A Social Process Model of User-Analyst Relationships

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Abstract

The development of an information system is a social process involving users and systems analysts, carried out in an organizational setting. This paper presents a process model of user-analyst relationships to guide research into the social dynamics of system development. The model identifies antecedent conditions, encounters, episodes, and outcomes over the course of a project. The model asserts that established relationships between analysts and users will persist unless critical encounters change the trajectory of the project. By conceiving of systems development as a series of encounters and episodes, researchers may identify critical encounters and study the connections between preceding events and their consequences. Practitioners may use the model to diagnose problems and to enact critical encounters that move a project in a different direction. The descriptive and predictive capacities of the process model are illustrated with two case studies.

Keywords: Information systems development, user participation, social process models

ACM Category: K.6.1

Introduction

The development of information systems is an important organizational process that is generally assumed to affect the quality of resultant systems. Traditionally, recommendations for effective information system development (ISD) have addressed the need for precision and technical accuracy, using a number of structured methods and procedures carried out under the supervision of professional data processing specialists (Amadio, 1989; Colter, 1984; DeMarco, 1978; Eliason, 1987). These structured techniques still form the core of practical knowledge in ISD, despite the fact that most ISD methodologies formally neglect the social dynamics of development work.

Recent research has focused on ISD as a social process, seeking to understand how the characteristics of that process affect its outcomes. Outcomes are not restricted to the technical validity of systems but also include their behavioral and organizational validity (Markus and Robey, 1983; Schultz and Slevin, 1975). Recommendations for user involvement, top management support, prototyping, end-user development, and so on have been offered to improve the prospects of developing systems that are both technically and organizationally valid (Bjørn-Andersen and Hedberg, 1977; Lucas, 1975; Robey and Farrow, 1982; Swanson, 1988). These prescriptions are typically intended to supplement or replace standard structured methodologies by addressing the social relationships between users and systems analysts. They focus on the affective and behavioral responses of users, including their possible rejection of technically valid systems.

The consequences of ineffective ISDs have proved costly to organizations seeking to improve their competitive positions. Poor development practices may result in inferior systems, which are sometimes institutionalized despite their low quality. In other cases, systems are developed that require redesign at great expense. Gladden (1982) reports on the scale of economic consequences that follows from ineffective systems. He claims that a majority of projects results in systems that are neither completed nor accepted if completed.

This paper proposes a model for research on the ISD process. The model is constructed using episodes and encounters involving users and analysts. Development is conceived as a sequence of episodes, punctuated by encounters, that follows patterns established in previous development work. These established patterns of interaction may also change as a result of specific encounters, altering the relationship between users and analysts. The research model thus portrays ISD as a dynamic social process that is simultaneously constrained by past experience and capable of constructing new patterns of interaction.[1]

Process models complement *factor* models, which are more commonly used in research on ISD. While both types of models are useful to researchers interested in ISD, process models are used less and perhaps not understood as well as factor models. To clarify the difference in our approach, differences in form between factor and process models are briefly described. Next the model of user-analyst relationships is presented, then illustrated with two case studies. The concluding remarks address both the needs of future research and the practical implications for managing the system development process.

Research models for information systems development

Factor Research Models

The factor approach to research on ISD identifies the potential predictors of successful system development and tests empirical associations between predictors and outcomes. Both predictors and outcomes are conceived as variables that can be measured along some type of scale. For example, the degree of user involvement, the degree of top management support, and the perceptions and attitudes of various participants are commonly used predictors in factor research (Swanson, 1988). The degree of a system's success, or some other dependent variable, can be associated with the levels of the independent variables using a statistical technique such as multiple regression.

Factor research models are structured to conceive of predictors as factors that vary in degree or intensity. The basic assumption is that variation in these predictor (or independent) variables accounts for variation in outcome (or dependent) variables. This strategy of "explaining variance," however, often neglects to "explain" exactly how or why the predictors and outcomes are related. That is, it does not provide evidence of the phenomena (events, actions, and so on) that link the independent and dependent variables. Even where causal modeling is used (e.g., Lucas, et al., 1990; Robey, et al., 1989), causal connections are *assumed* to exist rather than are demonstrated empirically. Factor models, therefore, do not explain how outcomes occur; they associate a level of outcome with a level of predictor, inferring the causal linkages between the two.

A frequent conclusion from factor research is that relatively little variance in system success is accounted for by the factors commonly thought to predict those outcomes (e.g., Ives and Olson, 1984; Tait and Vessey, 1988). Further, factor research provides only partial guidance to the practitioner who must assume responsibility for attaining positive outcomes. The attainment of system success can be likened to a puzzle wherein the pieces can be identified but where the implementor is left to his or her own resources to put the puzzle together (Swanson, 1988). While some technical improvements in research methodology could elevate the percentage of explained variance in factor studies, solving the implementation puzzle can also be informed by the use of process models.

Process Research Models

A complementary alternative to the factor approach is the process approach, which focuses on the dynamics of social change, explaining how and why the results of development efforts are achieved (Mohr, 1982; Van de Ven and Huber, 1990). Process models provide the story that explains the degree of association between predictors and outcomes. Thus, ISD is conceived as a sequence of events that occurs over time. For example, the factors of user involvement or top management support assume dynamic properties when conceived as processes. They can become ingredients in a realistic political drama pitting analysts versus users or top management against lower levels. A positive feature of process

[1] The idea that processes are both constrained by structured patterns and capable of constituting new patterns is fundamental to the theory of structuration offered by Giddens (1979). Elaboration of structuration theory is beyond the scope of this paper. For applications of structuration to information systems research, see Orlikowski (1992), Orlikowski and Robey (1991), and Walsham and Hahn (1990).

models is their faithful account of actual experiences, although they can become cumbersome and analytically complex (Kling, 1987; Markus and Robey, 1988). However, process models do adopt a specific form and should not be discounted as unscientific or less rigorous than factor models.

Process models focus on sequences of events over time in order to explain how and why particular outcomes are reached (Mohr, 1982). As such they differ from "dispositional" models that focus on the capacity or potential for those events to occur. In the study of power, for example, a process model examines the *exercise* of power, whereas a factor model examines the *conditions* that give rise to power prior to its actual use (Cobb, 1984; Wrong, 1968). Process models consider the antecedents of action, recognizing the importance of one's basis of power, but they are more interested in the dynamics of exercising power (e.g., Markus and (Bjørn-Andersen, 1987). Factor models are dispositional because they treat antecedent predictors as conditions with the potential to affect outcomes. Process models focus specifically on sequences of events within the context described by the antecedents.

Factor and process models: Complementary but separate

Factor and process models can be complementary approaches to research. Ideally, factor research should establish strong empirical connections between antecedent conditions and later outcomes, while process research should examine the streams of activities that explain these connections. Figure 1 shows how the two models might work together. In the factor model the box representing the process is inferred, whereas in the process model the sequence of events inside the box is directly examined.

Applied to ISD, factor and process models together could provide a more comprehensive explanation than using either model separately. For example, factor research might establish a strong association between two predictors (resource constraints and top management support) and the degree of success achieved by projects. Working from this empirical association, process research could study the actions by which top managers actually support ISD projects despite resource constraints. Resultant pressures to succeed without adequate resources may cause systems to fail (i.e., for lack of full testing), or projects may succeed because users infuse their own resources into development projects. By using a combined strategy involving the study of factors and processes, the ISD researcher would be in a better position to explain the role of managerial support and resource constraints in project success.

Stated somewhat more cryptically, process models adopt the strategy of explaining what can be predicted, while factor models predict what cannot always be explained.

Despite the complementarity between factor and process models, they differ in form and should *not* be combined into a single model. Mohr (1982) issues three warnings to those tempted to integrate the two types of models. First, a process model should not be encumbered by adding variables that are thought to make events more or less likely. It would be wrong, for example, to conceive of the antecedent conditions of top management support as a predictor *variable* within a *process* model. Rather, top management support should be conceived as social action that helps to produce the outcome of interest. In this example, top management support should be conceived as a sequence of events rather than as a variable.

Second, a process model should not conceive of outcomes as dependent variables. Outcomes are the "final cause" of preceding events, the result of a developmental sequence. This "pull-type" causality differs from the "push-type" causality implicit in factor models, where the levels of independent variables cause the levels of dependent variables (Mohr, 1982). In process models, the outcome implies the preceding events, which is a fundamentally different casual argument than the ones offered by factor models.

Third, factor and process models may be "mutually informative," but their results may not be easy to combine (Mohr, 1982). In ISD, for example, findings about the *degree* of top management support may not be directly integrated with findings about the *character and seqencing* of that support. Taken separately, we may learn different things about top management support from factor and process models, but it may be hard to combine that learning into a coherent theoretical statement.

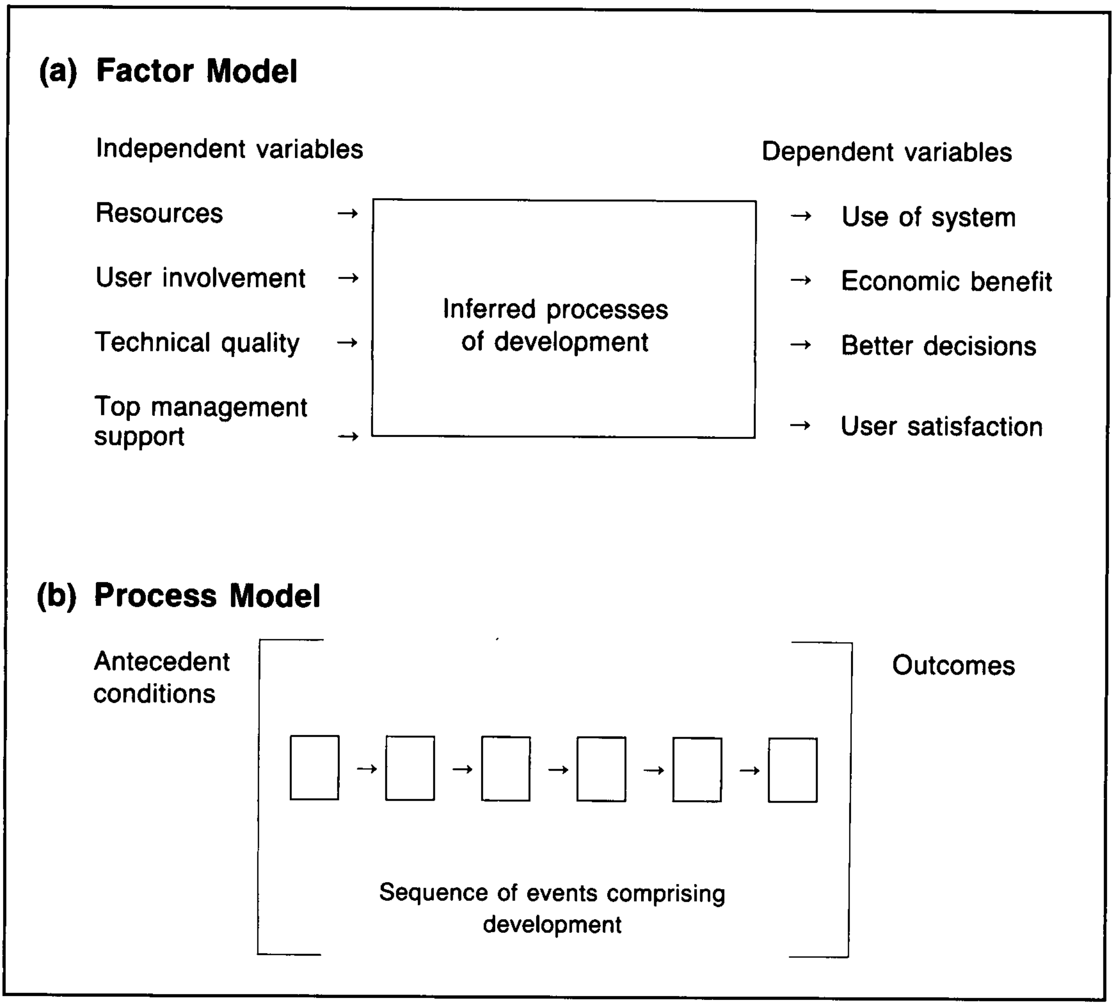

Figure 1. Factor and Process Models of Systems Development

A Process Model of User-Analyst Relationships

With these cautions in mind, this section specifies a process model of user-analyst relationships. Because process models are not common in the literature on information systems, our model of user-analyst relattionships is presented with some precision about its boundary conditions, form, and constructs.

Boundary conditions

To place broad boundary conditions on the applicability of the model, events are assumed to occur in an organization characterized by a division of labor between systems analysts and users. For convenience, all systems personnel are referred to as analysts even though many job specializations may fall within the realm of systems development. This assumption of organizational role differentiation does not limit the application of our model to organizations with large centralized data processing departments and traditional system development practices. Newer arrangements, involving end-user development of computing applications or information centers, are also accommodated within the model. For example, end-user computing still involves relationships between analysts and users, but those relationships differ from relationships found in traditional development. Our interest lies in explaining the origin and consequences of such arrangements, and we argue that the history of the relationship is important to consider.

Form of the model

The general form of the model represents ISD as a sequence of events, classified as either encounters or episodes, that occur across time. Events are the basic theoretical constructs of the model and are measured by observations of incidents. It is important to maintain the distinction between incidents that actually occur and events that represent theoretical entities (Van de Ven and Poole, 1990).

Encounters and Episodes

As indicated, events in the model are of two types: encounters and episodes. In common usage, an episode refers to a set of events that stand apart from others, thus signifying the end of one sequence of activities and the beginning of another.[2] In our model, encounters mark the beginnings and ends of episodes. That is, episodes are separated by encounters between analysts and users. The form of the model represents the more general punctuated equilibrium model, which treats change as "an alternation between long periods when stable infrastructures permit only incremental adaptations, and brief periods of revolutionary upheaval" (Gersick, 1991, p. 10). Thus ISD progresses through time as a series of longer episodes, punctuated by brief encounters. More specifically, the model focuses on the developing relationship between analysts and users over the course of an ISD project.[3]

Consistent with punctuated equilibrium theory, our model predicts that the relationship between users and analysts will persist both within and across episodes. When change does occur, it will be initiated in critical encounters involving users and analysts. An encounter can be judged as critical either by the researchers or, in interpretive studies, by the actors in the situation themselves. Clearly, every interaction (meeting, phone call, etc.) cannot be considered of equal theoretical importance, so (like all theories) the model is a simplification of reality and treats different events in different ways.

The model describes the conditions for both persistence and change in social systems, although precise predictions are beyond the scope of this and most other process models (Mohr, 1982). The greatest opportunity to change occurs during the critical encounters. In the episodes between encounters user-analyst relations are less likely to change.

Theoretical Support

Different kinds of theoretical support can be offered for the prediction of stability. One concept is behavioral inertia, which applies to theories of individual organisms (Mohr, 1987) At the organizational level of analysis, where our model applies, are concepts of institutional analysis, which support the persistence of established behavioral patterns between social roles (Scott, 1987). In addition, structuration theory (Giddens, 1979) posits that actors draw from established social relationships and reconstitute those relationships through their actions. Thus, established social patterns are predicted to persist in the absence of social encounters that challenge the status quo.

Because the model includes the prospect of change in these established patterns, the mechanisms for achieving change must also be prescribed. At the individual level, readaptation is defined as a process through which organisms overcome behavioral inertia (Mohr, 1987). However, the prediction of readaptation is difficult and may be beyond the reach of process theory. "The readaptation decision deals by definition with complex and intricately balanced forces that would not seem at all capable of methodical enumeration, organization, and weighting" (Mohr, 1987, p. 19).

While change may not require special events (March, 1981; Mohr, 1987) we specify that an encounter between analysts and users is the most likely time in a process when such change will occur. Encounters provide the opportunity to ad-

[2] In Greek tragedy, episodes occur between choric songs. All similarities between Greek tragedy and user-analyst relationships may not be completely accidental.

[3] Gersick's (1988; 1989) theory of transitions in task groups is another specific model of the general punctuated equilibrium form. Because user-analyst relationships do not occur exclusively in task groups, we have not depended on Gersick's specific propositions regarding midpoint transitions.

dress prior performance, relate unsatisfactory experiences of either party, and anticipate future needs. Encounters are thus necessary, but not sufficient, events for changing the relationship between users and analysts. The role of encounters within the model is consistent with structuration theory insofar as human interaction is conceived as the vehicle for actors to alter social structures. Encounters provide actors this opportunity, but it is still problematic to predict when and how actors will use encounters to modify structure (Orlikowski and Robey, 1991).

Types of Episodes

To simplify the model, we consider episodes to be characterized by one of four types of relationships: joint system development, analyst-led development, user-led development, and equivocation. Each of the first three represents an equilibrium where the parties have agreed on project leadership responsibilities. This important dimension of a social relationship (leadership) potentially influences many of the methods used in system design work. Thus, where ISD has been led by analysts, it is likely that traditional structured methods have been employed by analysts. In the absence of encounters challenging the use of such methods, we would expect those patterns to continue, reinforcing and reproducing the relationship. By contrast, user-led projects might use more "user-friendly," higher-level development tools that enable users to specify their own needs. Joint development might be characterized by prototyping where users respond to analyst-created proposals with the idea that modifications will be frequent and easy to execute. Moving away from any of these patterns is possible but would require a critical encounter between the two parties.

The fourth type of episode, equivocation, occurs when either party adopts an uncommitted, "wait-and-see" stance. Equivocation postpones endorsement of an established relationship and thus implies a much less certain future for a project. During episodes of equivocation, both analysts and users have opportunities to influence the course of events that follow.

Mapping Events

Using the model becomes a more useful research tool when events are mapped according to the conventions seen in Figure 2. As the figure shows, encounters are placed in the area describing the preceding episode. Encounters themselves are not described as acceptance, equivocation, or rejection, but they occur between episodes that are classified that way. If an encounter in the acceptance area is followed by an equivocation episode, that episode is shown descending from the acceptance area of the map into the equivocation area. Likewise, if an en-

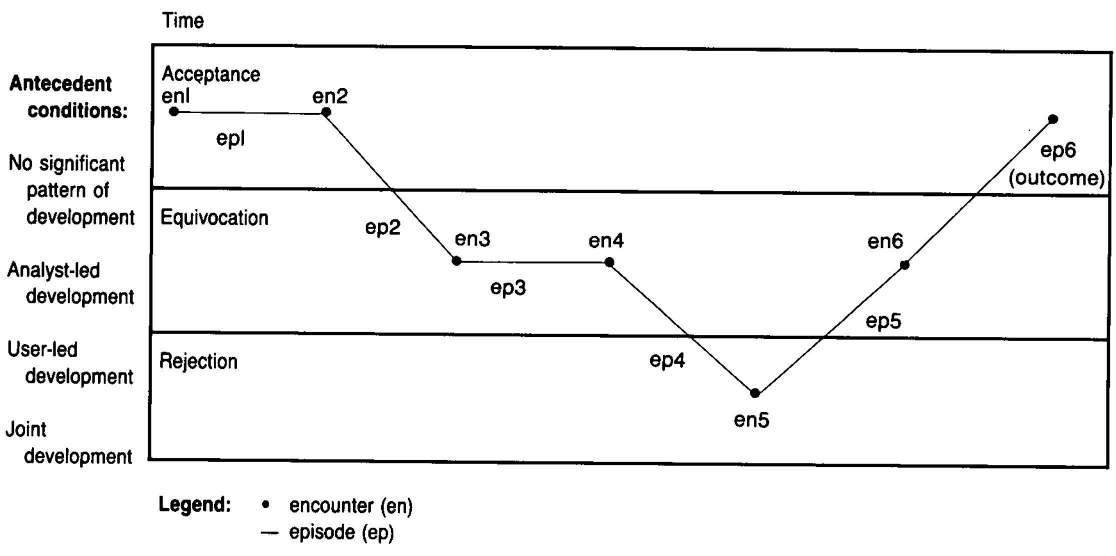

Figure 2. Mapping Events in a Social Process: A Hypothetical Example

counter in the rejection area is followed by an equivocation episode, that episode is shown ascending from the rejection area into the equivocation area. Figure 2 shows hypothetical sequences of events to illustrate the mapping convention; figures used later in this paper illustrate mapping for particular cases whose events are described and numbered.

Antecedent conditions

The antecedent condition is treated as the relationship between users and analysts occurring before a project is begun. It is the episode in progress as the parties embark on a new project being investigated by the researcher. Antecedent conditions are essentially the outcomes of a whole history of prior projects, and they will usually affect subsequent events. In the rare case where there is no significant historical relationship between users and analysts, each party is likely to appropriate practices from related contexts and propose that they be used in the current project. For instance, proposed relationships may be drawn from occupational practices outside a specific organization or from internal experiences with similar projects, such as new product development. Typical examples would be the merging of firms or the creation of an entirely new IS department.

In Figure 2 four varieties of antecedent conditions are shown. The relationship between users and analysts may be characterized by joint development, analyst-led development, user-led development, or no significant pattern of development. Clearly, these conditions can be considered antecedent for a current project, but they are also outcomes of prior projects. The researcher's window of observation on a sequence of events can slide forward or backward in order to capture the processes operating for any single project. The choice of project obviously affects the determination of what episodes can be considered antecedent.

Initial encounter

The model specifies that the initial encounter is an opportunity for new claims to be proposed. While the particular form of this and subsequent encounters will vary, encounters are defined as relatively brief events that punctuate a process and offer opportunities for an established equilibrium to change. Encounters, as social phenomena, require the two parties to interact, although this interaction does not need to be face-to-face. Encounters can occur in formal meetings, or they can be evidenced by written memoranda, or any other type of specific interaction. Episodes, by contrast, are longer time periods wherein the pattern set within an earlier encounter is played out. Episodes can be very long or relatively short, depending on the frequency of encounters.

Response and subsequent episodes

Claims made in the initial encounter may be met by one of three general responses: acceptance of the claim, rejection of the claim, and equivocation. *Acceptance* acknowledges the legitimacy of the claim and grants the right to proceed in the proposed fashion. Normally, acceptance is followed by an episode in which conflict is absent. If a project is completed successfully, this pattern has a strong chance of becoming established as the standard approach to ISD in a particular setting. If unsuccessful, alternative methods are likely to be proposed in subsequent encounters.

Rejection of claims in the initial encounter is most likely to engage the parties in an episode of conflict, where opposing claims are formulated and proposed in subsequent encounters, where they too would probably be rejected. Rejection episodes often culminate in a win/lose confrontation, where one party overcomes the other and gains control of the project. If the users win a user-dominated process should prevail; if the analysts win, an analyst-dominated process should prevail. Accounts in the literature of conflict, resistance, threats, coercion, appeals to higher authority, withholding information, and distorted communication are evidence of rejection (see, for example, Franz and Robey, 1984; Markus, 1984; Newman and Noble, 1990).

The third type of response to the initial encounter is *equivocation,* which neither accepts nor rejects the initial claim. Equivocation can eventually lead to a different outcome ranging from analyst domination to joint development. Each encounter that follows an equivocal episode may prove critical to the outcome of the project. Episodes of equivocation are most susceptible to intervention by interested parties outside of the user-analyst relationship. For example, top management may intervene by supporting users who want to assume project leadership (Franz and Robey, 1984). Indirect users may also take advantage of the conflict to make both parties look bad, possibly gaining a victory for themselves. Vendors and consultants may propose packaged solutions and attempt to take over much of the development process (Orlikowski, 1991; Robey and Markus, 1984). The uncertainty of equivocation presents the opportunity for such interventions to influence the ISD process.

Predicting the timing of encounters is difficult. Traditional, analyst-led approaches are punctuated by formal reviews, walk throughs, and handoffs. User-led and joint development offer fewer textbook prescriptions for types of interaction, possibly suggesting more frequent encounters. Joint development, in particular, seems to imply frequent meetings between users and analysts. However, parties may wish to avoid encounters if they suspect a challenge to the status quo, so timing is never sure. Although the model clearly involves time as an essential ingredient, it does not offer explicit predictions about the duration of episodes.

As the ISD process proceeds, users and analysts move through a series of encounters and episodes. Each episode ends with an encounter in which new claims for governing the ISD process can be proposed. The aftermath of this encounter is a new episode in which the claim is either accepted or rejected, or where equivocation takes place. When the parties have delivered a completed system, or given up hopes of doing so, the final episode has concluded.

Outcome

An essential ingredient of a process model is specification of outcomes, conceptualized as states rather than levels on variables. In our model, three outcomes of interest are defined the same as in earlier episodes; that is, an ISD project is completed under a user-led, an analyst-led, or a joint development relationship. A fourth outcome, equivocation, is also possible if the parties have not resolved the issue of project leadership. With equivocation, future projects are likely to be marked by uncertainty, similar to the initiation of a project without an established pattern.

It is tempting to specify the success or failure of the resultant information system itself as an outcome of the development process. As mentioned in the introduction, this is certainly a concern, but we believe system success is subject to too many other influences to include it as an outcome in our model. This is not meant to sidestep the important issue of system success. However, including system success (or even project success) as an outcome of the user-analyst relationship would be too speculative at present.

In summary, the model is concerned with explaining how the relationship between users and analysts is maintained and altered over the course of an ISD project occurring within an organization. Starting with antecedent conditions, it suggests that the sequence of encounters and episodes be examined. It predicts the persistence of established patterns, but it identifies encounters as points in the process when change can occur. The model is specific about the role of antecedent conditions, the types of events, and the nature of outcomes. The model adopts the form of a process model insofar as it uses a sequence of events as an explanatory device rather than sets of independent and dependent variables. As such, the process model offers a different look at the phenomenon of ISD.

Empirical Illustration of the Process Model: Two Cases

Case studies are useful ways to illustrate the use of process research models, although more quantitative alternatives such as simulation (Guetzkow, et al, 1972) and sequence analysis (Abbott, 1990; Van de Ven and Poole, 1990) are available. A process model can provide an organizing theoretical structure for case study research, enabling case studies to support the objectives of normal science, including prediction and generalization (Benbasat, et al, 1987; Lee, 1989; Tsoukas, 1989). Cases are also useful for generating theories for research areas where little theory has been developed (Eisenhardt, 1989).

The purpose of this section is to illustrate the constructs of the process model by referring to two case studies. It is important to ground the model in empirical reality, and case studies have been useful to us in refining the concepts used, particulary the distinctions between episodes and encounters. It should be emphasized, however, that the use of cases in this manner does not constitute a test of the model. That remains for future research. The format for description follows the format of the model.

The first case illustrates a user-dominated design process at a large U.S. university, designated as Middleton State University (MSU). This case was first presented by Newman and Noble (1990). The second case is part of an ongoing longitudinal study of ISD at an insurance company, designated in this article as Hartfield Insurance Corporation. While events have been designated as encounters and episodes, there is a degree of simplification and interpretation. For example, during periods we called *episodes,* there were undoubtedly contacts between analysts and users. However, those contacts labeled *encounters* were judged to be more critical to the history of the project.

Middleton State University

Antecedent Conditions

Figure 3 portrays the ISD process for Middleton State University (MSU). In the early 1980s, the graduate and undergraduate admissions offices of the university each had its own procedures for processing student applications. The undergraduate office would collect and process data specific to its own needs, as would the graduate office. These systems were largely irreconcilable, but because contact between offices was infrequent, the systems could comfortably co-exist. Up to this point, the computer center had used traditional, systems-led design techniques, and their response to requests was considered slow by most user groups. Thus, the existing relationship betweeen the users and analysts in this case was based on analyst-led design.

Encounter 1: Proposal for an Integrated System

Enrollment pressures in the early 1980s led to a decision to coordinate admissions and recruitment activities for the whole university. MSU officials proposed the idea of a comprehensive student information system (SIS) that would encompass admissions, recruitment, student records, and financial information using common biographical information. At about the same time, the financial aid office was implementing a computer package developed by Alpha, an outside software house. The Alpha system had solved the financial aid office's chronic delay problems at the beginning of each academic year, so Alpha was approached to assist in the development and marketing of the proposed SIS. Simultaneously,

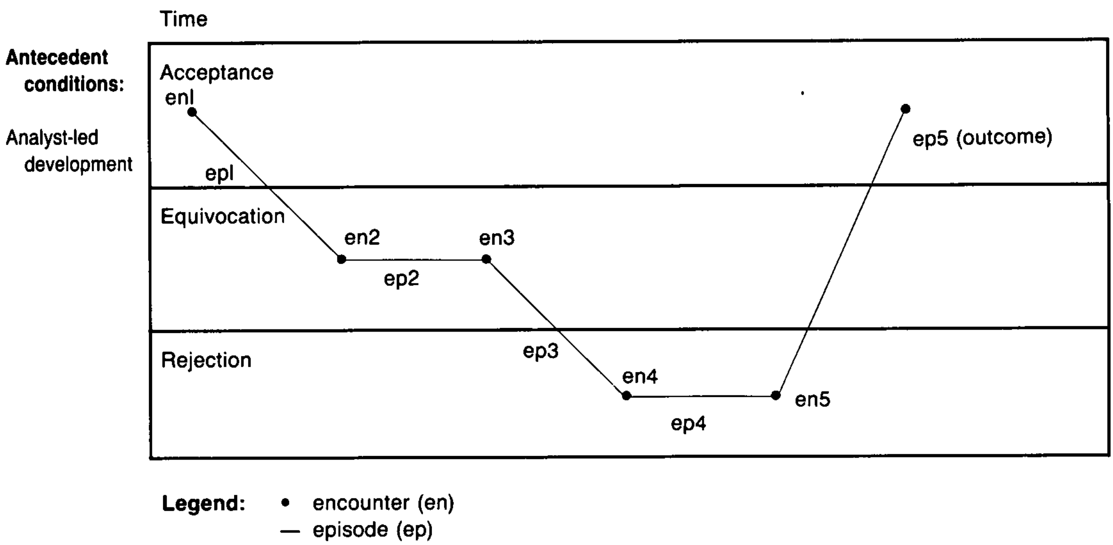

Figure 3. Process Map for Middleton State University

the director of undergraduate admissions retired and was replaced by a younger, computer-literate director.

Episode 1: Equivocation

The first episode represents a long period of equivocation on the part of the users, who were unsure about how to react to the claim for traditional, analyst-led development. About two years were spent gathering requirements from the various offices to be affected by the system. The admissions system was to be developed for the largest office, undergraduate admissions. The analyst-led approach was assumed for the SIS project, but the computer center staff left unfavorable impressions after the first encounter. The user from the undergraduate office described the relationships as follows:

> We felt that they [systems staff] didn't have our best interest in mind; they had *their* best interests in mind. We literally didn't believe a word they said in the beginning. We really did start out in an adversarial kind of way. . . . We had quite a time of it.

Nonetheless, the users did cooperate with the analyst at this stage while maintaining a healthy skepticism.

Encounter 2: Sign-Off

Episode 1 led to the successful gathering of information requirments, and the users signed off on the specifications. The computer center analysts then proceeded to build the system and turn it over to the users.

Episode 2: Equivocation

The result of the sign-off was again equivocation on the part of the users. The analysts felt that the sign-off document authorized them to proceed to the design phase, which was conducted with minimal user involvement. The first hint of problems surfaced when the users in the undergraduate office were shown the system at the end of Episode 2.

Encounter 3: Test System Handed Over to Users

When the users first saw the test system they considered it unworkable because it was complex and had a slow response time. Although they had signed off on the system requirements, the users were dismayed to find that the initial system produced by the computer center involved the use of multiple screens to process students. One user observed:

> So in order for us to enter data, for, say, 15,000 applications a year we had to accept eight-to-10 screens for each applicant. So we rebelled against that. The reaction of the systems people was 'Oh, it's going to go really quickly once you get used to it, but you just are nervous about it.' Well, you don't know how much of that is true and how much isn't because you've had no experience.

Moreover, the times for screen changes were unacceptably slow:

> We would sit for over 60 seconds and wait for the screen to change, and we were hysterical. This was before the data-entry screen, so all we knew was [to] multiply this by eight screens by 2,000 applications and we would be dead in the water. There would be no way this would work.

From the perspective of the computer center, the standard of one file to one screen had led to the multi-screen design and, as far as they were concerned, this rule was non-negotiable.

Episode 3: Rejection

The users rejected the test system and called for a custom-designed single screen for undergraduate admissions. From their point of view, the system had to be simple and efficient to deal with the large number of applicants, especially at peak times when they relied on inexperienced, temporary data-entry staff. This episode was one of heightened hostilities between the parties, and it appeared that one party would have to prevail at the expense of the other.

Encounter 4: Attempts to Persuade, Then Coerce Users

The project leader from the computer center attempted to convince the undergraduate office that the system would eventually be acceptable as presented. But the undergraduate office used a stopwatch to time screen changes in order to prove that the issue was not a fantasy. The principal user commented:

> Oh boy, were we ever complaining. We went through a very intricate timing procedure—I think I still have the stopwatch here somewhere—where everybody, both at the computer center and at our office where we had several people, every hour on the hour would get on there and go through this choreographed system of screen changing with a stopwatch to see how long it took.

The encounter escalated into the use of coercive tactics by the computer center staff. As the project leader described:

> And the fact is that in undergraduate admissions one of the people there said, "we don't really want it. We've talked it over and we don't really want this new system." And here we've been working two years on this, it's just about ready, and you don't want it. And basically the computer center says, "well, look, you have no choice. The old system will be turned off, and [SIS] will be here to stay, and you're not going to have that choice."

Episode 4: Rejection

The state of conflict between the users and the computer center continued until the new director of undergraduate admissions intervened decisively.

Encounter 5: Director Appeals to Authority and Prevails

The situation did not work out as the computer center had hoped. The users continued to reject the new system, pressing instead for a single-screen design. The new director of admissions made a successful appeal to the vice president to back her demands. The undergraduate director then issued an ultimatum to the computer center and they capitulated. The situation of threat and counterthreat ended with the undergraduate office "winning the battle," as a member of the computer center expressed it.

Outcome: User-Dominant Pattern Established

Once the computer center staff capitulated, they designed a single-screen system to the great satisfaction of the undergraduate office. The wishes of the undergraduate office were finally heeded, and the admissions office subsequently controlled the ISD process.

Hartfield Insurance Corporation

Antecedent Conditions

Figure 4 illustrates the process model in diagram form for Hartfield Insurance Corp., a very large insurance company located in New England. Hartfield was attempting to change its claims processing system from a manual system supported by batch processing at its head office to a distributed system allowing claims processing in the field offices using networked personal computers. ISD at Hartfield was historically traditional and analyst-led, and directed from the home office. This approach had low credibility in the field offices where the claims were actually processed. One manager of this user group commented:

> One of the problems you've got to be careful with is that the person out on the line [field office staff] gets this new system that was designed by some guru in the home office that doesn't know a thing about them. Leave them a system, and it doesn't work. There's a great tendency out there, a credibility problem concerning these kinds of things.

Each field office was a profit center and was relatively autonomous from the head office. Claims representatives were notorious about guarding data, and they sought to preserve the decentralized structure.

Encounter 1: Proposal to Develop Claims System Jointly

The initial encounter involved a proposal to develop the claims system jointly. Both users and home-office managers recognized that the highly lucrative claims project could only succeed if both parties cooperated fully. The users were asked to lead the project using an advisory group of six people recruited from the field offices. In addition, a new category of designer, called business analyst, was created to interface between the programmers and the users. These designers were often ex-claims staff with some systems experience.

Two major advantages of the claims system were identified in a feasibility study—a rapid financial payback to the project and an improvement in

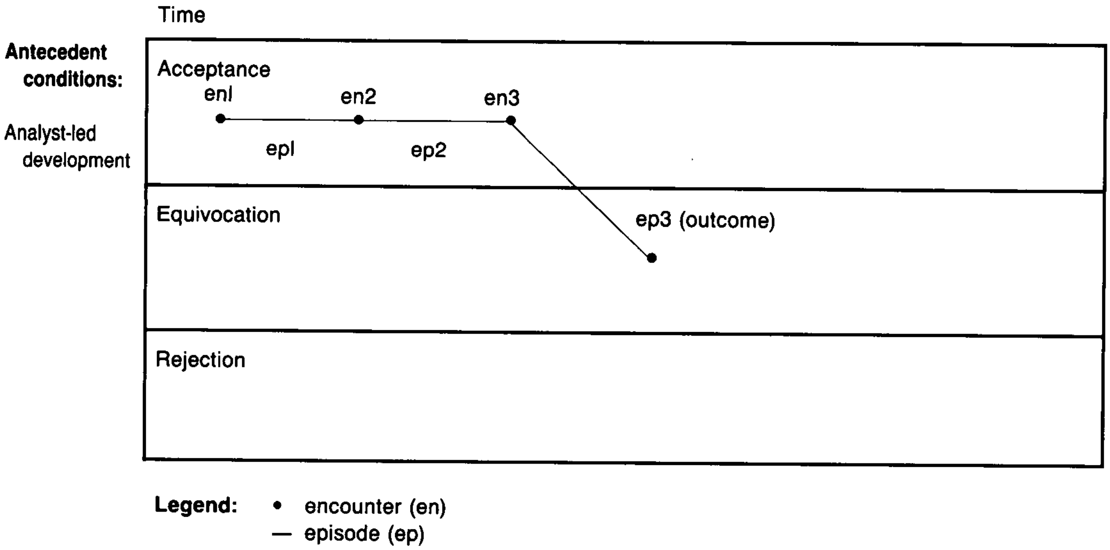

Figure 4. Process Map for Hartfield Insurance Corp.

service to the customer because of more timely and accurate data. On the financial side, the total cost of the hardware, development of software, office furniture, and so on was estimated at $16 million. This was to be balanced by savings in personnel estimated at $10 million per year. Hartfield planned to achieve this through attrition and through redeployment of some staff. The new claims system was specifically designed to support the existing decentralized structure and to disperse any fears that field office data would become entirely visible to the head office.

Episode 1: Acceptance

The proposal to develop the claims system jointly was accepted enthusiastically. In addition to the regular analysis and design activities, which included a substantial input from users, the parties decided to create a new physical office environment along with the system. A study was made, alternative arrangements were analyzed, and a model office was designed for the home office. The model was to contain a prototype system and the preferred new office furniture. Staff from the field offices would be trained using a simulated office environment. Additionally, a new position of claim system technician was created to manage this training and to handle local questions. Screens for the new system were designed to be very easy to use, with a judicious use of color. In order to widely promote and garner support for the new system, a project logo was designed and printed on hats and pens that were distributed to staff.

Encounter 2: Obtaining Two Field Sites

The Hartfield and Bridgehead offices were selected as pilot test sites for the claims system because they were regarded as progressive and were located within 80 miles of the home office.

Episode 2: Acceptance

Staff at the two field sites responded favorably to their selection for the pilot test. After gaining the approval of the field office managers, the claims staff from those offices were then trained at the model in the home office. When asked what kind of impression people had of the new system, one technician replied:

> They're very excited. They have lots of questions because they haven't seen the actual system. A lot of then have been able to come here and see it [model office] and relayed what they've seen to others, but there are a couple who have no idea what it looks like and they've really been curious. Basically, I'd say 99 percent of the people feel very positive about the system.

Even users with reservations about the new system were won over by the joint development approach. One branch manager told of a user who exhibited an extreme fear of even touching the keyboard of his personal computer. After a brief, hands-on orientation to the system, he reportedly left happy.

Encounter 3: Pilot Test in Two Field Sites

The claims system was pilot-tested at Hartfield and Bridgehead in the summer of 1986. Later that year two additional field offices were to be included in the test, with the remaining 20 national offices to be converted in 1987.

Episode 3: Acceptance

The outcome of the pilot test in Hartfield and Bridgehead was favorable. By training the claims staff, fears were allayed about the system, and the model office proved successful in simulating the claims environment. The initial level of enthusiasm was maintained through episode 3, and the acceptance of the joint-development claim was continued.

Encounter 4: Technical Problems Arise

The test in Hartfield and Bridgehead was successful for the simplest function, automobile claims. However, technical problems arose as additional functions were added. Under certain circumstances, the response time of the system degraded to an unacceptable level. Moreover, certain types of claims (e.g., shared losses) could not be handled by the system satisfactorily. Consequently, the system was withdrawn from all but the automobile function, and the implementation schedule was abandoned.

Outcome: Unresolved Problems

At the time of study, the technical issues were still unresolved, leaving the users in an equivocal state. One systems technician commented on the users' disappointment over withdrawal of the system:

> They're concerned about it: "Are we ever going to get new training?" And I think I understand that, but they were so excited when [the system] first started. ". . . [W]e've got new furniture, we've got a computer on our desk." I Joke around with a lot of the people. . . but they are disappointed. . . . The delays meant that the users would also need new training rather than just a refresher. The only thing that has saved us is the fact that we are really honest about it. "It's typical. Typical home office." You're definitely going to have that attitude because of the [low] credibility prior to this. But I think they're handling this in a way that [the system] is eventually going to outshine all of those other projects and take on a new attitude for home office when it is up and running and everyone is being serviced by it.

Here the claims system technician admits that the problem and delay have reminded some users of the old patterns of systems development. Nonetheless, she is convinced that the new pattern of joint development will eventually produce a successful system and establish itself. Indeed, the senior technical administrator looked forward to the next project using the same joint development approach:

> There was an affirmation, a positive affirmation of our method of doing things—our approach to this—in the fact that they have now given us responsibility for underwriting office automation.

Prediction That Joint Development Would Persist

The Hartfield cases illustrates the predictive ability of the process model. Subsequent to compiling the case description provided so far, one of the researchers returned to Hartfield to continue documentation of the case history. Prior to this visit in December 1989, we had decided to use the model to predict the progress made on the claims system. We believed that the joint-development approach had been sufficiently established to persist through the technical difficulties, and we reasoned that an analyst-led approach would have faltered if tried at the point where problems arose in 1987. By using joint development, even though it had failed before, the parties could resume their work on the claims system. The prediction was recorded in writing one week prior to the visit at Hartfield.

The prediction was supported by the evidence. The parties had stayed with the joint-development approach, and the system was actually being used in nine of 20 branches nationwide, with the others due for implementation by the end of 1990. However, such progress on the project was gained at a high cost. Much of the original software was rewritten, the budget was more than doubled, and the timetable was stretched by three years. The proposed staff savings had vaporized, and the emphasis of the project had shifted subtly from cost savings to service gains. Nonetheless, so established was the joint-development methodology that it was being used as a standard in the systems divisions for new projects, and the method had been codified. Indeed, the original project leader was promoted to a senior consulting position for information technology strategy in the organization, further solidifying the ISD methodology.

Discussion

This article has described a social process model consisting of episodes and encounters between users and analysts. At each encounter, the claim to proceed in a particular manner may be met with agreeement, rejection, or equivocation. Thus, commitments made in one encounter may constrain activities in subsequent episodes. The model was applied in two case studies to illustrate how a sequence of episodes and encounters leads to eventual outcomes.

The model offers several advantages to researchers and practitioners interested in the social dynamics of ISD. First, the process model offers a form of explanation and prediction that complements the form of factor models. Second, the form of the process model can host a variety of specific theories with different contents. Third, the process model is capable of guiding both research and the practice of ISD. Each of these contributions is considered in the next sections.

Explanation and prediction

The process model focuses on the events within ISD, which complement the predictions gained from factor models. The explanation provided by the process model shows how parties interact, how they collectively agree on future courses of action, and how they perceive constraints on their action. This form of explanation is needed in ISD research to reveal the reasons for the associations detected by factor studies. The process model portrays ISD as a series of social encounters and episodes that are both constrained by past experience and capable of constructing new patterns of interaction.

For example, the process model illuminates the persistence of analyst-led development at MSU and the ultimate breaking of that pattern because of a critical encounter. The role of unexpected, random events is also illustrated at MSU by the replacement of the retired admissions director with someone more computer literate. Without considering the sequence of events that occurred at MSU, in fact, it would be very difficult to explain why the university shifted from an analyst-led to a user-led pattern of systems development.

It might be tempting to treat the process model merely as a descriptive tool, useful in explaining events after the fact. However, closer examination of the model's structure reveals predictive capability, gained through the greater comprehension it affords of the process under study. At any point in the course of an ISD project, alternative paths can be taken. It also indicates that the prior path is most likely to continue but that it is not determined by past events. Through its attention to the encounter preceding each episode, the model predicts the character of subsequent episodes and even the type of issues that might be raised in a later encounter. The predictive capabilities of the model are illustrated by Hartfield's decision to retain joint development.

Despite its predictive ability, the process model is fully sympathetic to the role played by random events. This might include commitments made innocently in another area that become crucial in the life of the project (such as choice of vendor or co-developer) and the entry and exit of key stakeholders. Predictions in process models can be adjusted as such events occur, but the random events themselves cannot be predicted. Outcomes of processes, therefore, are never completely determined by preceding events.

Form and content

The process model requires a researcher's judgment in defining and classifying events across time. These judgments should undoubtedly be influenced by the theoretical interests of the researcher. Our own analysis has focused on the generation and resolution of conflicts, a central theoretical interest in ISD (Newman and Sabherwal, 1989; Robey and Farrow, 1982; Robey, et al., 1989). Thus, encounters that serve the political interests of analysts (e.g., encounter 2 at MSU) are critical to an analysis of conflict between analysts and users. Mapping the equivocal response of the users to the sign-off (MSU Episode 2) and the ultimate rejection of the test system (MSU episode 3) aids in the analysis of intergroup relationships, conflict, and conflict resolution.

The general form for mapping encounters and episodes may serve the interests of researchers adopting other specialized theories of social process. For example, the process model could potentially accommodate analyses based on learning (e.g., Salaway, 1987), communication (Guinan and Bostrom, 1986), and decision making (Mintzberg, et al., 1976). The process model could also accommodate the submodels of routine change discussed by Mohr (1987). Thus, processes like search, imitation, modernization, status maintenance, play, and naturation could be housed within the structure of the process model.

The model might also accommodate multiple theories in the same analysis. For instance, different episodes of systems development may emphasize different activities and, consequently, different theories to explain them (Newman and Noble, 1990). The abstract focus on episodes and encounters seems not to exclude any particular theory that deals with events over time.

Research and practice

Finally, the process model offers utility for the ISD practitioner as well as the researcher. In many ISD projects, a change in the relationship between analysts and users may be considered desirable, but managers cannot simply announce that a new method for system development will be used. Rather, previous patterns of resistance, conflict, or even indifference on the part of the user community may have to be overcome, and significant resources may need to be consumed in the change process. To equate this problem to a learning model, unfreezing must precede both change and refreezing into a new pattern. The manager serving as project leader for such an effort can use the process model to identify prevailing episodes and plan encounters strategically to produce changes.

Practitioners should also realize that establishing a new pattern for user-analyst relations can bear implications far beyond the success or failure of an individual project. To allow a large project to degenerate into encounters filled with destructive and unresolved conflict could have immense, long-term economic and social consequences for ISD. Indeed, it may be relatively easy to lose "desirable" patterns but difficult to establish them. The model illustrates the improtance of project history to current and future events.

The process model does suggest that great attention should be paid to individual encounters between analysts and users. Studying the process clearly shows that the quality of these encounters can significantly affect the users' views of a project whether they accept or reject the various claims put by systems personnel. The process is capable of taking different directions under differing circumstances. Thus, the project leader could manage the process by watching for signs of progress or degeneration and then provoking encounters for the purpose of raising issues.

The type of prediction of which process models are capable offers another significant advantage to the practitioner. The practitioner is more interested in predicting the consequences of actions taken during ISD than in testing theories about social processes. If, for example, management is contemplating a costly training program for users, it would be beneficial to predict the users' reaction to training before it begins. By attending to critical encounters and the ensuing episodes, management may decide to defer training until more favorable attitudes toward the system are evident. In the Hartfield case, the creation of the model office used for training and the use of special logos on hats and pens are examples of planned events that had beneficial effects. Planned encounters can also be used to demonstrate the shortcomings of existing systems in order to break old patterns that users may have developed.

Conclusion

The process model presented in this paper should raise the consciousness of both researchers and practitioners about systems development. Reserachers can gain new insights into ISD by measuring the encounters and episodes that comprise it. Practitioners are likely to gain similar, valuable insights through the use of the model. As more research and practical experience accumulates, more specific predictions of stages, phases, transitions, and so on can flesh out the content of the model more completely. The resulting knowledge about the social process of ISD is likely to be a valuable complement to our current understanding of system development and its outcomes.

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