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Organizational context and the IS implementation process: an integrated research framework

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Abstract
Good IS managers have an intuitive grasp of the complex organizational and project dynamics required for successful implementation of large information systems. Years of hard-earned experience have taught them that IS implementation requires simultaneous attention to the political and structural contexts of the host organization as well as to the execution of a well planned IS project. Yet, much of the research on IS implementation has focused on narrowly bounded, individual dimensions of this multi-faceted real-world phenomenon. The work described here attempts to integrate these various perspectives into a robust research strategy, and evaluates its application in a comparative case study.

Broadly, research on information systems implementation can be classified into two distinct groups: Factors Studies and Process Studies. These offer valuable academic insight into separate aspects of IS implementation concerned, respectively, with the underlying factors affecting IS success or failure and the dynamics of the implementation project. However, the practitioner must grapple with both of these dimensions simultaneously, attempting to achieve a pragmatic balance between business objectives, organizational and political dynamics and the implementation process itself.

This paper presents an integrated methodology for studying systems implementation within its organizational and business contexts. The approach uses a number of models and techniques to formulate an holistic view of the implementation process, to enable its examination and subsequent interpretation in an organizational framework. Development of the methodology involved the selection and adaptation of key elements from cognate areas such as IS investment analysis and success criteria, techno-structural approaches to organization development, and IS implementation research.

The methodology was successfully tested in a comparative case study on the implementation of a major information system in two separate business units of an electrical utility. This integrated approach provides an holistic IS implementation framework for practitioners and helps to knit together much valuable earlier work into a coherent research strategy.

Keywords: MIS implementation management, IS success or failure, research methodology, organization behavior, implementation path.
INTRODUCTION

The difficulties of implementing large information systems in established organizations daily confounds IT managers throughout the private and public sectors. Having successfully completed an implementation in a single business unit, branch plant or subsidiary, business managers and IT specialists confidently approach the next installation, only to be confronted by resistance, technical or social shortcomings, and perhaps eventual project failure. In practice, such anomalies, while frequently encountered, are not well understood. However, these hold valuable lessons for our understanding of information systems development and implementation, and deserve serious research attention.

The research described in this paper was conducted in direct response to a practical business need to master the deep-rooted organizational and political footings of IS implementation. The original research was commissioned to explain the organizational impediments to successful implementation of a corporate Materials Management System at the Irish state-owned Electricity Supply Board (ESB). However, this initial aim was refined following a review of earlier literature and initial investigations at the case study site. The extended research objectives then became:
1. the development and evaluation of a comprehensive methodology for assessing organizational context in IS implementation; and
2. assessment of the organizational impediments to IS implementation at the case study site.

The work reported in this paper focuses primarily on the first of these objectives.

Based on a thorough examination of the literature in areas germane to the study of IS implementation, the authors developed and applied an holistic research methodology within the case study organization. This methodology attempts to integrate perspectives emerging from IS implementation research, change management research, and organization development. The application of this methodology to a comparative case study allows the authors to evaluate its viability as a research framework. It equally sheds some light for practitioners on the many interacting variables affecting IS implementation.

SEARCH FOR APPROPRIATE RESEARCH METHODS

Background Research
The ultimate purpose of this study was to analyze underlying patterns and behaviors in successful and unsuccessful IS implementation, with a view to recommending improvements to the implementation process. This would entail the examination of organizational context, the implementation process itself in considerable detail, and first order success or failure criteria. Before undertaking the empirical work, a detailed study of published research in
these areas was undertaken in order to identify relevant methodologies and approaches that would help in achieving the primary research objective.

A considerable amount of research has been dedicated to the study of information systems implementation over the past 20 years. A number of comprehensive reviews of this research have been published, which synthesize some of the principal issues emerging and identify directions for further work. The purpose of this paper is not to add to the rich portfolio of review works, but rather to draw valuable insight from the many perspectives presented in order to arrive at an appropriate methodology for the empirical study.

The literature on information systems application research covers a wide spectrum of areas, ranging from Theory and Models to Applied Research Methods. Critical reviews of IS implementation research include those by: Lucas (1981), Ives and Olson (1984), Franz and Robey (1987), Kwon and Zmud (1987), and Benbasat et al (1987). Research strategies have also been examined to identify which approaches are best suited to specific applications and these extend our understanding of theory development (Mumford et al, 1985; Galliers, 1991).

Figure 1 provides an overview of this domain, as a frame of reference for the research described later.
This published research includes work on:

**Theories and Models**
- Nolan (1989) - Stage model of information systems maturity.
- Cooper & Zmud (1990) - Stage model of implementation.

**Factors Research**

**Process Research**
- Ginzberg (1981); Joshi (1990); Symon & Clegg (1991); Hepworth et al (1992);

**Political Research**
- Markus (1983); Symon & Clegg (1991);

**Research Strategies**
- Franz & Robey (1987); Benbasat et al (1987);

**Research Methods**
- Quantitative methods: Onsrud et al (1990);
- Qualitative methods: Kaplan & Duchon (1988);

While an extensive set of techniques was available from this literature, most of the Factors Study methods were more appropriate to an in-depth exploration of specific implementation factors, such as user involvement or management support. Others lacked the scope required for the immediate case research of systems implementation in a large organization. In particular, published Process Studies have focused on individual stages of IS implementation, to explain successful or unsuccessful results, but have taken a limited view of the organizational environment, concentrating instead on a few contextual parameters, such as the power of various stakeholders. These studies, which by their nature require longitudinal study, are less rigorous and focussed than Factors Studies and have generally been limited in scope and interpretation.

In brief, the previously published techniques, individually, did not meet our requirements for a comprehensive methodology that would simultaneously address the organizational context, success/failure criteria and the IS implementation process. This called for an effective combination, or bridging, of aspects of these separate methods, to yield an holistic research methodology. Such an approach was required if the total IS implementation process was to be examined together with the organizational dynamics associated with the system roll-out.

**Requirements of an Integrated Methodology**
Given the specific requirements of the primary research objective, our applied research methods would have to encompass (see figure 2):

(a) an appropriate strategy for case research;
(b) success criteria - to enable degrees of success or failure to be measured objectively and a comparative case to be selected;
(c) an organizational model, in sufficient detail to enable the interaction between an information system and the other organizational
elements to be examined;
(d) an implementation process model to enable the implementation effort to be recorded and analyzed;
(e) techniques to analyze and interpret the interaction between the implementation process and changes in the organization – i.e. the organizational dynamics; and
(f) appropriate quantitative and qualitative techniques for data collection and analysis.

Finally, the methodology should avoid the major weaknesses highlighted by key research reviews, such as:
• research purpose and context not clearly stated;
• research strategy not appropriate to research purpose;
• assumptions and methodology design choices not adequately described; and
• data gathering and validation techniques not explicit.
The development of the methodology is outlined in the following section.

Fig. 2 Outline Methodology and Associated Research
METHODOLOGY DEVELOPMENT

Research Strategy
The research strategy adopted was one of Case Research, which is a scientific, case study approach (Benbasat et al, 1987; Galliers, 1991). While the unit of analysis would be the work organization (i.e. Business Unit) within which systems implementation occurred, the research focus was on the implementation process itself, “a sequence of events or activities that describes how things change over time” (Van de Ven, 1992). Data would need to be gathered over multiple time periods, as discussed by Franz and Robey (1987), since the study set-out to explore the causal chain that led to success or failure by testing an appropriate implementation model.

Key limitations of a case study approach were identified, such as: the likelihood of different interpretations of events been taken by researchers and stakeholders; difficulties in distinguishing between cause and effect; unstated or qualitative judgements of success/failure criteria; little understanding and poor calibration of before/after organizational contexts. These shortcomings were addressed in this study through specific data gathering and analysis techniques as described below. The techniques included: measurement of success relative to stated criteria, independently from the events described; validation of stakeholders accounts through archival data to clearly establish event timing; calibration of organizational contexts from multiple data sources.

Methodology Summary
The methodology developed proposes the investigation of IS implementation along a number of interconnecting axes, including:
1. the primary business rationale for systems implementation (i.e. first order success criteria);
2. an organizational context for the IS project; this would provide evidence of the underlying organizational climate, which might affect the project outcomes;
3. the organizational changes arising from IS implementation, as second order impacts (i.e. success or failure); and
4. the implementation process itself.

The methodology is illustrated in Figure 3, and is discussed in detail in following sections.

Systems success criteria
A primary assumption of the methodology is that systems success can be determined objectively from a number of exogenous business and user criteria. The evaluation of a system against these criteria would require the collection and analysis of data using a number of qualitative and quantitative techniques.

Business Environment -- Organizational components and dimensions
The pre-implementation business environment (E1) and post-implementation business environment (E2) are described in terms of the
selected organizational elements and their associated dimensions. This data would be obtained from the company archives (strategic plans, corporate plans, business plans) and structured interviews with key stakeholders, e.g. project sponsors, project managers, project team members, etc.

Implementation process
The implementation model proposes that:
- a pre-implementation Business Environment (E1) changes to the post-implementation Business Environment (E2) both as a direct consequence of the system itself and due to other external factors.
- The introduction of an information system proceeds through a sequence of identifiable process stages from initiation to infusion, as a result of a series of events/decisions undertaken by participants during these stages.

Patterns of success -- implementation paths
Analysis of the decisions/events, participants and chronology of decisions in successful and unsuccessful implementations identify patterns of events and interactions leading to success. The analysis of these patterns is carried out using the technique of 'Implementation Path Analysis'.

Organizational dynamics
A comprehensive organizational model (Kotter 1978) and an associated approach to the short, medium and long term dynamics resulting from changes in any of the organizational elements are used to analyze the interactions between the implementation of an information system and the organization. Of particular interest for this case are the short and medium term organizational dynamics.
Fig. 3 Integrated Case Study Methodology
Six criteria were identified which were considered the most important measures of system success from a general management perspective, (Laudon & Laudon, 1988), and included those employed in published research (Lucas, 1981).

They were usefully classified into Business and User Criteria, as follows:

**Business Criteria** - Business operational objectives; Financial payoff; project on-time and within budget;

**User Criteria** - User satisfaction; expectations met; levels of use, as a proxy measure of acceptance.

Reported limitations of such criteria included: 1. evidence of low quality, ambiguous objectives and hence difficulty in measuring achievement against them (Lyytinen and Hirschheim, 1987); and 2. the complex multidimensionality of user satisfaction found in practice (Bailey and Pearson 1983). Despite analytical shortcomings, however, these combined criteria provide a set of complementary indicators of system success or failure as illustrated in Fig. 4.

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**Figure 4. Systems success criteria**

**Organizational Components and Dimensions**

A clearer understanding of organizational elements and their attributes, or dimensions, was required in order to examine what happens when an information system is introduced into the organization. This would enable patterns of change in these elements to be examined together with their
interaction with new information systems, and each other, and to detect interactions that align with successful implementation. The role of technology as an organizational element and the influence of information technology in particular was highlighted in much of the earlier cited literature.

Leavitt's organizational model as applied in the MIT90's program (Scott-Morton, 1990) was selected as an acceptable working framework, but modified to specifically include the elements of culture and politics (Tichy, 1983) (see figure 5). The MIT90's model represents the organization as four major components (structure, strategy/objectives/tasks, technology, individuals and roles) inter-related by management processes, and again interacting with the external environment. Culture is seen as being embodied in the structure, individuals, roles and management processes.

Other organizational models embracing similar components were also considered. These include the Socio-technical Systems view (Pasmore 1988), Kotter's diagnostic model (1978) and also Kolb and Frohman's (1970) view of the organization as six organizational sub-systems. In fact, Kotter's model was designed to enable organizational dynamics to be examined in the short, medium and long term and will be addressed under Data Collection and Analysis below.

### Dimensions of Organizational Components

The dimensions associated with the constituent elements of Leavitt's organizational model, as well as the correlation found between these variables and innovation/change have previously been synthesized from a large number of research sources (Kwon and Zmud 1987).

The methodology presented here uses these dimensions, augmented by thinking from a number of other sources, principally:

- Rogers (1983) on organization structural characteristics;
- Hackman and Oldham (1976) on task and individual dimensions;
- Pasmore (1988), Rogers (1971) on technology, management processes
and innovation;
• Schein (1985), Handy (1991), DeLisi (1989) on culture;
• Tichy (1983) on politics;

Thus, each of the organizational components is described in a number of ways. For example, structure is described as centralized or decentralized, highly or less formalized, functional (specialized) or otherwise, etc. This approach also helps to illustrate how, say, organization structure variables might relate differently to success at various stages of the change process. For example, organizations which are less complex, less formalized, and decentralized might be more receptive to innovation but could find consistent implementation difficult (Rogers, 1983).

Implementation Process Model
A multi-stage model, based on the work of Cooper and Zmud (1990), was used to represent the IS implementation process. This is a variation on an earlier model of Kwon and Zmud (1987) and incorporates post-adoption behaviors. In this later model, activities that occur during stages, as well as the products yielded from each stage are described. Indeed, Kwon and Zmud's (1987) initial model was itself developed in response to the absence of an integrated approach to implementation research and is based on the organizational change, innovation and technological diffusion literatures, e.g. Lewin (1952), Kolb and Frohman (1970), Rogers (1983). While the model falls into a broad group which divides the implementation process into a priori stages (Sabherwal and Robey, 1993), it does not make assumptions (often implicit in such models) that feedback and overlap are absent between stages. However, it does assume that stages consistently occur in the same order.

Our selected implementation process model (Cooper and Zmud, 1990) presents the following implementation stages:

INITIATION
• **Process:** Active and/or passive scanning of organizational problems/opportunities and IT solutions are undertaken. Pressure to change evolves from either organizational need (pull), technological innovation (push) or both.
• **Product:** A match is found between an IT solution and its application in the organization

ADOPTION
• **Process:** Rational and political negotiations ensue to get organizational backing for implementation of the IT application.
• **Product:** A decision is reached to invest resources necessary to accommodate the implementation effort.

ADAPTATION
• **Process:** The IT application is developed, installed, and maintained.
Organizational procedures are revised and developed. Organizational members are trained both in the new procedures and in the IT application.

- **Product:** The IT application is available for use in the organization.

**Acceptance**

- **Process:** Organizational members are induced to commit to IT application usage
- **Product:** The IT application is employed in organizational work

**Routinization**

- **Process:** Usage of the IT application is encouraged as a normal activity.
- **Product:** The organization’s governance systems are adjusted to account for the IT application; the IT application is no longer perceived as something out of the ordinary.

**Infusion**

- **Process:** Increased organizational effectiveness is obtained by using the IT application in a more comprehensive and integrated manner to support higher level aspects of organizational work.
- **Product:** The IT application is used within the organization to its fullest potential.

**Implementation Path Analysis**

Implementation Path Analysis (Levinson, 1985) was used as the primary data gathering method for qualitative data. This offers a well-structured technique for data collection and analysis in longitudinal case studies of technology introduction.

The technique was first developed to enable multiple researchers to systematically examine systems implementation across several sites, over a lengthy timeframe (18 months). The original case research involved such complexities as the longitudinal nature of the studies, the question of whether these systems were actually implemented, and an identification of factors that contributed to the effective or problematic implementation of these systems.

An implementation path is the decomposition of a case into a series of events and decisions. The approach of using events and/or decisions as the unit of observation has been recommended by a number of leading researchers. (Leonard-Barton, 1990; Van de Ven, 1992). The underlying assumption is that a case is an accumulation of a series of smaller events and decision points. Linked to each event or decision is a string of variables, each with a set of discrete values that inform that event. The variables and their values may be modified to meet the needs of a particular case. Typical variables are type of decision or event, date of event, who was involved, decision content, etc. The total case is thus an aggregate of the individual events and their associated variables.

The technique can be used in two ways:
1. as a guide to the systematic gathering of data, e.g. ensuring that all key participants are considered, getting the full set of events, providing informed support for 'selective' memories. The path also focuses on the more objective 'what happened', which is less threatening than the subjective 'why it happened'.

2. to display and analyze qualitative and quantitative data and thus shed light on complexities, in particular, to compare across cases of implementation of the same technology in different settings.

It supplements the descriptive case in a number of respects:

- it compresses the case into a concise series of events with associated attributes; and
- it highlights patterns in the case, such as types of decision, or participation in decision-making which allow for confirmation, clarification or questioning of the descriptive analysis of the case.

In particular, implementation path analysis was used initially by Levinson to compare across cases and to make generalizations or create hypotheses about the technology-organizational relationship. These specific applications are also of interest in the case research described here.

**Organizational Interactions**

The principles of organizational dynamics, as described by Kotter (1978), were adopted as an appropriate mechanism for analyzing the short and medium-run interactions and organizational outcomes resulting from system implementation. The many examples presented by Kotter offer useful guidance in applying the model as a diagnostic tool.

The model proposes seven organizational elements (six structural elements and key organizational processes) interacting to create organizational dynamics (see figure 6). It distinguishes between three different timeframes: the short-run (up to a few months), the moderate-run (a few months to a few years) and the long-run (a few years to a few decades).

In the short-run, Kotter suggests that “the most important relationships among the elements in this model are those of a cause and effect nature that connect the organizational processes with the other elements .... the processes impact on the other six elements, thus maintaining or changing their state.”

The key to understanding moderate-run dynamics lies in the alignment between the structural elements in the model. When an organization's elements have characteristics that are a good fit, are consistent and congruent, one tends to find an efficient, effective and stable organization within a moderate timeframe.

Understanding the long-run dynamics requires consideration of what organizational elements act as 'driving forces' and what level of adaptability is built into the system. The influence of the various elements on the organizational processes will vary, but one or two are usually more influential than others, and they become 'driving forces' of the system, thus determining the general direction in which the organization will evolve.
Typically, in well-established (older) organizations, the internal social systems and the formal organization arrangements (structure, operating systems and procedures) are the most influential elements.

**Organisational Processes**
- Information Gathering
- Communication
- Decision Making
- Matter/energy conversion

**Formal Organisational Arrangements**
- Structure
- Operating systems

**Social System**
- Culture
- Social structure

**Employees and other tangible assets**
- People
- Plant, etc.

**Technology**
- Methods
- Techniques

**External Environment**
- Task environment
- Wider Environment

**Dominant Coalition**
- Personal characteristics
- Goals, strategies

**Source of potential behaviour and constraints**

**Impacts upon**

(Fig. 6. Short term organisational dynamics (Kotter, 1978)

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**APPLICATION OF THE METHODOLOGY**

This methodology was developed and applied to examine the implementation of a corporate Materials Management System at the Irish state-owned Electricity Supply Board (ESB). However, as stated in our broader research objectives, its application also represents a valuable “field trial” of our approach, as a basis for proposing this as a more generally useful IS research framework.

**Business Context**

The company, ESB, is the sole electricity utility in Ireland, with responsibility for the
generation, transmission, distribution and sale of electricity to some 1.4m industrial,
commercial and domestic customers. When this retrospective research commenced in
1994, the company had a turnover of approx. £1bn. and employed about 10,000 staff. It
was also embarking on a major restructuring program aimed at reducing costs and
improving competitiveness as the threat of competition loomed nearer, driven by draft
directives from the European Commission.

The company had embarked on the specification, development and implementation of a
new Materials Management Information System (MMIS) as early as 1986. By 1993, an
extensive and lengthy redesign of the materials supply chain, supported by system
implementation, was largely complete in the Customer Service Business Unit -- the
distribution and supply areas of the company. In the Power Generation Business Unit,
where the introduction of the system began in 1989, the process of implementation, while
substantially complete had been noticeably slower, with much resistance to the system,
numerous reviews and changes in personnel.

This research was commissioned to explain the organizational impediments to systems
implementation in the Power Generation Business Unit, as the unit did not enjoy the same
success with MMIS as was evident in its sister Customer Services Business Unit. The
methodology described here was applied to undertake an intensive comparative case
study of the implementation in the two business units.

Data Gathering and Analysis
In order to measure the success of the system from a user perspective, the
research surveyed all (1,200) account holders of the systems concerned via a
questionnaire administered through the company’s internal mail system. It
consisted of a series of 24 questions covering: levels of use (3); satisfaction
with the system (18); and user expectations (3). The questions relating to
user satisfaction were derived from Bailey and Pearson’s (1983) instrument
for measuring user satisfaction. The survey also gathered relevant
demographic data and was correlated with information from user interviews.

In terms of measuring success from a business perspective, determining the
business environment and establishing the chronology of events, the
researchers had access to the company’s strategic and business plans, project
files, internal reports and key stakeholders. The main data for measuring the
Business Criteria were obtained from archival data including: the initial
business case documentation, project files, relevant business plans, Internal
Audit reviews and interviews with business and project managers.

The research documented 89 discrete events/decisions with their associated
attributes, recording them in a PC database for analysis. Structured
interviews were conducted with twenty-three interested staff, consisting of
project sponsors, project managers, project team members, business
managers and users, in order to establish valid baseline and post-
implementation descriptions of the business environment. Annual internal
business performance reports and the company’s annual reports for the
periods concerned were used to confirm the internal and external business
environment. Locations, typical of the three main configurations of materials
stores in the company, were visited to view the systems in action.
DISCUSSION AND CONCLUSIONS

In general, the integrated research framework proved to be a good model by which to study information systems implementation in the organizational context. It provided a good conceptualization of the scope and complexity of the factors involved in successful implementation of large-scale information systems. Any one of the component models on their own (e.g. Implementation Stage Models) would have been inadequate in developing an understanding of the interplay between organization context, the implementation process, success criteria and organizational impacts of the system at the case study site.

Application of the framework confirmed that the organizational elements had changed over time in response to the introduction of new technology and work processes. It enabled the study of the interactive nature of this change, with bi-directional impacts between the new work processes and the other organizational elements. It also demonstrated how variations in the environment and the way technology is introduced -- how an organization progresses through the implementation stages -- affect the outcome.

Case Study Conclusions

Measured against the pre-defined success criteria, the system implementation was clearly more successful in one business unit than in the other, confirming the existing perception of users and managers in the company. While a number of organizational factors contributed to these different outcomes, the more successful implementation more closely adhered to the management Stage Model described in our framework. A number of observations can be made on the application of the stage model to the less successful case:

• This implementation lacked any clear Initiation Stage, which might have formalized the need for business systems change. In this case, neither the organizational ‘pull’ nor technological innovation ‘push’ provided sufficient pressure for change to a new system.
• Key products from the early stages, such as management decisions on resource commitment, were not available to the implementation team as the disciplines of an early Adaptation Stage were lacking.
• The implementation of one specific module became ‘fixated’ (Kolb and Frohman, 1970) at the Adaptation Stage, with the failure to resolve central difficulties giving rise to the re-emergence of these later in the project.

The main conclusions emerging from the analysis of organizational context were:

• In the successful implementation, there was an obvious congruence between the key organizational components, for example between individuals and technology, and between business objectives and organizational work processes.
• In contrast, there was a lack of alignment in the less successful project between such elements. For example, there was a poor ‘fit’ between
business processes and the technology being implemented.

- There was also considerable difference in management commitment needed to affect important changes in the respective business units. In the less successful case, management were more prepared to tolerate inadequacies in the existing processes and had little concern for the fruitless waste of energy in half-hearted efforts to affect change.

From the Implementation Path Analysis, it became clear that key players became involved at the earliest stage in the successful case. Here, their influence over project direction and execution would become an essential feature of the implementation and helped to ensure clarity of purpose and commitment to delivery. Such involvement was very limited or lacking completely in the less successful implementation. Key decisions were also relegated to the later Adaptation Stage in this case.

### Evaluation of the Research Framework

**Success criteria**
The user survey provided a considerable amount of useful quantitative data about user satisfaction, user expectations and levels of use within a short time-scale and at relatively little cost. The internal electronic mailing facilities proved extremely efficient in administering the questionnaire. The relatively high response rate (approx. 40%) added to the reliability of the data. The response rate was particularly satisfying given the absence of any specific incentive to respond. The volume of data necessitated the use of a computer based market research package for analysis, so all of the data is available for further analysis, if required. The main investment in time was in the development and testing of a comprehensive questionnaire and mailing list.

The main strength of the survey was that it allowed user perception of success to be measured independently of the events described and of the main stakeholders interviewed. This provided the most objective evaluation possible. It also confirmed perceptions in the company about the relative success within the two business units. The main area of weakness in questionnaire design proved to be in the area of ‘user expectations’. It later emerged from interviews that system features, such as ‘extensive management reporting’ were expected but not delivered. The survey was biased towards eliciting how the existing functions met expectations and did not guide the user through questions related to functions or information that were expected but not delivered. In future applications of this methodology, a more refined selection of questions related to expectations would seem appropriate before posing a general question about how the system has met expectations.

The survey analysis confirmed the need to consider a range of complementary user criteria when evaluating system success. Individual criteria can be flawed. In this case, the survey revealed high levels of usage for one module of the system under investigation, indicating success by one criterion, but also showed considerable levels of dissatisfaction with that
module, indicating lack of success from a user's perspective.

An evaluation of the business criteria was conducted against the data gathered from structured interviews and the company archives, business plans, expenditure approvals, project files and project audit reports. Anonymity and the objective nature of a scientific case study enabled unfettered access to company archives. The evaluation provided a high level analysis of the system against these criteria. This approach highlighted one key weakness -- the absence of specific business objectives -- particularly in the less successful business unit, against which to judge degrees of success. This is precisely one of the weaknesses identified by Lyytinen and Hirschheim (1987).

The issue of financial return proved particularly difficult to address. Only one module of the system had been formally evaluated on this basis through a post-implementation audit. It looked at a simple payback equation based only on staff savings. A more detailed evaluation of the system implementation against such defined business criteria would require a formal post-implementation audit.

Organizational elements and dimensions
The defined organizational elements and associated dimensions provided a comprehensive model for identifying changes in the organization and its environment during implementation. It embodied the elements and dimensions necessary for the task. Kotter (1978) admitted that it is impossible to demonstrate that his organizational model was the “best way to conceptualize the parts of the system that focus on the dynamics of the formal organization”. Likewise, the various elements used in this research model could be recombined into other similar frameworks. Nonetheless, all of the key dimensions or variables relating to these organizational elements have been addressed in an integrated way in the methodology described here.

The model demonstrated the breadth and depth of organizational interaction resulting from systems implementation, though the large number of elements being examined proved onerous and necessarily meant less detail on the elements and their dimensions. In effect, depth was sacrificed for breadth. The model allowed changes in the various elements to be identified, although changes in culture, in particular, were more difficult to detect, even over the medium term. This can, perhaps, be understood in the context of a “hierarchy of organizational assets” (Adler and Shenhar's 1990). Here, culture is seen at the top of an organization's hierarchy of assets and any change in culture requires a high level of organizational learning, perhaps taking years to achieve, if at all. On the other hand, assets lower down in the hierarchy, such as skills, procedures and even structure can be changed within a matter of months. At least one other case examined was able to track and interpret ‘conflicts between cultural persistence and cultural change’ via a process model (Robey and Newman, 1996). This case study, also of a Materials Systems Implementation, traced the system development
and implementation over a 15-year period!

This thinking further highlights the need to understand the organizational context of changes being sought through system implementation. The model’s application as a means of interpreting sequences of events and the causal links between them is discussed below.

Unlike Kotter’s model, the methodology does not explicitly refer to the “dominant coalition” -- the senior management team, together with their associated characteristics, goals and strategies. Instead, these variables are encapsulated in the more general individuals/roles and strategy. Kotter’s model provides a stronger focus on this element which, based on the case research, seems to play an important part in a long established, institution-like organization such as an electricity utility. In retrospect, a greater account of this variable would have yielded valuable insight in the present case research and ought to be incorporated in future application.

**Implementation stage model**

The implementation process model used in the case study was derived from models of the organizational change process and also the diffusion of technological innovations within organizations. In the case study, it provided a suitable framework to analyze (a) the implementation process and (b) the chronology of the implementation events and decisions. At a minimum, the articulation of the processes and products at each stage provides an extremely useful way of conceptualizing and recognizing the implementation stages.

It has also provided a means of understanding and theorizing about the problems which arose in implementation, in terms of managing change, a skill-set with which most managers are becoming increasingly familiar.

The sequential stage model still does not depict the actual implementation process, but provides a framework through which the process can be analyzed. For instance, the sequential stage model used suggests clear-cut stages. In practice, some of these activities occurred in parallel, though the more successful implementation still showed a broad sequential pattern. The parallel nature of the stages also reflects the modular nature of the system. In addition, iteration through the stages is often required, which is not reflected in this model. These limitations, have been previously identified in relation to models which divide the implementation process into a priori stages (Sabherwal and Robey, 1993). In order to overcome these shortcomings in the present work, the sequence of events within the overall process was examined, and matched to the discrete stages, thus “liberating the researcher from the confining assumption that the process proceeds in a simple unitary sequence of stages”. (Van de Ven, 1992).

It can be concluded, that models derived from thinking about organizational change and the diffusion of innovation provide a powerful framework for planning and analyzing systems implementation. However, these must be
applied with pragmatism and an appreciation of the *real politik* of work organizations as well as the iterative/repetitive nature of organizational change.

**Implementation path analysis**
Implementation Path Analysis (Levinson, 1985) proved to be an extremely useful tool in gathering, structuring and analyzing the case data. It provided a structured approach for data gathering, ensuring key participants and events/decisions were not missed. It also enabled the data to be collected in layers, with further data gathering helping to fill in the gaps in the initial *event path*. The technique was thus used ‘to iterate toward clarity’ (Leonard-Barton, 1990). The approach also fulfilled its purpose of translating a large volume of qualitative views into quantitative data, which could be more easily analyzed.

The additional variable of implementation stage, to describe the chronology of events, provided the bridging to enable the combination of this technique with the implementation stage model selected. Further customization of the variables attached to each event -- e.g., categories of participant and decision content -- allowed the tool to be applied more precisely to the organization being studied.

A PC database system was essential in storing and providing key analyses, such as cross-tabulation of events/decisions and implementation stages, enabling the researchers to look inside the black-box of the implementation stage.

The technique thus helped to overcome inherent limitations of qualitative case studies (Leonard-Barton, 1990), such as subjective interpretation of events by researchers and difficulties encountered in compiling relationships between variables. It also meant that detailed and potentially valuable information about the events comprising the implementation process was not sacrificed, another weakness of stage models (Sabherwal and Robey, 1995).

**Organizational dynamics**
The organizational dynamics model (Kotter, 1978) provided an appropriate analytical technique for examining the organizational interactions arising from system implementation in the short and medium term. While the elements in our applied framework did not map exactly to the original model, the variables (or dimensions) explored in the two models are essentially the same.

Some of the examples quoted by Kotter provided close parallels for the case study, and indeed the organization, and thus enabled the researchers to subject the events to a rigorous application of this diagnostic tool. The *structural* and *interactionist* perspectives, of Robey and Newman (1996), offer similar insights to the techniques applied in this methodology and emphasize the value of the process model and its ability to make sense of
complex social processes.

The case research has also illustrated the intensely organizational nature of systems implementation. The system -- partly organizational process, partly technology -- interacted with all of the organizational elements. Bidirectional impacts occurred between the project/system and some of the key elements, e.g., work processes, culture, politics. The sheer number of players involved in implementation, as evidenced by the participant categories in the implementation path analysis, reinforces the organizational nature of systems implementation.

**SUMMARY**

By combining the unique perspectives available from separate Factors and Process research studies, the methodology presented here effectively addressed the primary research objective – to explain the organizational impediments to successful implementation of information systems. The holistic and necessarily complex implementation model defined in the methodology, proved to be an effective conceptualization of the implementation process and one that could be applied more broadly in case research.

While a single case study, by its nature, cannot be generalized, the present methodology strengthens the value of case research through an innovative combination of quantitative and qualitative techniques within an overall process and organizational framework. In this particular instance, the case study itself provided a valuable test-bed for the methodology described, and highlighted some specific strengths:

- the molding of detailed events/decisions to a process model, enabling greater insight within and across stages;
- a retrospective case study where the stakeholders and archival data were recent and accessible, enabling triangulation of data for event reconstruction;
- evaluation of success independently of the events recorded;
- the interpretation of organizational dynamics using a defined model, rather than relying on informants’ interpretations.

Valuable lessons have also been learnt enabling further improvement of the methodology. Specifically, refinements are needed to the survey tool, especially in the area of expectations measurement. The formulation of organizational components, while generally suited to a large organization, need some redefinition, to bring into sharper relief the role and characteristics of the senior management team. Finally, one of the key challenges to be addressed in future research must be how these models and interpretations can be applied within systems implementation projects to increase the chances of success.
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