December 2003

Toward a Theory of Systems Integration Project Management

Pamela Carter
University of Oklahoma

TOWARD A THEORY OF SYSTEMS INTEGRATION PROJECT MANAGEMENT

Pamela E. Carter
University of Oklahoma
pcarter@ou.edu

Abstract

Two broad questions guide this research. First, how are the processes of systems integration projects situated within the organizational context? Second, how does the management of organizational structures inhibit or facilitate systems integration projects? A grounded theory approach is used to address these questions. Qualitative data has been, and continues to be, collected within the context of an in-depth case study of a single organization. Results thus far lead to the generation of a preliminary theory of systems integration project management.

Keywords: Project management, systems integration, grounded theory

Introduction

Corporate and government success today is often determined by how well their integrated systems allow them to conduct business. These systems might be completely separate applications that require additional functionality to communicate properly, or they may be application components within an enterprise architecture integration (EAI) solution. Organizations are investing enormous amounts of money into integrated systems for strategic, informational and operational purposes. However, leveraging the value of these investments has proven to be difficult.

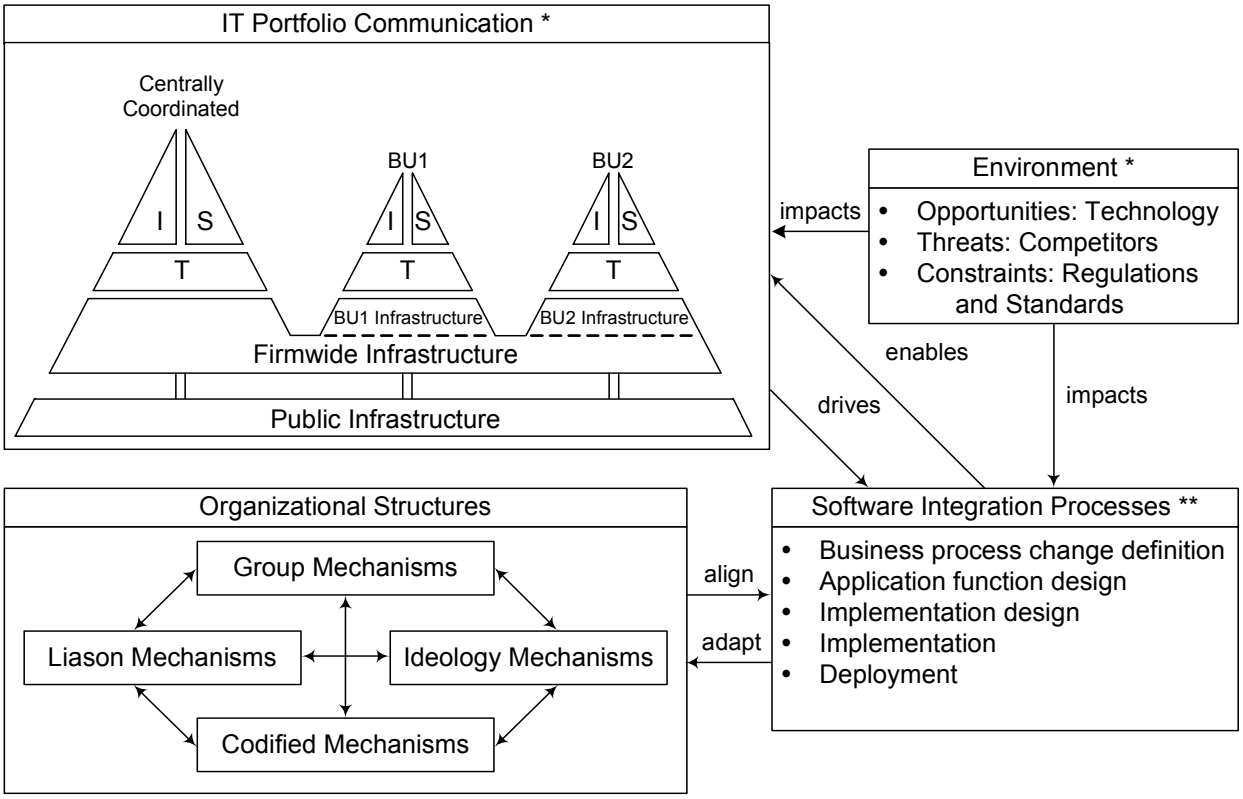
Integrated systems are complex due to the fact that their technologies have many interrelated components, and they are embedded within organizational contexts. Given this embeddedness, solutions must focus on technical functionality as well as the organizational structures that influence the processes of integrated system development. Unfortunately, there has been little systematic study of the organizational processes involved in complex integration efforts or of the organizational structures that influence them. Technical and business processes that significantly influence integration efforts have not been clearly identified, the interaction effects that technical and business processes have on each other are not well understood (Alsene, 1999), and, as a result, integration outcomes can be less than optimal. Since organizational structures can define and control the processes of integration (Michelis et al. 1998), a clear understanding of the governance, coordination, and feedback processes that facilitates and inhibits integration will allow us to determine the types of organizational structures that can be employed to effectively manage those processes.

Two research questions guide this research. How are the processes of systems integration projects situated within the organizational context? And, how does the management of organizational structures inhibit or facilitate systems integration projects? A grounded theory approach is used to address these questions. In grounded theory, theory is derived from data that has been systematically gathered and analyzed (Strauss and Corbin 1998). In order to systematically gather and analyze the data, the first phase of the research focused on developing 1) a high-level model of the situated nature of systems integration projects within the organizational context and 2) a framework to examine the processes of system integration. The model of the situated nature of systems integration projects allowed the researcher to better understand the context within which system integration projects are embedded. This in turn facilitated a more effective and efficient data collection strategy. The process framework provided a structure from which to begin analyzing system integration processes. Both the model and the framework are presented in the sections below so that the reader can gain insight into the mindset of the researcher when she began data collection and

analysis. The grounded theory methodology is then outlined. Finally, this paper concludes with preliminary results and expected contributions.

Situated Nature of Systems Integration Project Management

Drawing from the MIS and software engineering literatures, a model of the situated nature of systems integration project management was developed. The purpose of developing the model was to serve as a tool for data collection and analysis. Therefore, efforts were not made to develop detailed explanations of constructs (i.e., IT Portfolio Communication, Environment, Software Integration Processes, Organizational Structures) or relationships. Instead, the approach was to allow the analysis of data collected at a later date to "speak" to the validity and explanation of the model. As illustrated in Figure 1 below, technologies currently available for use, marketplace competitors, and regulations and standards impact the processes used in software systems integration, as well as the resulting communication outcomes of the IT portfolio (Weill and Broadbent 1998).



I = Informational Systems, S = Strategic Systems, T = Transaction Systems, BU = Business Unit
* (Weill and Broadbent 1998) ** (Britton 2001)

Figure 1. Situated Nature of Systems Integration Project Management

Software systems integration process categories include business process change definition, application function design, implementation design, implementation, and deployment, and in each category there are both technical and business processes. Technical processes include the activities required to create the technical aspects of systems integration solutions, and business processes include the activities needed to provide the planning, organizing, directing, and controlling necessary to successfully manage the systems integration effort (Britton 2001). While technical and business process sets are interdependent and must be coordinated in terms of managing resource allocation, sequencing, and synchronization (Bailetti et al. 1994), there has been little systematic study of these process sets, their interdependencies, and the organizational structures that manage their effectiveness (Alsene, 1999).

The participation, expertise, coordination, and cooperation of many individuals from different, interdependent units within and across organizational enterprises are typically required in system integration efforts. Prior research indicates that individuals involved in these types of activities are exposed to different, often conflicting, organizational structures; have different perspectives that interfere with effective communication; and have difficulties with unclear boundaries regarding project responsibilities and accountability (Bailey 1999; Dougherty 1992; Tan et al. 1996). As a result, success in managing system integration projects relies on the organizational structures that significantly impact software integration processes by aligning those processes with the organizational and environmental context.

Organizational structures can be categorized in many different ways. We use a typology developed from the coordination literature (Constantine 1993; Van de Ven et al. 1976) and classify organizational structures as group, liaison, ideology, or impersonal. Group structures are mechanisms that involve two or more individuals who communicate and negotiate decisions regarding how system integration activities are to be conducted. A corporate-level software process committee is an example of a group structure. Liaison structures are mechanisms, where one individual unit serves as a liaison or "go between" relaying information between two or more groups and making decisions on behalf of one or more groups. Business liaisons and project managers are examples of liaison structures. Ideology structures are mechanisms that are tacit and embedded within the environment, such as organizational culture or mission statements, where expected software integration behaviors are not directly, but indirectly, conveyed. Finally, impersonal structures are codified mechanisms that explicitly convey expected software integration behaviors. Written methodologies are examples of impersonal structures.

Process Framework

Systems integration involves a variety of processes (see Software Integration Processes in Figure 1 above) that ultimately determine the success of systems integration projects. Process can be defined as a collection of tasks and activities that together transform inputs into outputs, and within an organization can be categorized as organizational or managerial (Garvin 1998). Organizational processes can be further distinguished into *work*, *behavioral*, and *change* processes. Managerial processes fall into three categories: *direction-setting*, *negotiating and selling*, and *monitoring and control* processes (Garvin 1998). Upon examining these process categories, it was determined that they did not provide enough structure for data collection within a systems integration environment. Therefore, the researcher added three additional categories that have been identified as important to IT project management in the MIS literature and would shape any organizational or managerial process: governance, coordination, and feedback. Table 1 below details the tasks and activities associated with governance, coordination, and feedback processes for each set of organizational and managerial processes, as derived by the researcher to facilitate the collection and analysis of system integration process data.

Methodology

As noted above, a grounded theory approach has been taken in this study. Qualitative methods are being employed within the context of an in-depth case study of a single organization, ABCo. ABCo was chosen as an appropriate site because of the high number of systems integration projects it has completed over the past 5 years. Within this organization, embedded cases of six large-scale systems integration projects completed within the past 2 years are being examined. Of the six projects, three have been classified by the organization as successful and three have been classified as not successful. At this stage in our research, a review has been conducted of 988 documents generated by the six projects, consisting of text, spreadsheet, model design, and project management files, as well as general methodology documentation. Interviews have been conducted with the CIO and the Software Development Manager. Currently, interviews are being conducted with the architects, lead developers, quality assurance leads, and business liaisons for each project. Finally, with the knowledge gained from an analysis of interview transcripts, the CIO and Software Development Manager will again be interviewed to gain additional insights.

The analysis of project documentation and interview transcripts is being conducted utilizing the prescribed approach by Strauss and Corbin (1998): open coding, axial coding, and selective coding. At the start of open coding, concepts related to the research questions were identified and labeled with codes. As the researcher became more familiar with the data, concepts emerged from the data and were labeled and coded in the open coding stage. Axial coding then began as coding categories were formed and linked with subcategories. Open coding and axial coding will continue until all interview transcripts are coded. Selective coding, the analysis of categories and relationships emergent from axial coding, will then be used to define central themes and integrate and refine a preliminary theory of systems integration project management.

Table 1. Process Framework

PROCESSES	GOVERNANCE	COORDINATION	FEEDBACK
ORGANIZATIONAL Work -sequences, activities -transforming inputs-outputs	Exercise authority and control over activity sequences that transform inputs to outputs	Combine sequences of transformation activities to achieve proper order or relation	Take evaluative information derived from output reactions & use to inform/interpret future transformation activity inputs
Behavioral -widely shared patterns of behavior and ways of acting and interacting	Direct or restrain influence over widely shared patterns of behavior and ways of acting and interacting	Combine patterns of behavior & ways of acting and interacting to achieve harmonious relation	Take evaluative information derived from widely shared patterns of behavior and ways of acting/interacting & use to inform/interpret future behavior patterns
Change -sequence of events over time autonomous/induced incremental / revolutionary	Control induced sequence of events over time & directing or restraining influence over emergent events over time	Combine event sequences over time to induce effective outcomes	Take evaluative information derived from sequences of events over time & use to inform/interpret future event sequencing over time
MANAGERIAL Direction Setting -establish org. direction/goals ? develop agenda	Exercise authority and control in establishing org. direction/goals and developing agenda	Combine outcomes of org. direction/goals & agenda elements to achieve effective portfolio	Take evaluative information derived from established org. direction/goals & use to inform/interpret future development of org. agenda
Negotiation and Selling -obtain needed support & resources ? build network	Direct or restrain influence or authoritative control to build networks & obtain needed support and resources	Combine tactics (process) / strategies used to obtain needed support and resources	Take evaluative information derived from current networking portfolio of support/resources & use to inform/interpret future networking and efforts to obtain needed support/resources
Monitoring and Control -track ongoing activities and control ? collecting information	Exercise of authority over collecting info to track ongoing activities and performance	Combine proper portfolio of ongoing activity & performance information	Take evaluative information derived from tracking ongoing activity & performance and use to inform/interpret future ongoing activities and performance

Preliminary Results

Given the nature of the research and space limitations, it is not possible to highlight all preliminary results at this stage. Here, two interesting sets of results are highlighted.

Definition and Measurement of Project Success

Going into this project, success was defined as meeting project requirements within budget and on time. Interestingly, the CIO and Systems Development Manager wanted to go beyond this definition of success. While they monitor project metrics to measure the extent to which project requirements are met within budget and on time, this is only a partial definition of their idea of project success. For ABCo, success is also reflected by the extent to which relevant stakeholder communications are effectively

conducted, junior staff members are mentored and developed, and organizational learning occurs from project experiences. Yet, there are no clear metrics established for measuring these areas of success at ABCo.

Project documentation for all six projects included numerous reporting mechanisms to address project requirements and time/budget status. Yet, there was no documentation that reported on *and provided the ability to assess* stakeholder communication, junior staff member development, or organizational learning effectiveness. In fact, when it was apparent that documentation could have noted exceptional performance (positive or negative) in these areas, report authors found reasons to justify their exclusion – even if it meant deviating from standard methodology procedures. As a result, the ability to effectively manage these aspects across projects is severely inhibited.

Contra-Effects of Project Methodology

ABCo, currently applying for CMM level 2 certification, has a detailed software development methodology that is utilized for all software development projects. However, the extent to which the methodology is implemented – in practice – varies across projects. When looking at the "surface" of project management at ABCo., it is not readily apparent that modifications are being made to the methodology because the *presentation* of all documentation indicates that the methodology has been carefully followed except in "valid" and "justified" circumstances, where following the methodology is not required. An analysis of the data indicates that this is often a *face* given to each project. While the general structure of the methodology may be employed in terms of following identified phases and required reporting, the spirit in which activities are conducted is not necessarily in line with the stated intentions of the methodology. Instead, the methodology itself is used as a shield to hide, or even enable, system integration activities contraindicated by the spirit of the methodology. The extent to which this occurs appears to correlate negatively with the "success" of the project.

Expected Contributions of the Research

The primary contribution this research is expected to make is a preliminary theory of systems integration project management. The theory will be grounded in data collected from an in-depth case study of six, large-scale systems integration projects at a single organization. The richness of the qualitative data is allowing for considerable insight into the management of systems integration projects at ABCo, which will then be used to develop testable propositions for future research and provide recommended strategies to practitioners.

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