Determinants of Commitment to Information Systems Development: A Longitudinal Investigation

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Abstract

Commitment to an information systems (IS) development project is widely believed to affect the eventual success of the system. Problems arising from low commitment have also been described. However, there has been little research on the factors that influence the level of commitment to an IS project. This paper provides some initial insights into the determinants of commitment based on a longitudinal study of an IS project that was stopped and then restarted on several occasions over a 17-year period (1975–1992). The paper draws four types of determinants — project, psychological, social, and structural — from the organization behavior literature and uses them to explain six decisions that were made during the 17-year period. A comparison of these six decisions suggests that project determinants play a central role during the initial commitment decision, but the other determinants assume greater importance in later stages. Moreover, it seems that in this case study, project and psychological determinants affected the decision to increase commitment, whereas social and structural determinants influenced the decision to withdraw commitment to the project. Some implications for practice and future research are examined.

Keywords: Systems development, project management, commitment, conflict

ISRL Categories: AC0403, AI0102, AI0113, EE06, EL0201, FD04

Introduction

Successful development of an information system (IS) has long been believed to depend on the commitment to the project (Ginzberg, 1981; Kwon and Zmud, 1987; Lucas, 1981; Markus, 1981). Top-management commitment is rated as the most important factor in IS planning (Galliers, 1987) and the implementation of IS plans (Lederer and Sethi, 1988). It also affects the organization’s effectiveness in converting information technology investments into useful outputs (Weill and Olson, 1989). Conversely, lack of commitment could lead to indifference or deliberate resistance (Grover, et al., 1988) and may even cause the project to be abandoned (Ewusi-Mensah and Przasnyski, 1991).

Even though commitment is clearly important to the success of IS development projects, managers may sometimes become too committed to certain IS projects (Keil and Mixon, 1994; Neumann, 1994; Orli, 1989; Rothfeder, 1988). Decision makers who are committed to an IS project may continue to invest additional resources, and thereby further increase their commitment to an IS project, when faced with indications that the project may be failing. Alternatively, in some cases, IS development...
projects may take too much time, or even fail, if commitment is erratic, as in situations where the champion for the project departs in the middle of the project (Reich and Benbasat, 1990). Therefore, it is important to understand the dynamics of commitment during IS development projects.

This paper takes an initial step toward understanding the dynamics of commitment in IS projects by examining how events that take place during IS development affect the determinants of commitment and thereby lead to changes in commitment. For example, when the initial events in an IS project suggest that the system is likely to succeed, do managers increase their commitment to the project? Do problems in initial stages of the project cause managers to reduce their commitment and forget about the sunk costs, or do they lead to commitment of greater effort and resources in an attempt to turn the project around?

The literature on escalation of commitment (Bowen, 1987; Brockner, 1992; Staw, 1982; Staw and Ross, 1987; Whyte, 1986), which has examined how commitment can change over time, provides the theoretical underpinnings for the paper. A longitudinal study of the development of an IS provides the empirical basis. Changes in some key determinants caused variations in the level of commitment which, in turn, led to the project being stopped and then restarted on several occasions over a 17-year period (1975–1992). Six major decisions about the system were made during this time. Commitment to the project and its determinants are examined for each of these six decisions. By comparing these results for the six decisions, some implications are drawn for executives responsible for managing IS development projects and for future research on commitment to IS projects.

The theoretical background

Commitment

Commitment has been defined as a state of mind that holds people and organizations in a line of behavior (Staw, 1982). It encompasses psychological forces that bind an individual to an action (Kiesler, 1971) as well as structural conditions that make a behavior irrevocable or difficult to change (Becker, 1960). Commitment has been argued to greatly affect the persistence of behavior (Salancik, 1977).

Commitment to an IS development project involves “doing what is necessary throughout the stages of system development, installation, and use to assure that the system is understood and that the system development solves the problem” (Ginzberg, 1981, p. 54). A high level of commitment to an IS project reflects the belief that the system will make a valuable contribution to the organization (Weill, 1992). Without such commitment, necessary resources may not be dedicated (Grover, et al., 1988; Lederer and Sethi, 1988; Weill and Olson, 1989). Therefore, the project may be abandoned midway or even before IS development begins (Ewusi-Mensah and Przasnyski, 1991; Runge, 1988).

Escalation of commitment

The phenomenon of escalation of commitment refers to situations where decision makers commit additional resources to a failing course of action (Bowen, 1987; Staw, 1981). It reflects the tendency of individuals, when choosing between discontinuation of an unproductive line of behavior and investment of additional resources to make that course of action pay off, to increase commitment beyond what is appropriate considering the objective facts of the situation (Whyte, 1986). At the individual level, this phenomenon may be illustrated by the tendency to continue standing in a long queue because one has already been standing there for some time, even though the queue may be moving very slowly. At the organizational level, this phenomenon may be illustrated by the following examples from case studies on escalation of commitment:

Following an initial suggestion by Provincial Premier William Bennett in 1978, British Columbia applied in June 1979 for hosting a world exposition, Expo 86, in Vancouver in 1986. The application was approved in November 1979. The initial budget projection
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was $78 million, with a “worst-case” deficit of $6 million. However, by 1985, Expo 86 had become a $1.5 billion project with a projected deficit of $311 million (Ross and Staw, 1986).

In April 1966, Long Island Lighting Company announced plans to construct a nuclear facility in Shoreham, New York. The construction of the plant was expected to begin in 1969, and the plant was expected to start operating in 1973. The anticipated cost for the plant was between $65 and $75 million. However, the cost of the project was increased frequently, and it had risen to over $5.5 billion by 1989, when an agreement was signed to close the plant. During this 23-year period, the project faced several problems including an increase in the projected plant capacity, resistance from an antinuclear group, public hearings lasting three years, investigation of the plant’s construction by New York State Public Service Commission, recurrence of antinuclear demonstrations in the light of the major nuclear accident at the Three Mile Island facility (Ross and Staw, 1993).

Escalation of Commitment in IS Development Projects

IS development projects often take more time and cost much more than originally expected. They are also sometimes abandoned after absorbing large investments over long periods of time; a study of abandoned IS projects found that, at the time of abandonment, eight out of 21 projects were in the implementation stage, and four of these had already consumed greater expenditure than the budgeted amount (Ewusi-Mensah and Przasnyski, 1991). While the problem of cost overruns has traditionally been attributed to the poor quality of the original estimates, the original system design, etc., it has recently been recognized that escalation of commitment may be an additional reason (Orl, 1989; Rothfeder, 1988). Organizations apparently keep investing additional resources into failing IS projects in an attempt to make them work, and consequently these “runaway” projects (Barki, et al., 1993; Keil and Mixon, 1994) are continued even though it may make more economic sense to stop them.

Escalation of commitment situations is characterized by three essential features: costs of continuing the course of action, opportunities for withdrawal, and uncertainty about the consequences of persistence and withdrawal (Staw and Ross, 1987). There are occasions in IS development projects where a decision has to be made on continuing the project, which is associated with certain costs, or canceling it, and the consequences of either action seem uncertain. Thus, IS development projects commonly have all three features of escalation situations. It is therefore not surprising to find escalation of commitment in IS projects, as illustrated in these examples:

Led by Bank of America, a consortium of banks began the development of MasterNet, a state-of-the-art trust accounting system in 1982. The estimated cost was $20 million, and the target deadline was December 1984. Following several postponements, allocation of additional funds, and even a party to announce and display the system to its key customers in 1986, the project was terminated in 1988. By that time, the cost of the project was about $80 million, even if the loss of the trust accounting business is disregarded (Neumann, 1994, pp. 156–160).

The Executive Committee of BP Chemicals, a subsidiary of British Petroleum Chemicals, approved a $7.9 million budget for a Commercial Systems Project in June 1985, expecting the project to last only 18 months. The project eventually took six years, and required additional spending of four to five times the original budget (Jelassi, et al., 1994a; 1994b).

Theoretical basis for escalation of commitment

The literature on escalation of commitment has been explained using several theories. One theory that has had considerable impact on escalation literature is self-justification theory (Staw, 1981; Staw and Ross, 1978). When the managers who originally approved a project have to choose among terminating the project, modifying its nature, or pursuing it further with additional resources, they are likely to select the last option (Davis and Bobko, 1986). Based on the theory of cognitive dissonance (Festinger, 1957), self-justification theory posits that the
decision makers may be reluctant to admit that their earlier decisions were incorrect and may invest additional resources in an attempt to demonstrate the correctness of those decisions (Brockner, 1992). Therefore, individuals who have a high level of personal responsibility for a failing project would be more likely to commit additional resources than individuals with a low level of personal responsibility (Staw and Ross, 1987).

The tendency to escalate commitment may also be partly explained by expectancy theory (Vroom, 1964). According to this theory, decision makers assess the subjective expected utility of allocating additional resources based on estimates of the value of goal attainment (i.e., rewards minus costs) and the probability that additional resources will help attain the goal (Brockner, 1992). Therefore, if the reasons for the earlier poor performance are perceived to be unstable rather than stable, the decision makers would consider the probability of goal attainment to be more favorable and would therefore be more likely to commit additional resources (Levi, 1982).

Prospect theory, which explains an individual's tendency to take risk under conditions of uncertainty, has also been used to explain escalation of commitment (Garland, 1990; Keil and Mixon, 1994; Whyte, 1986). According to this theory, individuals are risk seeking when choosing between two losing options but risk averse when choosing between two winning options (Kahneman and Tversky, 1979; 1982). Therefore, the decision may depend on how the problem is framed to the decision makers (Brockner, 1992). Moreover, when deciding between canceling a failing project and escalating commitment to the project, those deciding on failing projects are likely to be risk seeking and may therefore be expected to escalate commitment (Whyte, 1986). Moreover, these decision makers are likely to take sunk costs, representing an irrevocable investment of resources that should be irrelevant in decision making because the past cannot be changed, into consideration (Whyte, 1991).

In addition to the above theories, some other theories, including decision dilemma theory and self-presentation theory, have been used to explain escalation. According to decision dilemma theory, escalation of commitment occurs because the information on past performance is equivocal and does not clearly indicate failure (Bowen, 1987). According to self-presentation theory (Goffman, 1959), organization culture influences escalation decisions, with escalation being more likely when organization culture values consistency in behavior or makes people unwilling to admit failure (Brockner, 1992).

Determinants of commitment

Following an exhaustive review of the literature on escalation of commitment, Brockner (1992) concludes that self-justification theory provides a partial explanation of the phenomenon, and other theories should be used to provide a more complete explanation. Staw and Ross (1987) incorporate the determinants of commitment based on these theories into a taxonomy of four types: (1) project determinants, focusing on objective attributes of the project; (2) psychological determinants, focusing on the key individuals participating in the process; (3) social determinants, focusing on the various groups involved; and (4) structural determinants, focusing on attributes of the organization and its relationship with the project. These four types of determinants and their relevance to IS development projects are briefly discussed below. Table 1 summarizes the determinants.

Project Determinants

Project determinants are objective features of the project itself. Primarily based on expectancy theory, they reflect the costs and benefits of the project (Brockner, 1992). The project is likely to be continued when it is considered to be a long-term investment, involving a large payoff and a long-term payoff structure. Moreover, escalation of commitment is likely when the costs associated with closing or stopping the project are high, the salvage value is low, and no feasible alternatives are available (Staw and Ross, 1987). Escalation is also likely if the performance data is ambiguous and if the performance problems
**Table 1. Determinants of Commitment to Projects**

<table>
<thead>
<tr>
<th>Level of analysis</th>
<th>Project Determinants</th>
<th>Psychological Determinants</th>
<th>Social Determinants</th>
<th>Structural Determinants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>The project</td>
<td>Each decision maker</td>
<td>Each decision maker and his/her social group</td>
<td>The organization and the IS function</td>
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<td>Determinants**</td>
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<td></td>
<td>Objective features of the project, reflecting costs and benefits</td>
<td>Attributes of the decision maker's relationship with the project</td>
<td>Features of the social group surrounding each decision maker</td>
<td>Contextual conditions surrounding the project</td>
</tr>
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<td></td>
<td>• Large payoff (Keil, 1994)</td>
<td>• Personal responsibility for failure (Staw, 1976; Bazerman et al., 1982; Davis and Bobko, 1986; Haunschild, et al., 1994; Keil, 1994)</td>
<td>• Public identification with the project (Ross and Staw, 1993)</td>
<td>• Political support for the project, including top management support (Ross and Staw, 1986, 1993; Keil, 1994)</td>
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<td></td>
<td>• Long-term payoff structure (Ross and Staw, 1986, 1993)</td>
<td>• Information processing errors (Ross and Staw, 1986, 1993; Keil, 1994)</td>
<td>• Responsibility for failure (Caldwell and O'Reilly, 1992)</td>
<td>• Institutionalization, or strategic nature of the project (Ross and Staw, 1986, 1993)</td>
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<td></td>
<td>• Large closing costs (Ross and Staw, 1993)</td>
<td>• Framing (Davis and Bobko, 1986)</td>
<td>• Competitive/political rivalry (Rubin et al., 1980; Haunschild, et al., 1994; Keil, 1994)</td>
<td>• Economic and technical side bets (Ross and Staw, 1993)</td>
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<td></td>
<td>• Low salvage value (Ross and Staw, 1986, 1993)</td>
<td>• Sunk costs (Garland, 1990; Keil and Mixon, 1994)</td>
<td>• Successful models of persistence (Staw and Ross, 1980; Brockner et al., 1984; Ross and Staw, 1993)</td>
<td>• Slack resources (Keil, 1994)</td>
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<td></td>
<td>• Infeasibility of alternatives (Keil and Mixon, 1994)</td>
<td>• Reinforcement traps (Ross and Staw, 1993)</td>
<td>• Norms of consistency (Ross and Staw, 1993; Keil, 1994)</td>
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<td></td>
<td>• Ambiguous performance data (Ross and Staw, 1986, 1993)</td>
<td>• Continuity of champion (Ross and Staw, 1993; Keil, 1994)</td>
<td>• Public decision context (Haunschild, et al., 1994)</td>
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<td></td>
<td>• Temporary cause of setback (Keil, 1994)</td>
<td>• Emotional attachment (Keil, 1994)</td>
<td>• Emotional attachment (Keil, 1994)</td>
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<tr>
<td></td>
<td></td>
<td>• Prior history of success (Keil, 1994)</td>
<td>• Prior resistance encountered (Fox and Staw, 1979)</td>
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<td></td>
<td></td>
<td>• Strong and repeated support in the past</td>
<td>• Administrative inertia</td>
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<td></td>
<td></td>
<td>• Value attached to turnarounds</td>
<td>• Top management's knowledge of information technology</td>
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<td></td>
<td></td>
<td></td>
<td>• Information intensity</td>
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<td></td>
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<td>• IS maturity</td>
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</table>

* This taxonomy of determinants was originally proposed by Staw and Ross (1987).

** Most, but not all, of the determinants listed in this table have been empirically tested and supported in prior research on escalation. The determinants shown above the dotted line have been supported in the cited empirical research. The determinants shown below the dotted line have not received empirical support.
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can be attributed to a temporary cause (Ross and Staw, 1986; 1993).

These determinants can be applied to IS development as well. Commitment to an IS development project is likely to be high if the eventual system is expected to provide large benefits. If alternative ways of achieving the objectives of a project are available, the project is more likely to be discontinued in case it runs into difficulty than if such alternatives did not exist. For example, the project team at BP Chemicals had concluded at the start of the project that the new system was necessary because "networking the existing systems would be prohibitively expensive and technically difficult" (Jelassi, et al., 1994a, p. 122). Finally, an IS development project facing problems is more likely to be continued if the problems seem to be due to a temporary cause, which can be avoided in future.

Psychological Determinants

Psychological determinants are those that cause managers to "convince themselves that things do not look so bad" (Brockner, 1992; p. 54). Such self-justification reflects the tendency of managers to continue an apparently failing project because of their unwillingness to admit, to themselves or to others, that their previous decisions were mistaken (Staw and Ross, 1987). Self-justification is more likely if the managers hold themselves responsible for failure.

Psychological determinants also include factors that closely bind the decision maker to the project. For example, a manager whose prior support for the project was strong, frequent, and public, may continue to support the project even when problems arise. In addition, psychological determinants include information-processing errors, such as seeking and interpreting evidence in a way that sustains prior beliefs (Bargh, 1982), and overestimation of the chances of success. These errors are more likely when the information on past performance is ambiguous (Staw and Ross, 1987), which, as discussed earlier, is a project determinant. The value individuals commonly attach to turnarounds can also cause escalation (Bowen, 1987). Framing the decision as a choice between losing options, and sunk costs, which are both related to prospect theory, also cause information processing errors. Finally, some psychological determinants represent "reinforcement traps," such as the decision maker's self-esteem; high self-esteem individuals seek less information and tend to stay committed to their original course of action (Ross and Staw, 1993; Staw and Ross, 1987).

The above determinants partially explain the importance of continuity of champions in IS development projects (Reich and Benbasat, 1990). If the individual who has championed an IS project is involved with the project when it runs into difficulty, that individual may overestimate the system's chances of success, and is likely to further support the system in an attempt to self-justify. Escalation of commitment is likely when the decision makers are overconfident due to their prior history of success (Keil, 1994), and also when they express their initial commitment to the project in unambiguous terms, and in public forums, such as the public commitment by the son of Singapore's Prime Minister to deliver the Tradenet system in two years (King and Konsynski, 1993). Finally, sunk costs - for example, the resources spent on buying the hardware - often drive the decision to escalate commitment. Thus, psychological determinants, which originate from within each individual decision maker, affect the decision maker's beliefs about the consequences of an action.

Social Determinants

By contrast, social determinants originate from the group surrounding the individual decision maker and hold the individual to a course of action, regardless of personal beliefs (Brockner and Rubin, 1985). Some social determinants arise from the individual's actions being observed by an audience (Brockner, 1992). The individual's public identification with the project and responsibility for failure are two such factors (Staw and Ross, 1987). An individual decision maker's own belief about personal responsibility for failure, which is a psychological determinant, may be quite different from the group's perception about the individual's responsibility, which is a social determinant. Social determi-
nants could also arise from the decision-making group's competitive rivalry with another social group or from the group's considering another group, which is highly successful, as a model (Brockner, 1992; Staw and Ross, 1987).

The literature on IS development projects has given considerable attention to politics that can occur during these projects (e.g., Grover, et al., 1988; Markus, 1981). In addition to political/competitive rivalry, other social determinants may also affect commitment to IS projects. For example, if an organization has developed and used an information system successfully, this success may lead other organizations trying to develop similar systems to minimize the importance of problems they encounter.

Structural Determinants

Finally, structural determinants represent the contextual conditions surrounding the project. They include political support for the project, administrative inertia in the organization, and the extent to which the project is institutionalized, i.e., the extent to which it seems strategic. Structural determinants also include the motivation to persist because of "economic and technical side-bets," such as hiring of new employees, that may have been made earlier in the project (Staw and Ross, 1987; p. 212).

Structural determinants also affect commitment to IS development projects. For example, the strategic nature of the project was a key determinant of commitment during the development of Master-Net (Neumann, 1994). Another structural determinant that has been emphasized in IS literature is the top-management support for the project (Johnston and Carrico, 1988). For example, at BP Chemicals, the project champion in the Executive Committee left BP Chemicals in June 1986 (Jelassi, et al., 1994b). Although no major problems were visible in the project at that time, the departure of the champion may have adversely affected the project later. This did not happen, however, apparently because the Executive Committee had supported the project strongly, publicly, and repeatedly. This may have made it difficult for this committee to withdraw commitment and may have also reduced the likelihood of opposition from others.

IS researchers have implicitly referred to several other structural factors that may affect commitment to an IS project, such as top management's knowledge of information technology (Vitale, et al., 1986), information intensity of the organization's value chain and products (Johnston and Carrico, 1988), and maturity of the IS function (Sabherwal and King, 1992).

The four types of determinants are not mutually independent. Interrelationships may exist among them. For example, the social determinants of an individual's commitment are affected by the psychological determinants of commitment of other members of the group surrounding the individual. Moreover, different types of determinants would have influence during different stages of a project (Staw and Ross, 1987; Ross and Staw, 1986; 1993). Two prototypes have been proposed for escalation and withdrawal of commitment (Staw and Ross, 1987). In the escalation prototype, project determinants play an important role in the earliest stages of the project, followed in succession by psychological, social, and structural determinants.

Empirical research on escalation of commitment

Escalation of commitment has primarily been studied using laboratory experiments examining the effects of variables such as personal responsibility for failure (Bazerman, et al., 1982; Davis and Bobko, 1986; Haunschild, et al., 1994; Staw, 1981). Such laboratory experiments focus on the individual rather than organizations and may not be able to adequately incorporate social determinants.

In addition, two in-depth case studies examining the phenomenon have been conducted (Ross

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1 Jerry Ross (1990, personal communication with Joel Brockner, as described in Brockner, 1992, p. 49) has pointed out that laboratory experiments may also not adequately capture self-justification due to two main reasons. First, the personal involvement of subjects is likely to be limited in laboratory experiments as compared to real organizational settings. Second, there are usually strong norms for college students (who are often used as subjects) to act or appear "rational."
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and Staw, 1986; 1993), and were summarized earlier. Based on the study of Expo 86, Ross and Staw (1986) argue that the four types of determinants have varying impacts on the different stages of a project. According to them, project determinants play the paramount role during the initial stages of the project. As the project progresses and project determinants become less favorable, psychological determinants, followed by social determinants, and finally structural determinants, affect commitment. Later, based on the study of the Shoreham nuclear plant, Ross and Staw (1993) argue that the project determinants may become important again during the later stages of the project.

While escalation of commitment in IS development has been recognized in the popular IS literature (Orli, 1989; Rothfeder, 1988), there has been little empirical research in this area (Keil, 1994; Keil and Mixon, 1994). Keil (1994) conducted an in-depth case study of the development of an expert system, called CONFIG. Initiated in the early 1980s, this project was continued despite numerous problems until late 1992, when it was terminated after millions of dollars had been spent. Keil studied the effects of the four types of determinants (Staw and Ross, 1987) on escalation of commitment. Keil and Mixon (1994) conducted four experiments. The first two experiments did not show the expected effects of personal responsibility and sunk costs on commitment. The third experiment found subjects to be less likely to stay committed if they had the option to invest in an alternative project. This experiment also found sunk costs to increase commitment. The fourth experiment supported this finding.

Dynamics of IS development

The IS development process may simply be viewed as consisting of (a) the decision to develop the system, including identification of its scope, planning for its development, and commitment of requisite resources, followed by (b) the actual development of the system, including logical and physical design, programming, and testing (Johnston and Carrico, 1988). This unidirectional progression from decision making to IS development assumes "immaculate conception," wherein the decision makers are able to assess in advance, and hence plan for, the problems and opportunities that may arise during IS development (Swanson, 1988). However, in most practical situations, numerous unexpected problems and opportunities occur during systems development, necessitating further decisions about the system (Lyytinen, 1987; Sabherwal and Robey, 1993). Therefore, "lengthy development efforts may require periodic recommitment or increased investments" (Beath, 1991, p. 358).

The problems and opportunities may arise from unexpected events in the organization or its environment (Ewusi-Mensah and Przasnyski, 1991; Lederer and Mendelow, 1990). Alternatively, the project may encounter problems such as cost overruns, delays, resistance, and inadequate functionality (Grover, et al., 1988). As shown in the left part of Figure 1, which summarizes our dynamic view of IS development, such problems and opportunities necessitate further decisions to: (a) continue the IS project unchanged, (b) pursue it further but using a different approach (e.g., in-house development instead of outsourcing), or (c) abandon it. Moreover, as shown on the right side of Figure 1, the level of commitment could itself vary over time because factors determining it are affected by changes in the organization and its environment (Lederer and Mendelow, 1990). This paper examines how the influence of the various types of determinants changes over time. It uses the insights obtained from a longitudinal case study of IS development, involving six episodes of escalation or withdrawal of commitment, to develop a dynamic model of commitment to IS development projects.

Research Methods

Each research method has its pros and cons, which makes it beneficial to study a topic using multiple methods. Laboratory experiments may not adequately assess self-justification because the subjects may not feel as emotionally committed as the individuals personally involved in an IS development project (Brockner, 1992). They may also not be suitable to assess the
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Figure 1. The Dynamics of Information Systems Development

effect of social factors such as political rivalry (Keil and Mixon, 1994). A longitudinal case study was used in this paper to examine the escalation of commitment in an IS project. Case research can provide rich insights into the issues that we wished to examine, namely the way in which commitment affects decisions made during IS development, as well as the determinants of commitment. Also, escalation has been studied primarily using laboratory studies. A longitudinal case study enabled us to examine this phenomenon in a real organization. We examined how changes in commitment affected six decisions made during the development of one large IS over a 17-year time period. As interviews were done over time, the conditions surrounding each decision could be identified and linked to the outcome of the decision.

The case method was used to create a description of events that occurred from 1975 to 1992 in one division of a major corporation when it made four attempts to implement a complex materials management system (see Robey and Newman, forthcoming). In this paper the pseudonym Centco is used for the corporation, and the division implementing the system is called the Supply Division.
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Data collection and analysis

The longitudinal case study reported in this paper consisted of intensive, non-directive interviews of individuals charged with developing versions of a complex materials management system. Interviews were conducted in situ on five different occasions — 1978, 1986, 1990, 1992, and 1994. Appendix A provides the details of stakeholders interviewed (using pseudonyms) and indicates when each stakeholder was interviewed. The interviews were conducted by the first author usually in the interviewee's office or a nearby seminar room. Each interview was tape-recorded and lasted between 30 and 90 minutes. Over 300 pages of transcripts were generated from interviews with 13 stakeholders.

In addition to being asked to discuss current events, subjects were also encouraged to comment on major historical events concerning the project (Glick, et al., 1990), thereby producing a concurrent and reconstructed account of the key events over the entire 17-year period. It may be noted that using even non-directed interviews clearly has its limitations. All subjects' comments are "theory impregnated" and somewhat interpreted already. The researcher then imposes a second tier of interpretation resulting in what some have called the "double hermeneutic" (Hirschheim, et al., 1991). This problem was somewhat ameliorated in this study by using multiple informants. In addition, informants were encouraged to focus on specific critical events but were also allowed the freedom to expand their disclosure into areas of personal interest concerning IS development. More vivid events (resistance, project approval, project cancellation, etc.) were of special interest, as they enabled us to obtain multiple interpretations from the respondents. No attempt was made to privilege one interpretation over others — the differing interpretations were of considerable interest in their own right.

The timing of the interviews was largely serendipitous. The first interviews in 1978 took place while the first author was completing his Ph.D. The second interviews in 1986 coincided with the end of a sabbatical leave. In 1990 and 1992, visits were made to the U.S. and Canada for research purposes, but with the specific aim of going to Centco. The final visit in 1994 was linked to an international conference taking place in the vicinity. If resources and time were more freely available, a more systematic schedule of visits could have been undertaken. As it was, the research visits often had to be linked to other activities. Nonetheless, within this limitation, we do not believe our study has suffered unduly from being under-researched. Indeed, re-entering sites too frequently can result in "interviewee fatigue" where the interviewee believes all that can be said on a subject has been said (Buchanan, et al., 1988). In this study, interviewee fatigue was experienced with Ian and Trevor. When we attempted to set up interviews with them in 1992, we were diverted to other people.

One strength of a longitudinal study over many years is the ability to observe the entry and exit of key subjects (see Appendix A). For example, James, the original project leader for MIS interviewed in 1978, left Centco within the subsequent 18 months under stressful circumstances, which are described later. Both the vice president of Supply and the materials manager were victims of a financial crisis in Supply in 1986 and were offered early retirement. Ian held several titles during his tenure at Centco, which, to some extent, matched the ebb and flow of the project's progress. Much of the stress resulting from failure was apparent in the interviews. Ian was traumatized by the failure of one of the projects (the ASI project, as described later) and by his subsequent demotion from project manager to line manager of customer equipment. The transcripts of the 1990 interviews (after the failure) contain evidence of his struggle to cope with the stress from his loss of status. This is in stark contrast to the confident, positive statements made in 1986 when he was looking forward to the challenge of the project. At the final interview with Sam in 1994 we discovered that Ian had been offered early retirement on the grounds of ill health.

We supplemented the interviews using memos, organizational charts, project timetables, and other documents such as annual reports. For example, the chairmen's (Graham's) statements from the annual reports for the years 1978 to 1989 were analyzed to identify trends in Centco's competitive environment. Direct obser-
Commitment to IS Development

vation of the organizational circumstances also provided some useful insights. Feedback was obtained by giving a 37-page factual summary of the Centco case to one key informant, Ian, in 1990. Ian was a key stakeholder over the 17-year period who remained involved in all stages of the project in some capacity. He confirmed the facts of the case except for a few minor historical details and the need to maintain confidentiality. These changes were incorporated into the case.

The first author used the over 300 pages of interview transcripts to prepare a detailed (33 pages) case description containing a summary of the entire IS development process. The second author then read this case description and identified portions relevant to commitment and its determinants. Next, the first author examined the interview transcripts and extracted quotes concerning commitment and its determinants. These quotes were used to validate, and if necessary modify, the conclusions drawn from the case description. Thus, in analyzing the qualitative data, we moved back and forth between the 33-page case description and the over 300 pages of transcript until we arrived at conclusions that found clear support both in the big picture represented by the case description and in the detailed transcripts.

The research site

Centco is a subsidiary of a US-based conglomerate, which we call GenComm. A glossary of the key terms used in this case study is given in Appendix B. In 1990, Centco employed 14,000 people in several widely dispersed locations in North America. Its total revenue for 1989–90 was $1.6 billion, with a profit of $118 million. The Supply Division was responsible for centralized purchasing, inventory control, warehousing, and distribution from two large central warehouses. Supply's repair facility serviced all types of equipment and manufactured some parts. One of Supply's departments acquired and maintained vehicles for the company's local needs, while another department maintained and operated all heating, ventilation, and air conditioning equipment.

A vice president (VP), Bob, headed Supply in 1990. Bob reported to Centco's president of Operations, who in turn reported to the chairman of the board, Graham. The industry in which Centco operated underwent deregulation throughout the 1980s. People at Centco were aware of the threat from greater competition, although they were not sure how the company would respond. The pressures to contain costs necessitated more sophisticated information systems, especially in the materials management area. Until 1990, Supply purchased $300 million to $400 million of inventory per year and held approximately $70 million of equipment and materials in stock. Engineering and finance were the dominant management orientations at Centco. Supply was viewed as a staff group through which engineering people were rotated to prepare them for higher management positions.

Systems at Centco had traditionally been developed for Supply by Management Information Services (MIS). Responding to ad hoc requests, MIS had built several isolated systems spread over three hardware platforms: IBM, DEC, and Datapoint. In 1974, Ian, who later became one of the project leaders, moved to Supply from MIS as part of a natural job progression. He had been instrumental in developing some of the systems in use and arrived at Supply to help implement a new catalog system and a new purchase order system. Within a year, he realized that Supply had a "mishmash" of eight or nine systems, including some large ones, that had been implemented without an overall plan in mind.

IS Development Process and the Determinants of Commitment

An overview of the IS development process

Figure 2 provides a list of the key events, which are described later in this section. The

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Commitment to IS Development

Roll-out to rest of Centco completed

Project implemented at Supply

Trevor plans 5-phase implementation

Trevor reassesses project

MIS buys into project

Decision 6

ASI contract terminated

Trevor stops project

Trevor replaces lan as project leader

VP of Supply (Richard) is removed

Financial crisis at Supply

Technical problems with IMS version

Problems between MIS and Supply continue

AS modules arrive

Decision 5

lan evaluates ASI product

William informs about ASI product

Conflict concerning project leadership

lan returns

MIS builds corporate business models

MIS proposes 11-phase, $10 million project

lan leaves for special assignment

lan custom-designs system

lan proposes in-house development

lan and Jake examine another package

Decision 3

TRES contract terminated

Jake halts payment to TRES

Problems in TRES software

Completion of systems requirements

Resistance from Engineering

James and lan propose to begin systems development with the help of TRES. DECISION 1

James and lan examine alternative software packages

Derek brought in to investigate Centco's problems

Note: This figure has not been drawn to scale along either axis (resources or time). It is meant only to summarize the development process.

Figure 2. Escalation of Commitment in Information Systems Development

MIS Quarterly/March 1996
initial problems in the materials management system are described first. In response to these problems, Blake, the president of Centco at that time, made decision 1 in 1975, committing to development by an external vendor, TRES. TRES tried to develop the system, but several problems surfaced, causing Supply to make decision 2, withdrawing commitment to TRES software. After a few months, decision 3, to develop the software in-house, was made. But in-house development also encountered problems. Moreover, while in-house development was going on, the opportunity to use a software package developed by another vendor, ASI, was identified. This led to decision 4, to shift commitment from in-house development to the ASI package. Several problems concerning ASI's software as well as Supply and its top management occurred during systems development by ASI. Therefore, decision 5, to withdraw commitment to ASI software, was made. After some time, decision 6, to modify ASI software in-house, was made in 1987. These modifications proceeded smoothly, and the system was finally rolled out in Supply by October 1990 and to the other warehouses in 1991.

Thus, during this IS development project, attempts were made to address the same materials management problem using four different approaches: TRES software, in-house development, ASI package, and modification of the ASI package. The focus was on the same problem all along, and all the approaches involved a computerized system. However, the project was occasionally stopped and then restarted using a different approach, implicitly assuming that the previous approach had failed because of its inherent limitations that the new approach would avoid. The IS development process is described in greater detail below. Each of the six decisions is considered an individual episode involving escalation or withdrawal of commitment. Figure 3 summarizes the determinants of commitment for each decision.

The initial problems

By all accounts, materials and inventory management at Centco suffered from gross inefficiencies and waste. When the project leader for MIS (James) began analyzing the current procedures and practices, he found several major problems. Excess inventory carrying charges were estimated to be at least $6.5 million per year. One cause of excess inventory was insufficient and inaccurate data in the manual system. For example, acquiring materials for a particular work order required sending out a purchase order for all of its requirements at one time. This meant that some of the material was brought in too early. Because it was physically available, that material was often used for other work orders or emergency maintenance requirements. This practice caused the materials not to be available when required for the original order.

Decision 1 — making commitment to development by TRES

In 1975, a consultant, Derek, was brought in to consider Centco's problem of disparate non-integrated systems for materials management. Ian was the prime mover in Supply and was the one to recognize the need for a more sophisticated materials management system. Derek and Ian prepared a report recommending a 13-phase in-house development. Coincidentally, a new VP for Supply, Brian, arrived soon after the report was published and saw it as a good way of reorganizing the department. However, developing the system in-house with Derek's assistance was unacceptable to MIS. MIS, a headquarters function, had established a clear pattern of leading IS projects for other departments.

One of the powerful members of the MIS department, Jake, proposed that they instead look for a suitable software package. This was accepted, whereby Jake hired a systems analyst, James, a particularly business-oriented professional, which was in contrast to the technical orientation of a majority of his new colleagues. Jake described him as "gung ho." This
Figure 3. Determinants of Commitment During Each IS Decision

<table>
<thead>
<tr>
<th>Type of decision</th>
<th>Withdrawing Commitment to TRES software</th>
<th>Withdrawing Commitment to ASI software</th>
<th>Shifting Commitment to ASI software</th>
<th>Making Additional Commitment to ASI software</th>
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<tbody>
<tr>
<td>Decision 1</td>
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<td>Decision 6</td>
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**Structural determinants**
- Blake's political support
- Lack of political support

**Social determinants**
- Lack of public identification of George and Dave failure for project
- Ian's strong, repeated, and public support in the past
- Value attached to turnarounds

**Psychological determinants**
- High payoff
- Sunk costs
- Value attached to turnarounds

**Project determinants**
- Large payoff
- Long-term payoff
- Structure of alternatives

**Withdrawal of commitment**
- Low closing cost
- Feasibility of alternative (ASI package)

**Commitment to ASI software**
- Successful models of persistence
- Ian’s identification with the project

**Political rivalry between MIS and Supply**
- Lack of political support
- Lack of political support due to Supply’s financial difficulties

**Resource constraints**
- Lack of public support

**Political rivalry between MIS and Supply**
- Lack of public support

**Identification of Bob and Trevor**
- Lack of public identification

**Identification of George and Dave**
- Lack of public identification

**Political support for project**
- Lack of political support

**Political support**
- Lack of public identification of George and Dave failure for project

**Political support for the project**
- Lack of political support

**Information processing errors**
- Overestimation of system’s chances

**Switching from in-house development to ASI software**
- Withdrawal of commitment to ASI software

**Commitment to IS development**
- Withdrawal of commitment to TRES software

**Commitment to IS development**
- Withdrawing commitment to ASI software

**Commitment to IS development**
- Making additional commitment to ASI software

**Commitment to IS development**
- Shifting commitment to ASI software
Commitment to IS Development

was a crucial decision as James soon became highly critical of the organization culture at Centco.

James and Ian toured North America in search for software packages that met Supply's needs. After three fruitless visits to software vendors, they came across TRES computer systems, which was installing a version of a materials management system (later labeled MMS2) at Tampa Electric Company in Florida. However, the principals at TRES were describing a materials management system that consisted of modules at Tampa Electric, modules at other client sites, and elements that did not yet exist. There was no integrated version anywhere in existence.

James and Ian returned to Centco and made a presentation to the president (Blake), and VPs of Supply (Brian) and Operations (Graham). James described this incident as follows:

We went up to the steering committee consisting of the president, the vice president. It was the highest level, and so I was up there for what, 3-1/2 hours, doing a presentation. Right! How soon can you get it in? Well Sir. I think it will be about 2-1/2 years to get this thing organized because we've got all this preliminary work. Can't you do it quicker? I said, no, afraid not. And away we were, the VP rather delighted.

At this point, the commitment was public, irrecoverable, and important. Graham, the VP of Operations, criticized the decision to some extent but was overruled by Blake, the president. Following previous patterns, Jake from MIS was appointed as overall project manager, James as project leader for MIS, and Ian as project leader for Supply. Although this followed tradition, the appointment of Jake as project manager was not universally endorsed, particularly in Supply.

Determinants

When making decision 1, the project was expected to have a large payoff. The financial analysis was highly favorable, indicating a two-year payback on an investment of $4 million and a net present value of $11.7 million over five years. Blake, the president, decided that the potential benefits justified the risk of buying a system that was not yet working. It was implicitly believed that the system would help turn the problematic materials management situation around. Moreover, no alternative seemed to be available, as James and Ian had found through their long search for software packages. Thus, two project determinants were crucial here — the large payoff and the infeasibility of alternatives. These determinants enabled James to "sell" the project during his presentation to the top management. In addition, a structural determinant, Blake's political support, was also quite important.

Development by TRES

Ian set up the user side, which involved coordinating up to 35 users from internal audit, engineering, construction, industrial relations, and accounting, in addition to Supply staff. They had three–four analysts from TRES, but only one individual understood the whole system, and Ian and James soon demanded his presence at Centco. TRES agreed and subsequently pulled this person off the Tampa account. Additionally, although no formal decision had been made, the project team assumed that the version of the system, MMS3, would be customized for Centco. This was to cause numerous problems later. In total, the project team interviewed 500 people at Centco. Not surprisingly for a project of this size, cooperation was not always forthcoming from all departments. However, despite strong resistance, the information requirements phase was completed in 1977 with 1500 pages signed off by managers in each functional area. Significantly, around this time, both top managers on the original steering committee, Blake and Brian, left their positions. Blake, the president, was replaced by Graham, who was judged to be much more conservative, and Brian, the VP of Supply, was replaced by Dave.

Soon after the requirements were completed, software modules started arriving from TRES. At the same time Jake approached TRES to inquire about the MMS2 project at Tampa Electric. It was crucial that MMS2 was devel-
Commitment to IS Development

opened successfully because it formed the basis for MMS3. It quickly became clear that this was a major issue, especially since MMS2 was out of control.

Decision 2 — withdrawal of commitment to TRES software

The decision to terminate was made by Jake, the project manager, with the support of Graham, the new president. Initially, when doubts arose over the quality of the software and the MMS2 project, Jake halted payments. Jake took the decision to terminate the project.

However, there arose a sharp conflict between him and James and Ian, who tried very hard to dissuade him from cancelling. The stopping of payments caused an organizational crisis at TRES, a small company compared to Centco, and led to two VPs leaving. TRES offered to continue work on a cost-plus basis, which, given the problems with MMS3, had “nil credibility” according to Jake.

Centco began legal action to terminate the contract with TRES. Lawsuits were threatened by both parties, and meetings were arranged on neutral grounds. This culminated in the final agreement to terminate symbolized by an exchange of dollar bills. The original champions of the system had left, and the support to continue had gone with them. The estimated direct costs to Centco was $2.3 million, including $0.8 million in fees to TRES and $1.5 million in internal expenses. The salvage value was not very high either; all Centco obtained was seven volumes of requirements specification.

Centco would probably have absorbed all three individuals (Jake, Ian, James) back into their respective functions, but James took it upon himself to emphasize that the project had failed due to Jake’s poor management and failure to identify the risks of MMS2 not being available. Ian was put into a difficult position when James asked him to testify before a board of senior managers and VPs as to who was to blame for the project’s collapse. The resulting vote was in favor of Jake. Length of service was highly prized at Centco, and Jake had been with Centco many more years than James. Also, James had created a number of highly placed enemies. Eventually, James was “dehired”!

Determinants

Although the low salvage value, a project determinant, would have implied escalation of commitment, commitment was withdrawn, primarily due to social and structural determinants. No top executive was identified with the system. Blake and Brian, the two individuals who had been publicly responsible for the initial decision, had left Centco. Graham, the new president, and Dave, the new VP of Supply, had no public identification with the project, and therefore had no personal responsibility for failure. In fact, Graham had opposed the system when decision 1 was made. The project clearly suffered from a lack of political support. Ian described this situation as follows:

“... We really needed somebody to stand behind us and say "Never mind, these are just temporary difficulties. Let’s just go on." What we found was that our president had left ... and we had inherited a person who was a very conservative, very cautious individual, had himself expressed some concern ... who has since become the chairman of the board [Graham].

Interestingly, the decision to withdraw commitment to the TRES software was made by Jake, who had earlier supported it. Jake, who had supported a vendor-based approach, was less committed to TRES software than Ian and James, who had supported this vendor specifically. Also, Jake now reported to Graham, who had opposed the TRES software earlier. The following extract from an interview with Jake shows his feelings on this matter:

Jake: “Well, [James] had put all his eggs in this project and, when this project [TRES] didn’t go, there was no other spot for him. And he wasn’t willing to let this project go. . . .”

Interviewer: “Was it the same with [Ian] as well?”

Jake: “To a lesser extent. But [Ian] was pretty emotionally committed to it also because when I decided to halt payment and I sent the letter that caused the crisis, I was backed up by the
Commitment to IS Development

VP that I reported to, but I wasn’t backed up by those two. And I think what happened speaks for itself, as to who was right.”

Decision 3 — making commitment to in-house development

During their original search exercise, lan and James had looked at a materials management package produced by McDonnell-Douglas. After the cancellation of the TRES contract, Jake decided to open up the file on their product, believing that it might offer the functionality they were seeking. For 10 to 12 weeks, technical specialists from McDonnell-Douglas assessed how well their system met Centco’s requirements. Both lan and Jake concluded from this exercise that McDonnell-Douglas’ package did not sufficiently meet their requirements and rejected the idea of using it. This left no other known packages on the market. Jake returned to the central MIS group, lan returned to Supply but was now lacking his support team and needed to re-establish his credibility after the TRES fiasco.

At this point, lan persuaded Supply, which still needed better ISs, to revert to in-house development, as originally proposed by Derek in the mid-1970s. However, MIS was busy consolidating, on a new Amdahl computer, systems that over the years had been spread on three different platforms (DEC, Datapoint, and IBM). Due to this preoccupation of MIS, lan was able to seek and obtain the approval of Dave, who had replaced Brian as the VP of Supply, for designing and building an in-house system called MDS (Materials Distribution System).

Determinants

This decision was considerably influenced by lan’s desire to re-establish his credibility with the users by developing a usable materials management system. lan had openly supported the TRES system on several occasions. He truly believed that the system was feasible and should be pursued. This was reflected in his strong opposition to Jakes’ cancellation of the TRES contract:

lan: “Several of us rose up and said, ‘You can’t do this to us, we’ve put in two or three years of our life and our thoughts and ideas into this thing, which is really going to work. We believe. Why don’t you believe?’”

lan’s public and frequent support was a key psychological determinant of commitment in this decision. It bound him to the project and apparently led him to overestimate its chances of success. In addition, lan’s public identification with the project was a social determinant. lan had failed to prevent the cancellation of the TRES contract (decision 2) and wanted to redeem his reputation within the organization by turning the system around. This was an important factor in the continuation of the project even though the senior executives associated with this system, Blake and Brian, had departed. Moreover, the system was still expected to have a large payoff. Finally, the decision to develop the system in-house was also influenced by the lack of any feasible alternative to in-house development. The search for external software, including the experience with TRES and the investigation of the McDonnell-Douglas software, had failed to identify any useful package.

In-house development

MDS was custom-designed for Supply, but was not an integrated system, unlike the expected system from TRES and the system that was eventually developed. Nevertheless, it was a major advance over what they had, and lan was able to re-establish his credibility, which had undoubtedly been dented by TRES. As a reward for his efforts, lan was given a special project assignment outside Centco in 1982. He returned to Supply about two years later (1984) to find that the MIS group was reasserting itself in the development of systems for Supply. This made lan quite unhappy.

Jake, the project manager for MMS3, was now the data resource manager. He was insisting that Supply conform to a corporate business model that would result in the Supply system using 11 phases over 8–10 years at a cost of
$10 million. By contrast, Ian was keen to continue in-house development. After all, he had achieved some success with MDS, which had been received well at Supply. However, Ian did cooperate and helped to build the business model over a six-month period. But one crucial aspect of the project — leadership — did not work out as Ian had hoped: MIS took the project leadership and soon they were sharing it with people from Engineering, not from Supply.

**Decision 4 — switching from in-house development to ASI package**

The Supply people were experiencing a sense of grievance over the project leadership. At this time, Supply's new materials management director, Will, returned from a visit to GenComm, the parent company, with news of a new material management package from ASI. The managers at Supply were clearly eager to explore this package. They seemed scared of the 11 phases and the $10–11 million required for the in-house development. Ian was pulled off the in-house development in 1984 by the VP of Supply. He was sent to examine the ASI system and make a judgment, as the systems expert, on behalf of Supply. He put together a user team which, after three–four months, estimated that the ASI package had 60–70 percent of the functionality they wanted and was economically the better route to take.

Supply's executives felt that in-house development could not provide the functionality available in the ASI package. Using the ASI package also meant that Supply could reassert leadership. So Supply actively promoted the ASI package, while the MIS team, which was unhappy with this development, tried very hard to gather evidence from anyone who would say anything against the package.

The ASI package was justified to the VP of Supply. The in-house development proposed by MIS was firmly rejected, and MIS was told to cooperate. Ian was appointed as the project manager. He and some colleagues did a thorough, module-by-module examination of ASI's product. They rated it as an 84–85 percent fit with Supply’s needs, much better than the original estimate. They also joined the group of some 400–500 companies that used ASI's products. Unlike the TRES product, ASI's was in regular use by many companies. This was vital in demonstrating the project’s viability, especially to Graham, who had by now become the chairman of the board. Ian developed a comprehensive business plan, and the contract for the new system, called MMIS-II, was signed in April 1986 with completion due in two years. Supply also signed a five-year maintenance and enhancement contract with ASI.

**Determinants**

This decision was affected by two project determinants (low closing costs and feasibility of alternatives) and two social determinants (political/competitive rivalry and successful models of persistence). The closing costs for the current approach (in-house development) were low, because little software development had been done. Moreover, a feasible alternative (ASI package) to in-house development had now been identified. GenComm and several other companies had already bought the ASI package. These provided successful models for persistence, which were vital in demonstrating the project's viability, especially to Graham, who was now the chairman of the board. Another key determinant was the competitive/political rivalry between MIS and Supply. Although Ian from Supply had done the initial work on in-house development, project leadership had gone to MIS. Ian commented:

> We were sort of like a voice in the wilderness, left alone to cry out there and say, "What about us?" We were the initiators, we built the business model, we helped justify this thing financially, and now we've lost control of it.

**Development by ASI**

The users were confident that a two-year deadline was feasible because a consultant hired for
the project had installed a similar size system for an Alaskan oil company in less than two years. The major difference, which later proved critical, was that Centco took the IMS version rather than the more common CICS version. MIS insisted that the IMS version was required for technical reasons (e.g., size of the database). However, there were strong indications from some users that there were more "political" undertones to their insistence. This was MIS's way of reasserting its authority over the users. With echoes of problems from the history of TRES, the IMS package Centco would be adopting was not yet complete. Whereas there were approximately 200 CICS installations, the IMS version had only five customers, and Centco was the only ASI client proposing to take the full package. Later, the third project leader, Sam, looking back on the decision to take the IMS version, was able to reflect:

... maybe a decision was made which probably wasn't wise. ... But in the early 80s . . . the technocrats had a lot of rights to make decisions.

No one we spoke to could identify who made the decision, but its impact became clear. They were using an untested system (the IMS version) instead of a proven one (CICS). Although ASI, to expedite the sale, claimed they had a working IMS version, history showed that this was not the case.

Sam: "... they sent us a version which was supposedly a tested version, but it wasn't — people were still in the backroom working at it. ... This is the one that just was riddled with all these holes, and the whole program works only to some extent."

Although MIS had been put in its place, there was considerable resentment there and conflict was evident, especially between two key stakeholders: Ian and Dan, the second project leader. In one of the interviews, Ian recalled some of the comments he made to the top management:

I said, 'I can't go on. [Dan] is either with us or against us. What are we going to do?' And they hauled him on the carpet and said, 'Get with it! The user is driving this project.'

Although the early modules from ASI were installed successfully, in December 1986, the conflict between Supply and MIS worsened. Ian believed that MIS was imposing unreasonable technical demands on the new system, forcing it to conform to their standards. While this conflict was simmering, further modules were arriving from ASI for the IMS version of the package (now called MMIS-II, MMIS-I was the renamed in-house development). ASI was using as its base system one derived from another utility company called SouthWest. There were problems with this version — "hundreds of problems" (according to Tom, the ASI representative). As a consequence, Supply started to miss dates on the MMIS-II project. Meanwhile, MIS demanded that the IMS version conform to their internal standards. This caused Supply a great deal of extra effort in recoding the software.

**Decision 5 — withdrawal of commitment to ASI software**

To compound these problems, Supply was facing major financial difficulties in 1987, causing an unexpected $5 million deficit. This deficit was partly due to "some major blunders in budgeting strategy," including accounting changes making Supply a budget center. The situation was further aggravated by some difficult industrial relations problems at Supply. Supply came under rather close scrutiny, and as a result the VP of Supply, Richard, and several others were removed. A new VP, Bob, was appointed. Bob was convinced the project was in trouble, and consequently, all work on the project was halted in late 1987. Initially Ian, the project manager for MMIS-II, was untouched, but in January 1988, Bob appointed Trevor from marketing as the new project manager in his place. One of the accountants referred to Ian's career as being "red-circled." Trevor viewed Ian as a "details person." Curiously, Ian retained his old job title, making his situation full of uncertainty if not anxiety.

Upon assuming project leadership, the first thing Trevor did was to cancel all previous commitments, saying that the whole thing had to be rejustified with a new business case. He realized that the project organization had to be changed in two major ways. First, the antagonistic relations with MIS had to be resolved.
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Ian's old "sparring partner" [Dan] from MIS was removed from the project team and replaced by a more sympathetic project leader, Sam. The MIS personnel were also moved on site to Supply instead of working from the head office. Second, by relying on ASI for changes, the old project team had experienced significant response problems. Therefore, Trevor decided that to move the project forward it was necessary to buy their way out of the ASI contract and get MIS to take over the modifications and maintenance of the software. In June 1988, Centco bought out the contract with ASI. ASI got most of its contracted money, including the payment for defining requirements and developing software, but Supply did not give it the money contracted for five-year maintenance.

Determinants

At the time of making this decision, Supply was experiencing financial problems, which caused severe resource constraints. Moreover, there was now a lack of political support for the project because the earlier VP, Richard, and several others had been removed from the company, and Trevor had replaced Ian as the project leader. Ian felt that the new VP [Bob] "wanted to establish right out ... that he was in control of this [project]." In addition, two social factors, lack of public identification with the project and competitive rivalry, also affected the decision to terminate the ASI contract. None of the new decision makers — the VP [Bob] or the project leader [Trevor] — was identified with the project, but Ian was the individual considered responsible for the mess.

Decision 6 — making commitment to in-house modification of ASI software

Trevor, with Ian's help, had prepared a new business plan rejustifying the system to senior management. Whereas the original plan for MMIS-II showed a net present value of $4 million over five years for an investment of $18 million, the new plan produced a net present value of $2 million with a $35 million investment. This was projected over 10 years (1987–1996) and used incremental costs. According to one estimate, the full costs amounted to a staggering $76 million. Thus, the business case was weak, but it did produce a positive, albeit small, net present value.

Fortunately, the conditions were now less hostile than before. In the first place, the strife between Supply and MIS was resolved; Sam had replaced Dan. Second, MIS was persuaded to buy into the software development, replacing ASI who had been acting as a drag on the process. Thus, all the ingredients were now in place for Trevor to proceed with MMIS-II. The financial picture, although not exciting, was acceptable, and there was a feeling that the less tangible benefits of automation would make it essential to go ahead.

However, the approval of the new plan was not straightforward. The new accounting arrangements meant that $35 million was now the largest expense item at Supply and made it a highly risky project. The system was justified largely based on how much had already been invested. Trevor was in a strong position, personally. If he had recommended abandoning the project no one would have blamed him. After all, the project was failing. In order to justify the new case, he had to make sure there were enough resources to see the project through to completion. If successful, the project would probably mean a good promotion for Trevor.

Determinants

This decision was justified to considerable extent based on sunk costs. Supply had already invested a significant amount of money into the package, which it would have to write off if it abandoned the project at this stage. The decision seemed to be framed in terms of losses rather than gains, i.e., as one that would prevent losing the large sum of money already invested.

Ian: "[Trevor] has proven, through my work on the business case, and his selling and explain-
The above comment also indicates that the system was still expected to improve the company's performance. Moreover, the closing costs were high because of the contractual commitments. Thus, decision 6 was influenced by two project determinants, namely large expected payoffs and large closing costs. It was also influenced by two psychological determinants. One of these factors was the sunk cost, as discussed above. The other psychological determinant concerned the value commonly attached to turnarounds. Trevor wanted to turn the project, which was perceived to be a failure, around. He stood to gain considerably if he could successfully do so.

In-house modification of ASI software

Trevor decided that a project of the size of MMIS-II was too large to introduce in one attempt. Instead, he divided the project into five phases in an attempt to reduce the risk of failure and ensure that requisite functionality was delivered to the user community.

As of September 1990, the project was proceeding satisfactorily. Ian, who had been involved with systems development at Supply since 1974, was now in a line management position. Trevor had installed a large notice in the main Supply building highlighting the deadline for one of the major phases (October 8, 1990). This deadline was met successfully, and the final system phases were "rolled-out" to the other warehouses in 1991, a major undertaking involving around 1200 people. A final visit in 1992 (September) confirmed that the system had been fully implemented and that they were now in a maintenance and enhancement mode; the implementation strategy had worked. Supply now had a sophisticated, integrated materials management system that offered significant advantages over the previous systems.

The system was being used effectively by the staff.

Discussion

Implications for research

The Centco case provides some initial insights into the dynamics of commitment during IS development projects. Because of the length of the study at Centco we could see how unexpected events, such as the departure of some key managers and deterioration in organizational performance, can cause changes in commitment to an IS project. Many of these issues would probably not have been captured in a more short-term study. Not surprisingly, our study shows sustained commitment to be a key requirement for successfully completing IS projects. The project went through numerous peaks and valleys, facing several seemingly insurmountable problems. The project was canceled on two separate occasions, but it was shortly resurrected on each occasion. Changes in the levels of commitment to the project were found to be helpful in explaining these IS decisions. The longitudinal investigation of determinants shows that each type of determinant has varying effects on different stages of the IS development project. Figure 4 provides a preliminary dynamic model of commitment in IS projects which, based on the results of our study, modifies the models presented by Ross and Staw (1986; 1993).

The dynamic model of commitment in IS projects includes five processes, (A, B, C, D, E), including three types of decisions (A, making initial commitment; C, withdrawal of commitment; and E, making commitment to a new approach) and the intervening events (B and D), including systems development activities. At Centco, the project started with A, followed by the loop B->C->D->E->B, which was traversed three times. In the first pass, C represents the withdrawal of commitment to TRES software (decision 2), while E represents making commitment to in-house development (decision 3). In the second pass, switching from in-house development to the ASI package (decision 4)
At Centco, the project started with A, following which the loop B->C->D->E->B was traversed three times.

In the first pass, C represents withdrawal of commitment to TRES software (decision 2) and E represents making commitment to in-house development (decision 3).

In the second pass, switching from in-house development to ASI package (decision 4) combines withdrawal of commitment to in-house development (C) and making commitment to ASI package (E).

In the third pass, C represents withdrawal of commitment to ASI package (decision 4) and E represents making commitment to in-house modification of ASI software (decision 5).

Figure 4. A Dynamic Model of Commitment
Commitment to IS Development

combines withdrawal of commitment to in-house development (C) and making commitment to the ASI package (E). Finally, in the third pass, C represents the withdrawal of commitment to the ASI package (decision 5), while E represents making commitment to in-house modification of the ASI software (decision 6).

The initial commitment (A, specifically, decision 1) was influenced by project determinants, especially the large expected payoff, and a structural determinant, namely Blake’s political support for the project. The ensuing events (B) involved changes in top management (for example, between decisions 1 and 2, Graham and Dave replaced Blake and Brian as president of Centco and VP of Supply, respectively). Changes in top management imply reduction in social determinants (due to lack of public identification with the project and lack of responsibility for failure) as well as reduction in structural determinants (due to lack of political support). Conflict between MIS and Supply also caused reduction in social determinants. Deterioration in organizational performance reduced structural determinants, especially for decision 5, which was preceded by an unexpectedly large loss in Supply. The reduction in social and structural determinants seemed to influence the decisions to withdraw (at least temporarily) commitment to the IS development approach (C, specifically decisions 2 and 5).

The events (D) following withdrawal of commitment increased psychological determinants (for example, due to the motivation of the new manager to turn the project around and the recognition of sunk costs). They also increased project determinants (for example, due to the identification of alternative approaches for pursuing the project further and re-emphasis of the large payoff). The increase in psychological and project determinants, in turn, influenced the escalation of commitment to the project, although a different approach was used (E, specifically decisions 3 and 6).

Thus, our results suggest that project and structural determinants are crucial in obtaining initial commitment for the IS project, social and structural determinants influence whether commitment to the project is withdrawn, and psychological and project determinants influence escalation of commitment. This model differs considerably from earlier models of escalation (Ross and Staw, 1986; 1993; Staw and Ross, 1987). One major reason for the difference is that we encountered phases of withdrawal and escalation, unlike previous case studies (Keil, 1994; Ross and Staw, 1986; 1993), which found continual escalation until the eventual cancellation of the project. It is therefore not surprising that our model does not resemble the escalation prototype proposed by Staw and Ross (1987).4

One important difference between this case and the previous cases (Keil, 1994; Ross and Staw, 1986; 1993) is that this project involved a high turnover of senior management. In both Shoreham (Ross and Staw, 1993) and CONFIG (Keil, 1994), commitment declined sharply following the exit of key executives late in the project. But the Centco project encountered turnover of key people right from the early stages. We can only speculate as to what might have happened at Centco if key senior executives had not left. For example, would the project have gone through as many different approaches (TRES software → in-house development → ASI package)? Or, would the project managers have tried harder to stick to any one approach, in accordance with previous escalation cases? Future research, comparing IS projects involving low turnover of senior management with projects involving high turnover of senior management might provide valuable insights into this issue.

Further research is also needed to examine whether the differences between this case and previous cases (especially Expo 86 and Shoreham) represent general differences between IS projects and other types of projects. Such differences in escalation of commitment may reflect the very nature of IS projects. In IS projects, it is difficult to assess progress due to the intangible nature of software (Keil and Mixon, 1994). Moreover, multiple approaches are usually available for developing an information system, and new approaches may become available after some progress has been made.

4 Instead, our dynamic model, which includes both escalation and withdrawal of commitment, may be expected to resemble a combination of the escalation and withdrawal prototypes proposed by Staw and Ross (1987).
in an IS project. This may necessitate reconsideration of the original decision, and may therefore lead to cycles of withdrawal and recommitment, as evidenced at Centco.

Further research is also needed to understand the role of organization culture in escalation of commitment to IS projects. The traditions, norms, and procedures of Centco seemed to affect crucially the way they developed systems, especially the length of the projects they undertook. To take 17 years to develop a materials management system that was implemented on time in less than two years and within budget in an Alaskan Oil Company (a commercial benchmark used by one of the consultants), was no accident. For instance, it was interesting to see how many project deadlines were breached. Key project staff were allowed to take vacations in the middle of important periods, delaying the project in the process. Meetings had to be scheduled six months in advance to ensure that everyone’s diary was clear. It is compelling to claim that Centco had a climate of waste and slackness; indeed many informants characterized Centco’s culture as such but without any idea how this could be changed.

Further research also needs to examine the interrelationships among the four types of determinants. For example, political support (a structural determinant) and public identification with the project (a social determinant) were both reduced by the turnover of senior managers at Centco, as discussed earlier. Large sample studies of IS development projects can better assess the interrelationships among the different types of determinants.

Future research should also examine the effect of the systems development methodology (traditional systems development life cycle or SDLC, prototyping, etc.) on escalation of commitment. It has been pointed out earlier that SDLC discourages reconsideration of decisions (Beath, 1991). The salvage value may be greater when prototyping is used than when SDLC is used, which may make escalation less likely in prototyping situations. Future research can examine this issue more explicitly.

Future research on commitment to IS projects may benefit from controlled laboratory experiments, such as those by Keil and Mixon (1994). Case scenarios of IS projects could be provided to the subjects, and a few determinants of commitment to the project could be manipulated to study their effects on the subject’s level of commitment during various stages of the IS development process. Such experiments have been done in studies of commitment in other situations (for example, the use of a controlled experiment to study commitment in the corporate acquisition process by Haunschild, et al., 1994) and could be profitably replicated in the context of IS projects.

Future research on IS decisions should also find this paper to be useful. The case study suggests that IS decisions are influenced not only by project-related and structural factors, such as expected payoffs and IS maturity, respectively, but by social and psychological factors as well. Future research on IS decisions, especially research based on case studies, should therefore examine the role of such factors in addition to the effects of the rational/technical considerations.

Finally, this paper should also be useful to future research on commitment in general. We have presented a longitudinal study of the escalation and withdrawal of commitment, which several organizational behavior researchers have previously called for (e.g., Brockner, 1992; Staw and Ross, 1987). The results of this longitudinal study, and especially the differences between the model we have presented in Figure 4 and the models presented earlier, should be of considerable interest to these researchers. Two specific determinants require special attention. Value attached to turnarounds, which has not been empirically supported earlier, was found important in this case. Also, feasibility of alternatives, which has been supported in empirical research on IS projects (Keil and Mixon, 1994), but not in prior case studies, was also found to have a major effect on commitment.

**Limitations**

The findings of this study should be viewed with its limitations in mind. The timing of the inter-
views could not be adjusted to coincide with the actual decisions in the company, necessitating the use of interviewees' retrospective views of the case. In particular, there was an eight-year period during which no visit could be made to the company. For some decisions, we were also unable to interview one of the key decision makers.

The findings of this paper may also be limited because the paper is based on only one case study. Even though this case study was conducted longitudinally and six major IS decisions made over a 17-year period were examined, it is very difficult to generalize this study's results to other organizations. Moreover, although the study utilized an extensive amount of qualitative data, no quantitative measures of commitment or its determinants were used. Clearly, future research can build upon the findings of this study by examining additional projects and by trying to develop and use quantitative measures of the various constructs.

Implications for practice

The paper has several implications for practice. One broad implication is that IS managers should recognize that in addition to project attributes, social, psychological, and structural factors may determine whether commitment to the IS project can be sustained. Moreover, this paper provides insights into the types of tactics that may be used to maintain commitment to the project as well as the tactics that may be employed in order to ensure that commitment is not unduly escalated.

Tactics for Maintaining Commitment to an IS Project

We have examined the four diverse types of determinants of commitment — project, psychological, social, and structural — that comprise the typology proposed by Staw and Ross (1987). IS managers should find these determinants useful while building and sustaining commitment to IS projects. A number of useful tactics, listed in Table 2, emerge from the paper. These tactics for maintaining commitment are briefly discussed below.

First, the large payoff from the project needs to be emphasized continuously. The large expected payoff from the system was a major factor in all three commitment decisions (1, 3, and 6). This finding is consistent with other cases in which commitment is maintained or escalated, including MasterNet, Commercial Systems Project, and XSEL:

<table>
<thead>
<tr>
<th>Tactics for Maintaining Commitment</th>
<th>Tactics for Avoiding Escalation of Commitment*</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Emphasize the large payoffs from the project.</td>
<td>• Promote regular reconsideration of the project using techniques such as zero-based budgeting.</td>
</tr>
<tr>
<td>• Attribute the problems encountered during the project to temporary causes.</td>
<td>• Break down the system into &quot;modular deliverables.&quot;</td>
</tr>
<tr>
<td>• Prefer IS projects supported by a wider group of stakeholders over projects supported by one or two individuals.</td>
<td>• Separate responsibilities of individuals, e.g., by excluding individuals who initially approve a project from the group that evaluates its progress later.</td>
</tr>
<tr>
<td>• Try to get the other stakeholders to support the project explicitly and publicly.</td>
<td>• Reduce the severity of penalties for failure.</td>
</tr>
<tr>
<td>• Emphasize the values of persistence and turnaround.</td>
<td></td>
</tr>
</tbody>
</table>

* Some tactics suggested for avoiding escalation of commitment may, of course, counter some tactics suggested for maintaining commitment.
Difficult, innovative endeavors are more likely to be brought to a successful conclusion if the problem which they are addressing is seen as both critical and expensive. Small projects . . . (are not) . . . likely to generate much enthusiasm and interest (Mumford and MacDonald, 1989, p. 207).

Second, it is easier to maintain commitment if the problems encountered during the project can be attributed to temporary causes or some specific project features that can be avoided in the future. At Centco, the materials management systems project was continued despite numerous problems because the various problems were attributed to the specific software development approach being used (such as problems with TRES, ASI package, etc.). This enabled continuation of the project using a different approach. Another aspect of this tactic involves attributing problems to certain specific individuals. For example, Ian was held partly responsible for the problems with ASI.

Third, given that it may not be always possible to maintain continuity in the project team (as suggested above), IS development projects supported by a wider group of stakeholders should be preferred over projects supported by only one or two individuals. This helps maintain commitment in case the original champion of the project departs (Ewusi-Mensah and Przasnyski, 1991). At Centco, the project was continued even after the departure of Blake and Brian primarily because another stakeholder, Ian, was very keen on the project being continued.

Fourth, the project champions should try to sell the system’s idea to other stakeholders in the company, so that those individuals would support the project later. Moreover, an attempt should be made to get these other individuals to support the project explicitly and publicly. At Centco, Graham opposed the project during decision 1. Although Blake continued the project despite this opposition from Graham, he could not get Graham to publicly support the project. Consequently, there was no public identification of Graham with the project, and he could stop it when Blake and Brian left Centco. This may be contrasted to the case of BP Chemicals, where even after the champion’s departure the project was continued without hesitation because the champion, who was a member of the company’s Executive Committee, had successfully persuaded the Executive Committee to publicly and explicitly announce the strategic importance of the project (Jelassi, et al., 1994a; 1994b). Such explicit support made it difficult for the Executive Committee to change its decision after the champion departed.

Finally, the case demonstrates that emphasizing the values of persistence and turnaround helps maintain commitment. This was most notable during decision 6, where a primary motivation for Trevor to continue the project was his desire to turn the problematic project around. This was also a factor in decision 3 as well.

**Tactics for Avoiding Escalation of Commitment to an IS Project**

Although commitment to IS projects is generally desirable, IS projects should be terminated when they encounter insurmountable problems. However, IS projects are often continued because of strong commitment to them, even though technical, economic, or operational considerations would suggest cancellation. Jake compared the decision to terminate the TRES contract with the easier, and more common, option of continuing:

> . . . I would say it’s a very unusual thing in the MIS business to have that sort of decision. Mostly you plug on, even if the thing is late, and even if it’s over-budget and even if it looks impossible, you plug on. So this was very non-traditional, to call it quits, to make a business decision.

We can use the determinants of commitment to identify several tactics (also listed in Table 2) for avoiding escalation when the project should be terminated. First, the effects of sunk costs may be minimized through regular reconsideration of the project using such techniques as zero-based budgeting (Pyhrr, 1970). Unlike incremental budgeting, which uses the previous budget as a base, zero-based budgeting involves a complete review and justification of the entire budget amount. Thus, this approach avoids the
Commitment to IS Development

consideration of the sunk costs, which play an important role in escalation of commitment.

Another tactic for reducing escalation costs focuses on salvage value. If the entire system is developed in one attempt, as was the case at Centco, the salvage value from terminating a project may be very low. For example, when commitment to TRES software was withdrawn (decision 2), salvage value was minimal, because all Centco obtained were the requirements specification. By contrast, if the system is broken down into "modular deliverables" (Earl, 1989), it would be easier to stop a failing project because at least the previously developed modules would be available.

Third, escalation may be avoided through separation of responsibilities, for example by excluding individuals who initially approve an IS project from the group that evaluates its progress later or by keeping individuals who decide on project funding distinct from those who personally participate in development. In decision 2, withdrawal of commitment was possible since Jake was responsible for recommending whether to continue, whereas Ian and James were the individuals directly involved in IS development. In general, the periodic, and temporary, withdrawal of commitment at Centco may have been partly due to the company's policy of rotating individuals through MIS.

Finally, the tendency to persist with apparently failing IS projects can also be reduced by making the penalties for failure less severe so that individuals are not afraid of being fired or getting demoted for supporting an IS project that eventually fails. Again, the instances of withdrawal of commitment at Centco may be related to the company's policy of rewarding loyalty and its relative relaxed attitude toward failure. If they performed adequately, the staff had effectively a "job for life," and it wasn't uncommon to meet people with 40 years plus service at Centco. Both Jake and Ian were Centco people, and even though Ian's career was "red-circled," he was not fired but moved to a time-management position. James, who was never a Centco man, was always commenting critically on the antiquated management practices and had made a number of enemies in the process. However, when the TRES project was canceled even he would have been reabsorbed into Centco if he had conformed. He was eventually "let go" only because he was unwilling to cooperate and confronted the management.

This paper has examined the determinants of commitment to IS projects using longitudinal data. We were able to examine the level of commitment to an IS project as it increased and decreased over almost two decades. Future research on commitment and other social aspects of IS development would benefit considerably from similar longitudinal investigation. While research over such a long period is impossible for those earning their doctorate degrees, it is sometimes feasible to maintain links with research sites established at an early stage of one's career. As one IS project becomes the historical context for subsequent projects, efforts to conduct many research studies within the same organization over an extended period would lead to improved recognition of patterns of events across projects and thereby contribute to our understanding of the social aspects of IS development.

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References


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Sabherwal, R. and King, W.R. "Decision Processes for Developing Strategic Applications of Information Systems: A
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### Appendix A

#### Stakeholders in the IS Development Process

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Roles</th>
<th>Interviewed in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ian</td>
<td>1st Project Leader, Supply --&gt; Line Manager, Supply</td>
<td>1986, 1990</td>
</tr>
<tr>
<td>James</td>
<td>1st Project Leader, MIS</td>
<td>1978</td>
</tr>
<tr>
<td>Derek</td>
<td>Consultant before TRES Project</td>
<td></td>
</tr>
<tr>
<td>Brian</td>
<td>1st VP Supply</td>
<td></td>
</tr>
<tr>
<td>Graham</td>
<td>VP Operations --&gt; 2nd President Centco --&gt; Chair of Board</td>
<td>1978</td>
</tr>
<tr>
<td>Blake</td>
<td>1st President Centco (TRES Project)</td>
<td></td>
</tr>
<tr>
<td>Dave</td>
<td>2nd VP Supply</td>
<td></td>
</tr>
<tr>
<td>Will</td>
<td>Materials Management Director, Supply</td>
<td></td>
</tr>
<tr>
<td>Dan</td>
<td>2nd Project Leader, MIS</td>
<td></td>
</tr>
<tr>
<td>Trevor</td>
<td>2nd Project Leader, Supply</td>
<td>1990</td>
</tr>
<tr>
<td>Richard</td>
<td>3rd VP Supply</td>
<td>1992</td>
</tr>
<tr>
<td>Bob</td>
<td>4th VP Supply</td>
<td></td>
</tr>
<tr>
<td>Colin</td>
<td>Ian's Assistant</td>
<td>1986</td>
</tr>
<tr>
<td>Tom</td>
<td>ASI Representative</td>
<td>1990</td>
</tr>
<tr>
<td>Howard</td>
<td>Materials Manager</td>
<td>1990</td>
</tr>
<tr>
<td>Drake</td>
<td>Director, Materials Management</td>
<td>1990</td>
</tr>
<tr>
<td>Carl</td>
<td>Accounting Representative</td>
<td>1990</td>
</tr>
<tr>
<td>Paul</td>
<td>System Solution Associate</td>
<td>1994</td>
</tr>
</tbody>
</table>
# Appendix B

## A Glossary of Key Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
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</thead>
<tbody>
<tr>
<td>Centco</td>
<td>Large, regulated utility in the telecommunications industry. A subsidiary of Gen Comm.</td>
</tr>
<tr>
<td>MIS</td>
<td>Management Information Services. A headquarters function.</td>
</tr>
<tr>
<td>Supply</td>
<td>Division of Centco responsible for purchasing, inventory control, warehousing and distribution.</td>
</tr>
<tr>
<td>TRES, ASI</td>
<td>Two US-based software houses that specialized in materials management packages.</td>
</tr>
<tr>
<td>McDonnell-Douglas</td>
<td>A software house that was an off-shoot of the aircraft company of the same name.</td>
</tr>
<tr>
<td>MDS</td>
<td>Materials Distribution System. An in-house development by Ian and others after the failure of the TRES project. Later, renamed as MMIS-1.</td>
</tr>
<tr>
<td>MMS2</td>
<td>Centco's version of MMS2, also through TRES.</td>
</tr>
<tr>
<td>MMS3</td>
<td>Materials Management package being developed at Tampa Electric by TRES.</td>
</tr>
<tr>
<td>MMIS-2</td>
<td>ASI's package being modified to meet Centco's needs.</td>
</tr>
<tr>
<td>CICS, IMS</td>
<td>Two IBM database management systems. Centco's normal system was IMS.</td>
</tr>
</tbody>
</table>