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ABSTRACT

The question of IT organizational structure remains relevant and unresolved. To investigate how organizations structure their post-implementation ERP team, the authors interviewed key stakeholders from ERP implementations at 12 universities to determine how other institutions resolved similar issues. Given the highly integrated nature of ERPs, centralizing a team to support the new system seemed logical. Alternatively, returning subject matter experts to their business units could facilitate knowledge transfer.

After reviewing prior research, categorizing interview data and analyzing results, the authors found conflicting results. Salient issues that surfaced during data analysis led to further exploration of two factors. First, commitments made during the project's initiation constrained the choices available to management at its completion. Second, management's initial goals influenced their willingness to consider alternative support structures when the projects completed. This research highlights the critical nature of early decisions and offers insights for research and practice.

Keywords (Required)

Enterprise resource planning (ERP), organizational structure, centralization, decentralization, contingency theory, actor - network theory

INTRODUCTION

Enterprise resource planning systems (ERP) are commercial software systems that integrate business processes and allow access to integrated data across the entire organization (Gattiker & Goodhue, 2005). Even though ERPs have the potential to increase efficiency and effectiveness due to increased integration and "best practices" business processes, they are not without risks. Much attention has been given to the organizational implications of ERP implementation. For example, misalignment between ERP and organizational goals are a concern and point of friction, oftentimes because of disconnects between the inherent business process reference models and the practices of the implementing organization (Liang & Xue, 2004).

One facet of ERP implementation that has received little attention is how to structure the post-implementation support function. Most implementations require significant effort and commitment from functional subject matter experts (SMEs), but the question remains as to how these individuals should be leveraged after go-live. Should they return to their prior responsibilities in their functional units? Organizational theorist would suggest this approach is favorable as it increases absorptive capacity and knowledge transfer (Volkoff, Elmes, & Strong, 2004). Or should they remain in the IT function as permanent members of the ERP support function? This alternative has merit, since centralizing support tends to reduce costs and increase the organization's ability to deliver new functionality and support the system.

These and other issues were faced by the project management team of a major southeastern university implementing an ERP and grappling specifically with how best to organize their post-implementation support structure. We were asked to gain a better understanding of how other universities, faced with the same dilemma, had elected to structure their post-

implementation support function, and also how these institutions resolved the conflict surrounding the disposition of functional SMEs who had worked on the implementation.

Based on this request, we address the following research questions: What influences the organization of the post-implementation support structure, why were certain structures selected and how did the decision process unfold? This research paper unfolds as follows. First, a review of the literature is provided to discuss important concerns in the organizing logic of IT. This discussion reflects the focus in the IT literature on the debate over centralization and decentralization. Our discussion incorporates the latest theoretical advances, multiple contingency theory, and a proposed alternative theoretical approach, actor-network theory (ANT). This discussion of theory is offered to preface the study's methods and results sections. Next, the results and discussion sections are presented, followed by conclusions and recommendations for future research and practice.

THEORETICAL DEVELOPMENT

The issue of how best to organize the IT function has been a contested topic for over forty years (King, 1983), with the debate centering on centralization versus decentralization of the computing function (Agarwal & Sambamurthy, 2002). A centralized IT structure is one where management of technology and management of the use of technology are controlled by a centralized IT organization, while both management of technology and management of the use of technology are controlled by individual business units in a decentralized model (Brown & Magill, 1994). Alternatively, the federal model (Sambamurthy & Zmud, 1999) represents a compromise between centralized and decentralized models, where business units assume some control over IT functions, but the central IT organization retains control over others. The federal model is a form of hybrid suggested by Brown and Magill (1994), where management of IT is centralized and management of the use of IT is delegated to the various business units.

A centralized IT organization can be argued based the premise that it preserves top management's decision-making control, enables cost savings through economies of scale, minimizes conflicts between senior management and departmental goals, and facilitates information flows to senior management for decision-making (King, 1983; von Simson, 1990). Proponents of decentralized IT functions argue that it places more decision-making authority with line managers, better aligns computing services with the departments they support, and increases absorptive capacity (Brown & Magill, 1994; King, 1983; Sambamurthy & Zmud, 1999). Proponents of the federal model suggest that it allows for the cost savings and control inherent in centralization while benefiting from the responsiveness and power-sharing inherent in decentralization (Sambamurthy & Zmud, 1999; von Simson, 1990).

From a contingencies perspective, the structure should align with these various organizational and environmental factors to yield the best possible performance. However, strict adherence to fit would seem to ignore some important issues, as organizational structure is the result of complex interactions between the computing technology, the organization and its history, environment, and power structure (George & King, 1991). To examine these issues in a more comprehensive way, a multiple contingencies approach has evolved over time. This approach is discussed in the next section.

Multiple Contingency Theory

While many have examined individual contingency factors and their influence on IT organizational structure, others have suggested that a univariate or bivariate approach unduly simplifies analysis (Gresov, 1989) and ignores other organizational level contingency factors (Brown & Magill, 1998). To address these concerns, multiple contingency theory holds that, in any given situation, individual contingencies will vary in their salience. Given the interactive nature of contingency factors impacting IT governance, the effects of any single factor will be enhanced, diminished or muted based on the full set of factors in operation (Sambamurthy & Zmud, 1999).

Sambamurthy and Zmud (1999) propose three types of contingency forces: reinforcing, conflicting and dominating. Reinforcing contingencies are those that result in similar influences on the locus of decision-making. Conflicting contingencies result in incongruent influences, and dominating contingencies override or display primacy with respect to competing contingencies. In a review of IT organizational structures, they found that reinforcing or dominating contingencies influence organizations to adopt either centralized or decentralized IT structures, while conflicting contingencies oftentimes resulted in federal or hybrid models.

Using multiple contingency theory to inform IT organizational structure is not without its criticisms. Most notable is its failure to capture all of the factors and forces salient to determining structure and organization (Barley, 1990). Critics assert that contingency theories take a static view of organizations, ignoring the social and human aspects which likely influence structure and act as sources of variation. Alternatively, organizational structure can be viewed as emergent (Barley, 1990) and ever-changing (Orlikowski, 1996). From this perspective, contingency theories fail to adequately account for several

influences to the process of structuring organizational arrangements. In this paper, we suggest considering an approach that moves beyond the normative and mostly static perspectives that underlie discussions of centralized-decentralized structures and the fit to multiple contingencies. We believe that a more process-oriented perspective will help explain how IT structures emerge from ERP implementation activities.

Actor-Network Theory

ANT examines the process whereby social networks emerge or fail to emerge (Walsham, 1997). These social networks are constituted from the collective interactions of members in the network (Law 1992). ANT has several distinguishing premises that make it attractive in studying IT organizational structure. First, ANT views structure as an outcome of the process whereby a network of collective action is formed. Stable structures emerge as actors are enrolled in a network, which garners their cooperation and reduces resistance to alternative courses of action (Law 1992). Second, as a theory, ANT provides a method for analysis by suggesting the elements to investigate in order to understand the constitution and composition of structures (Walsham 1997). Noteworthy, ANT does not distinguish between human and nonhuman actors (Law 1992), and as a meta-theory, ANT can span unit of analysis, since it does not inherently distinguish between micro- and macro-level entities (Latour 1996). Therefore, ANT allows for analysis of a variety of influences on decisions and behaviors. For a summary of ANT concepts, see Table 1 below.

ANT has been embraced in IS research and used as the theoretical and methodological framework for several studies (Bloomfield, Coombs, Cooper & Rea, 1992; Preston, Cooper & Coombs, 1992; Walsham & Sahay, 1999). Walsham (1997) sums up the advantage of using ANT in MIS research: "ANT is concerned with investigating the social and technical taken together or, put another way, with the creation and maintenance of coextensive networks of human and nonhuman elements which, in the case of IT, include people, organizations, software, hardware and infrastructure standards."

In a study of hospital accounting system implementations, Bloomfield and colleagues (Bloomfield et al., 1992) provide an example of how ANT is employed in IS research. Working from the perspective that accounting systems are social technologies, they contend that understanding the resulting implementation requires examining the social forces that shaped the process, just as understanding the social forces requires examining the underlying technology. Since social technologies are aimed at facilitating or reinforcing social organizations, understanding the dynamic between the various constituencies and the technology leads to a more complete understanding of the resulting structure. In their study, they examined how three distinctly different outcomes resulted from implementing similar systems in similar contexts.

From their study, several observations are particularly salient in explaining why different outcomes are possible. Most notably, variances in the translation process are the result of negotiations between the different actors in the network. These translations, and enrollment of other actors, are the result of numerous factors, including organizational history, decision-maker autonomy, and distribution of knowledge and skills. Additionally, they observe that enrollment is critical to overcoming resistance to the new technology. Canvassing the stakeholders within the network not only identifies allies in the enrollment process, but also identifies those actors who must be enrolled to increase the likelihood of success. However, this evolving process and the resulting negotiated order, constituted in an aligned network, can also create path dependencies that set the course of future decisions. In some networks, this course becomes irreversible.

Concepts	Explanation
Actor/Actant	Human or nonhuman entity that either acts on its own or is permitted to act by another entity
Actor-network	Alignment of actors that have similar interests
Enrollment and Translation	Process whereby interests are aligned and actor networks are created
Delegate	Actor who stands in and speaks for other actors
Inscription	Process whereby meaning is embedded in an actor
Irreversibility	Condition where returning to a prior state where alternatives existed is unlikely
Black box	Frozen network element
Immutable mobile	Network element that displays strong irreversibility

Table 1. ANT Concepts (adapted from Walsham, 1997)

RESEARCH METHODOLOGY

The initial data used in this study was collected in response to a request by ERP implementation project management at major southeastern university. Project management was interested in how best to organize the post-implementation support function, how best to utilize functional SMEs subsequent to go-live, and how other universities who successfully implemented ERPs resolved the same issues. Of specific interest was whether functional SMEs were retained in IT to support ongoing ERP efforts or returned to their functional units and old responsibilities.

In order to understand what factors impact the post-implementation support structure and how this structure emerges from technical, social and organizational influences, we collected data through structured interviews of PeopleSoft implementation project owners at twelve higher education institutions. By electing to design a qualitative study, we could more readily capture and understand the rich interplay of the various contextual factors and dynamics in this process.

Design Considerations and Data Collection

As we were trying to isolate factors that influence post-implementation structure, we limited our sample to higher-education institutions that had successfully implemented PeopleSoft and were currently in a post-implementation support phase. We conducted structured telephone interviews with the project managers from twelve colleges and universities. We followed an interview protocol that asked questions aimed at understanding the project's goals, structure, evolution, current status, and key developments. A second round of interviews followed, aimed at understanding the relationship between IT and the various academic departments, level and type of commitment made by functional units to the project, and role of organizational learning in the decision to return functional SMEs to their units. All interviews from the first and second rounds were recorded, transcribed and lasted approximately one hour. The analysis demonstrates that our sample of organizations displays variation across the salient factors, discussed below.

Data Analysis Approach

We used thematic analysis (Boyatzis 1998) to guide our method design, data collection and data analysis. This process involves identifying and coding themes in qualitative data. The interview transcripts were distilled and a code was developed based on research from multiple contingency theory and ANT. Code development was a multi-step process. First, literature on multiple contingency theory and ANT was reviewed to determine salient principles and themes that should be incorporated, resulting in initial code development. Second, the code was reviewed against the distilled transcripts and revised based on the current study. The code consisted of a theme label, theme definition, and indicators on how to recognize the theme in the transcripts.

Two tables were developed for data analysis; one where the theme and supporting quote were recorded, and another to summarize findings for each university. Each interview was read and citations that were relevant to coding themes were highlighted. These citations were then pasted into the first table along with the theme label. Once all transcripts had been processed, theme labels were transferred to the second table for analysis.

RESULTS

Results of data analysis are presented in Table 2 below. Three dominant post-implementation support structures emerge from the data analysis. A hybrid model was observed in four of the universities. In this model, some of the SMEs elected to remain in IT and support the ERP on an ongoing basis, while others returned to their primary job functions. In the second model, observed in two universities, the project team remained intact in the IT function, which represents a centralized structure. In one instance, this was accomplished by affecting a transfer of the SMEs to the IT organization; while in another, the project was viewed solely as an IT initiative and only IT personnel were utilized. In the third model, all SMEs assigned to the project returned to their business unit shortly after go-live. For these SMEs, stabilization of the ERP effectively terminated their involvement. This was clearly the dominant outcome and was observed in six of the implementations we studied.

Given these wide-ranging outcomes, we attempted to find patterns or themes that might inform the structural choices made by management in the various universities. Since all twelve of the organizations dealt with higher education, environmental contingencies could not readily explain the variety of outcomes. Next, project goals were examined to understand if the implementation of the ERP was viewed as an opportunity to reengineer business processes or as the replacement of existing technology. Seven of the universities cited business process reengineering and improved planning capabilities as a key goal. Several interviewees commented that the implementation was viewed as a "transformational process" that gave them the opportunity to critically evaluate current business processes and to distribute workload and accountability to the various colleges, schools and departments.

Some cited the new and enabling capabilities of the technology as a significant goal for ERP implementation. For these five universities, the ability to leverage self-service platforms and web-based interfaces was observed to be a key goal for the

project. The year 2000 was also cited by three of the universities as a significant driver for ERP selection and implementation. As with other large organizations, universities scrambled to bring critical systems into Y2K compliance, and many universities leveraged this one-time crisis as an opportunity to implement integrated enterprise systems. These universities viewed the ERP as a replacement to aging legacy systems. These contingencies demonstrated no consistent pattern with the resulting structure.

Lastly, organizational learning and absorptive capacity were examined to determine if a pattern existed that might inform the decision to retain SMEs or return them to their units. We examined the transcripts for themes of retaining fundamental project knowledge intact or the desire to enable knowledge transfer back to the functional units and how this might impact the decision to centralize or decentralize the support structure. Of the twelve implementations, six of the interviewees explicitly alluded to the benefits of retaining acquired knowledge on the support team (in the case of centralized support structures) or transferring knowledge back to the functional units (in the case of hybrid or decentralized support structures) as a factor in their decision-making. Again, no consistent pattern was identified.

After comparison of the post-implementation support structures across organizations in a common industry, having alternative goals, and a variety of perspectives regarding knowledge retention and transfer, the data does not demonstrate relationships to support a contingency perspective. In light of these findings, we further analyzed the data in hopes of developing an alternative theoretical explanation. This explanation is discussed below.

Institution	Post-Implementation Structure Outcome	Original Project Goals	Functional / Technical Co-location Strategy for ERP System Development	Functional SME Dedication to Project	Position Backfill	Organizational Knowledge Transfer / Retention Impacted Support Decision
1	Hybrid	New Technology	Co-located	Fulltime	Yes	Yes
2	Decentralized	Business Process and Planning	Co-located	Not fulltime	No	No
3	Decentralized	New Technology	Co-located	Some fulltime, some not fulltime	No	Yes
4	Decentralized	Business Process and Planning	Co-located	Fulltime	Mix	No
5	Decentralized	Business Process and Planning	Co-located	Fulltime	Unknown	No
6	Centralized	New Technology, Business Process and Planning	Co-located	Fulltime	Yes	Yes
7	Hybrid	Business Process and Planning	Co-located	Fulltime	Yes	Yes
8	Hybrid	New Technology, Business Process and Planning	Co-located	Some fulltime, some not fulltime	Yes	Yes
9	Decentralized	New Technology	Partially Co-located	Some fulltime, some not fulltime	Yes	No
10	Decentralized	New Technology	Partially Co-located	Not fulltime	No	No
11	Hybrid	Business Process and Planning	Co-located	Unknown	Yes	No
12	Centralized	New Technology	Not co-located	Not fulltime	No	No

Table 2. Results Summary

AN ALTERNATIVE EXPLANATION

Based on our analysis of contingency factors, we were unable to find a pattern based on industry environment, original project goals or the role of organizational learning. Next, we revisited the interviews and, using ANT as a theoretical lens, focused on how the project's efforts to enroll cooperation of the organizational units may have involved commitments that influenced the ultimate decision. Furthermore, the enrollment of and commitments to participants may have created an irreversible path that determined post-implementation structure.

Recall that in ANT, irreversibility is the degree to which earlier available alternatives are no longer viable. This explanation for the variability in outcomes is that irreversibility in the emerging actor-networks around these ERPs constrained the options available to the project managers. As the network took shape, decisions and commitments made by the various actors could limit their options. To understand this process, we examined the level of dedication by business units, the co-location strategy for implementation and the use of backfill for SMEs in each project.

Dedication to the project team was assessed along two dimensions: co-location of technical and functional SMEs and team members' level of assignment to the project. For eight of the projects, the technical resources and functional SMEs were co-located. Two of the projects only partially co-located their project teams, due to space constraints or lack of fully dedicated functional SMEs. The remaining two projects did not co-locate; one of the project teams didn't employ functional SMEs to a great extent, while the other was unable obtain organizational support for co-location.

We considered functional SMEs fully assigned if the substantial portion of their daily responsibilities were driven by the project team. Seven of the project teams met these criteria. The remaining five demonstrated partial assignment. Despite the need for user involvement, these projects were unable to secure full-time commitment from the business units for these resources and several noted that this lack of support impacted their success.

Backfill was also investigated as an influence on post-implementation structure. Backfill refers to the extent to which functional SMEs who were assigned to the project were replaced by temporary staff in order to alleviate work overload in their home units. Seven of the project teams backfilled for functional SMEs who were assigned to the implementation. Backfill was often limited; amounting to at most five full-time equivalents for a project and often for only a limited time until the business unit could more efficiently distribute workload. In the other implementations studied, functional units either absorbed the work among remaining functional resources or the functional SMEs were not fully dedicated to the project team, thereby splitting time and effort between the implementation and other responsibilities.

DISCUSSION

The structures that emerged to support the post-implementation of the ERP projects were subject to negotiations between the actors. These negotiations, necessary to enroll various constituents, influenced how the project structure unfolded as time progressed. Commitments and decisions during these negotiations dictated the options available later on, as the structure and commitments of the network were constituted and reinforced.

Looking back to the six projects where a decentralized support structure emerged and the functional SMEs returned to their prior job functions, project management in three of these implementations recalled making decisions in early stages of the planning phase about how the ERP would be supported after go-live. As an example, project management at implementation 4 committed to return the SMEs to their business units in 12-18 months, in exchange for securing the services of high quality and competent functional staff. Taking "the best and the brightest," combined with limited backfill, essentially left the project team few options after stabilization.

An examination of the two organizations that pursued centralized support structures yields similar conclusions. In both of these implementations the project managers noted that, early in the planning discussions, decisions were made regarding how the support structure would unfold. When queried on how soon these discussions were held, one replied "We had that planned up front. We had a fairly good idea of what would happen as we transitioned…" from implementation to support. In other situations, budget decisions forced management into a single outcome option. Another manager noted, "…if you take a look at the original plan, it says right here 'we're going to be downsizing once we go live.' …It would be nice to keep the team and you could do all these enhancements, but it's not in the budget."

Such decisions and commitments can represent points of irreversibility, where alternative paths of organizing are effectively removed from consideration. While irreversibility may explain how the suite of available alternatives was pared down, the question remains as to why these decisions were made and why decisions around functional SMEs came to be irreversible.

First, we believe the co-location of the original project team was an influence on the post-implementation structure. If team members were not initially co-located, then the option to develop a centralized post-implementation team was not likely. In

other cases, the ERP project represented a fundamental change to the current work of business users, IT and university leadership. This represented a departure from how the SMEs operated and conducted their daily business. Depending on the effectiveness of the project, these new ways of organizing and working could offer a bridge for considering new structures for supporting the system in the future. In other words, the experience of the project opened the door to new possibilities.

Understanding how the SMEs and the business units were enrolled in the network also provides insight. Implicit in enrollment is the degree and type of commitment. For some organizations, the best commitment they could garner from the functional units was to allocate a percentage of SME time to the project. Failure to enroll the functional areas limited the possibilities for examining post-implementation alternatives. This often led to frustration at the lack of commitment and accountability from the SMEs and the functional units.

Alternatively, some scenarios played out where the project team was able to effectively align the units with the goals and objectives of the project and thereby receive a strong commitment of resources. For example, one project team was successful in securing the university Controller and Registrar as SMEs. These commitments would clearly afford a greater range of options, since these organizations believed there were benefits to investing in the ERP project.

To view enrollment as simply "getting the departments on board" is an oversimplification. Just as the degree or magnitude of commitment to the project varied, so too did the type of commitment. For example, many functional units viewed an "acceptable" degree of commitment as simply providing skilled resources. Once the ERP was implemented and stabilized, their commitment to the project diminished. In other words, their degree of enrollment changed once the process was viewed as complete. In other organizations, project management and the functional units came to agreement on how the post-implementation support structure would unfold over time.

We also believe that backfill played a role in these decisions. Many functional units viewed the ERP as a challenge and disruption to their routines, which limited their enrollment. Backfilling for the SME who would be dedicated to the project helped to enroll the unit's support. Backfill also enabled co-location during the project and created greater possibilities for SMEs to remain in the ERP project structure at the project's conclusion. Alternatively, if backfill did not occur, then SMEs could often not dedicate themselves to the project completely, much less become fulltime members of a post-implementation team.

CONTRIBUTION AND CONCLUSION

Our findings have implications for both practitioners and researchers. From a practitioner perspective, our findings suggest that decisions and commitments made as early as the planning stages can have far-reaching consequences in the stabilization and support phases. Additionally, while practitioner best practices suggest that executive buy-in is essential to a successful implementation, our findings reveal that the nature of buy-in is just as salient as the degree in influencing post-implementation outcomes. For researchers, further investigation into how the type and level of enrollment impacts the emergence of post-implementation structure would provide valuable insight. Replicating the existing study in a single organization and drawing on multiple perspectives from within the project team would provide valuable insight into how these post-implementation structures evolve.

Implementing ERPs presents many challenges to an organization. While there are numerous decision points throughout the course of the implementation, we suggest that commitments made during the formation of the project teams create irreversibilities that limit the available alternatives. If this is the case, the very act of garnering commitment from key stakeholders forces the project team down a path that leads to a reduced set of options.

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