and Tanis (2000), based on perspective of emerging process, argued that
misalignment and resolution actions of one point in time (e.g. during the “onward and
downward”) might originate from misalignment and resolution strategy of previous stage (e.g.
charting). Consistent with the common wisdom of software engineering, the cost of fixing
misalignment increases with delays in problem discovery and resolution (Markus and Tanis,
2000). Thus, it needs to analyze the case across/within the phases and understand the
cascading nature of misalignment and resolutions.

In describing their misalignment problems and resolutions, most managers mentioned the
constraints set by the consequences of previous decisions and the alternative resolutions in
such context. The implementation of the ERP system is a set of path-dependent processes
(Markus and Tanis, 2000). The resolutions of misalignment problems in each phase may be just suboptimal for the local conditions (e.g. goal, context constraints, etc.) of that phase. Thus, the interactions of variety of factors in one phase result in starting conditions for the next (Markus and Tanis, 2000, p.199).

Table 1 provides a typical example of cascading effects of misalignment and resolution across different phases. The first example illustrates cascading technology change from the chartering to the onward/upward phase (see Table 1). In the chartering phase, ElectronicCo decided not to use the workflow module of the ERP system because (1) it is not satisfactory to support the business requirements, and (2) the existed and extensively utilized infrastructure of workflow works as a strong constraint on adopting the ERP workflow module. Nevertheless, this created process misalignment problems later in the project phase. The purchase requisition (PR) documents issued by users need to be approved in different levels and departments, then to be handled by purchasing department after final approval. As the ERP system cannot support the workflow process, ElectronicCo developed the PR application with workflow engine on Notes platform and created interface programs with the ERP system to transfer final approved PR data into the system. However, this created report misalignment problem later in the shake down/onward and upward phases. The lack of real time PR information makes the available budget in ERP inaccurate. The problem is not solved until ElectronicCo adopted OLAP and data warehouse, enhancement functionalities of the ERP system, to integrate transaction data into data warehouse system and create analytical reports from OLAP tools. Obviously, adopting selected modules to resolve business misalignment problems may be a suboptimal alternative in the chartering phase, but this solution strategy inevitably induces other misalignment problems and related technology change in the project phase and then shake down/onward and upward phases.

5. Discussion and Conclusion
This research investigates the misalignment problems of adopting an ERP system from a stage view and also analyzes the resultant organizational change based on the interview data of an electronic company. Our findings show that different misalignment problems are occurred at different point in the ERP implementation cycle and that appropriate change actions to resolve misalignment problems at one point in time may not be appropriate for another phase. This occurs because the context of each phase is different: change strategy has different focuses, goals are different, team members can be changed, and starting conditions are complicated.

Generally, the industrial-, company-, and regulatory-specific misalignments often occur in the chartering phase. Adopting selected modules of the ERP system is the resolution strategy to overcome these problems, but this resolution may impact the integrity and completeness of the original system and create other problems in the following phases. Misalignments of input, report, control, process, data, and schedule are the major problems in the project phase. Customization ERP system and changing business process are both adopted as resolution strategies. As add-on programs increase the maintenance cost in the next phase and changing business process increases user resistance, there is no best way to resolve misalignment problems without associated organizational impact. In the last two phases, misalignments of information and new business requirements can be resolved by add-on programs or by the enhancement of the new version of the ERP system.
Table 1 Examples of cascading effects of misalignment and change across phases

<table>
<thead>
<tr>
<th>Phase</th>
<th>Misalignments/Resolutions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chartering</td>
<td>Business misalignment</td>
<td>The workflow module of the ERP system is not satisfactory to support the business requirements.</td>
</tr>
<tr>
<td></td>
<td>Technology change (adopting selected modules)</td>
<td>The workflow module of the ERP system is not selected.</td>
</tr>
<tr>
<td>Project</td>
<td>Process misalignment</td>
<td>The adopted ERP system cannot support the workflow process of purchase requisition (PR).</td>
</tr>
<tr>
<td></td>
<td>Technology change (interface development)</td>
<td>Developing PR application with workflow engine on Notes platform and creating interface with the ERP system.</td>
</tr>
<tr>
<td>Shakedown/ onward &amp; upward</td>
<td>Report misalignment (Insufficient decision support information)</td>
<td>The lack of real time PR information makes the available budget in ERP inaccurate.</td>
</tr>
<tr>
<td></td>
<td>Technology change (system upgrade)</td>
<td>Adopting enhancement functionalities of the ERP system to integrate transaction data into data warehouse system and creating analytical reports from OLAP tools.</td>
</tr>
</tbody>
</table>

The analysis in each phase helps understanding the misalignments of ERP systems and the impact on organizations. This research demonstrates that the outcomes of one phase become inputs at the next phase (Markus & Tanis, 2000). Change actions taken at one moment in time may induce misalignment problems in the next phase and another change actions are adopted to resolve these problems, thus yielding cascading effects of misalignments and changes. For example, some of the process misalignment problems are resulted from the decision of adopting only selected modules of the ERP system in the previous phase and the original technology change resolution results in business process change latter. The reasons why change will induce cascading effects may be due to the different dominant change driver behind each phase.

Misalignment problems are one type of the most difficult challenges in ERP implementation. Various resolution strategies can apply to align the ERP systems with the organizations in each implementation phase. As these resolution strategies decide the extent of technology change and organizational change, change management is very important in ERP implementation. Managers should notice that change actions taken in one phase might result
in another misalignment problems that induce other change actions to resolve them. The cascading nature of misalignment and change suggests that managers should not underestimate the efforts involved in managing change (Robey et al., 2002). Firms that are implementing or will adopt ERP should deliberately manage misalignment and change at their initialization by focusing on not only current misalignment and change actions, but also the potential cascading effects. Furthermore, while literature suggest that a phased implementation approach might help firms to overcome assimilation knowledge barriers of ERP implementation (Robey et al., 2002), our analysis reveals that such an incremental approach, without carefully managing, leads to process and report misalignment.

Although this study has provided some preliminary evidence that different ERP project phases may experience different types of problems that need to be resolved with different resolution strategies, further research is needed to understand the factors that influence the choices of resolution strategies. Future research could conduct more extensive and comprehensive empirical studies regarding the issues analyzed in this study.

6. References
AMR Research predicts the ERP software market is expected to grow from $21 billion in 2002 to $31 billion in 2006. AMR research, 2002. [Online]. Available: www.amrresearch.com


