Context, Process and Outcomes of ISD: An Allegorical Tale

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Abstract

In this paper we use a sporting allegory to reflect on the different approaches to studying Information Systems Development (ISD) and to reflect on the two main traditions in ISD research: factor studies and process modeling. We show that studying outcomes alone is of marginal interest only. Additionally, like a sports journalist focuses on major events during the game, researchers tend to focus on what we and others interpret to be important to the trajectory of the ISD project. Finally we show the importance of explicating the context(s) of the project and in particular the historical context or "form". Repeated cycles of failure have to be broken by decisive management interventions.

(keywords: factor studies, process modeling, ISD, success, failure)

Introduction

Despite the numerous methods and strategies designed to ensure IS project success such as ISD methodologies, project management techniques and software process improvement, it is still not possible to guarantee a successful project outcome for all interested parties. IS failures are legendary and have attracted much of the public's attention in recent years due to a series of spectacular cases (IT Cortex Statistics, 2004, Beynon-Davies, 1999), Eglizeau *et al.*, 1986; Mitev, 1996). More recently, the newspapers have reported on several notorious public sector cases in the UK such as the Passport Office, the Department of Social Security and the National Health Service[1]. The specter of IS failure continues to haunt both the academic and practitioner communities.

In order to shed light on these phenomena we use an allegory from the sporting domain. Consider the following partial summary description of a fictitious soccer[2] game between Manchester United (MU) away at Arsenal (A) in the English Premiership which ended in a victory for Arsenal 2-1:

> **8.00 Kickoff by Saha (MU)**
> **8.15 Serious foul – yellow card to Scholes (MU). Free kick**
> **8.16 Goal from free kick. Henry for Arsenal (1-0)**
> **8.25 Corner for MU. Giggs (MU) takes. Lehmann (Goalkeeper A) saves header from Ferdinand (MU)**

[1] http://news.bbc.co.uk/1/hi/health/5084596.stm (accessed 16.06.06).
[2] Outside North America, Soccer is referred to as Football.

8.26 Thow in collected by Reyes (A). Passes to Henry (A) who dummies Neville (MU), comes inside and chips van der Sar (Goalkeeper MU). 2nd goal for Henry (2-0)
8.41 Reyes (A) goes down in penalty area. Poll (referee) gives him yellow card for"simulation"
8.42 Wenger (Manager A) takes off Reyes (A) and brings on Fabregas (A)
etc. etc.

The numbers on the left of each line refer to the time in the evening with each line referring to a journalist's opinion of what constituted their summary of the major event on the field of play. We will use this throughout the paper to represent a sporting allegory for enriching our understanding of IS project work and the different ways of researching it.

While we cannot solve the general problem of success and failure in ISD we can add some value to the research traditions employed in this area. Consequently, *the objective of this paper is to use a sporting allegory to reveal the different approaches to studying Information Systems Development (ISD) and to reflect on the two main traditions in ISD research: factor studies and process modeling.* We show in our paper that process modeling translates easily to studying a soccer game as a sequence of major events on the field and *vice versa*. We begin with a discussion of the legitimacy of using soccer game as an allegory for ISD. A section on outcomes is followed by a discussion of process and context including historical context or "form". The paper ends with a discussion of the implications arising from these reflections.

Different ways of studying ISD (factor vs process studies)

Models of ISD and its environment can be applied to examine the IS implementation process, where the structure and content of the IS and its interaction with the environment can be described, analyzed, and communicated (De Abreu and Conrath, 1993). In general, there are two identifiable streams in the literature: factor studies and process models.

Factor Studies

A large number of IS implementation studies have tried to identify factors that are related to IS implementation success and failure (e.g. Burke *et al.*, 2001; Kanter and Walsh, 2004; Poon and Wagner, 2001; Somers and Nelson, 2001; Umble *et al.*, 2003, Hartwick and Barki, 1994). This model and its later variants such as structural equation modeling (SEM) remains as the largest research stream in the IS implementation literature; it uses independent and control variables and their associations with dependent variables, i.e. the project outcomes (Lyytinen, 1987). The value of these studies is seen as that they use cause-effect patterns to investigate IS implementation difficulties, and that they have provided some valuable insight into the nature of IS problems (De Abreu and Conrath, 1993).

Nonetheless, some researchers (e.g. Newman and Robey, 1992, Markus and Robey, 1983, Robey 1994) noted that factor models have been of little practical utility in coping with IS research problems, due to the lack of deep understanding of implementation process features, i.e. they emphasize **what** factors are associated with outcomes, not **how** they shape those outcomes. Processes are largely ignored and are closed boxed.

Process Models

ISD has long been seen as a socio-technical change process (Kwon and Zmud, 1987) that can be 'conceived as a sequence of episodes, punctuated by encounters, that follows patterns established in previous development work' (Newman and Robey, 1992, p.250). Studying the whole project implementation process can help researchers gain a fuller, richer picture. Rather than focusing on technical features, process models focuses on social change activities by investigating sequences of critical events

that link antecedent conditions with outcomes. The punctuated equilibrium model is one of the theoretical frameworks that has been used by IS researchers to describe and explain organizational change patterns (Newman and Zhu, 2005; Newman and Robey, 1992, Robey and Newman, 1996). The findings generated from process models are not necessarily inconsistent with those from factor models. Rather, process models may play a complementary role (Newman and Robey, 1992). Controversially, some have suggested that the two models should be applied together to provide a more complete view of IS implementation (De Abreu and Conrath, 1993). Let us first turn to look at the concept of allegory and how it may afford us deeper insights into the conundrum of ISD.

Soccer as an allegory for ISD

"Allegory: a work in which the characters and events are to be understood as representing other things and symbolically expressing a deeper, often spiritual, moral, or political meaning" (*Encarta UK Dictionary).* In our paper the allegory is a game of soccer which is used to represent the way we develop and adopt Information Systems in Organizations. Figure 1 represents a picture of a field of play in soccer with the goals at either end. As we progress the paper we will use this figure to reveal more about the game and consequently the study of ISD.

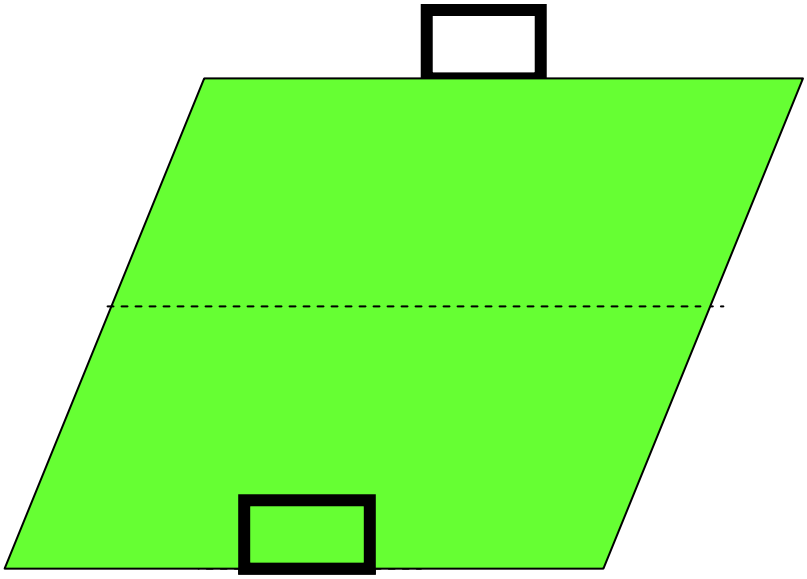

Figure 1 - A Sporting Allegory: Soccer

Why do we use soccer as our allegory? Soccer is a world-wide game and consequently the rules and parameters are widely known. But it is also a complex game involving many stakeholders (owners, managers, players, reserves, coaches, scouts, referees, regulatory bodies, media etc.). In ISD there are also many stakeholders. In soccer, no matter how strong the side is there is always a risk of losing a particular match. Failure is common in ISD projects even in previously successful project teams. The 90 minutes game time consists of 11 players per side so it is essentially a team game employing players of different specialisms (goalkeeper, defenders, midfield and attackers). IS project teams also have many specialists from those who interface with users to back-room technical personnel. Also the context(s) of the game is complex. Much can depend on the physical conditions of the pitch, the weather, the referee, and in a wider

sense the changing regulations agreed by the soccer governing bodies (e.g. recent changes to the so-called offside rule). Context in ISD can provide many unexpected perturbations (entry and exit of key persons; new technology emerging, budget crises, etc.). Each soccer team has "form" or a history of wins, losses and draws and individual players who are constrained or prevented to play by injuries and the totting up process of yellow (a caution) and red (sending off) cards awarded in previous matches for foul play. Organizations also have "form" when it comes to their history of successful and failed projects (Newman et al., 2006).

While there are obvious parallels with ISD, and we shall be elaborating on these parallels later, there are limitations to this allegory. First is the time dimension: a soccer game is 90 minutes of continuous action whereas an ISD project can take months or years to complete. Second, in a soccer game we would normally be watching the game live or mediated through the media. In research we are normally asking third party witnesses for their accounts of events in interviews. By careful interpretations of their accounts and with additional evidence from documents and observations we build up a story of the IS project (Myers and Newman, 2007). Finally, a soccer game is essentially competitive. There are winners and losers (although in soccer a draw is a possible and frequent occurrence). While we acknowledge this, others have drawn parallels with the "battles" and conflicts that can occur between designers and users in ISD and sometimes even referring to ISD as a "game" (Hirschheim and Newman, 1991). In summary, every allegory has limitations and the author and readers alike should not try to read too much into the story that is told. Used carefully, however, an allegory can reveal deeper insights into the phenomena we are studying, namely ISD.

Outcomes

A focus on results - but is it enough?

We can read in the media after the match that Arsenal beat Manchester United 2-1 (and obtain all the results of the other soccer games that were played that evening). This focusing on results has parallels with IS factor studies which emphasize the **outcomes** of project in terms of success and failure[3] and relate this to input variables across many sites, personnel, and projects (figure 2). These studies are mostly a-historical, a-contextual and a-processual as the surveys often poll many systems and personnel in different organizations that preclude common histories and contexts. Theory is often derived from the literature which is used to suggest and construct a testable model and hypotheses. Data is gathered by postal or web-based surveys and analyzed using statistical models. One of the problems with this research is making sense of the results especially if, as is often the case, the results are mixed or contradictory (see below). Structural Equation modeling is a more complex form of factor studies that explicitly builds in causal relationships between the dependent and independent variables (example shown in figure 3).

[3] Owing to space considerations, we will not be addressing the complex question as to what constitutes success and failure in ISD in this paper. Where the matter is not obvious, we will adopt a stakeholder view which may involve multiple and conflicting opinions on the subject.

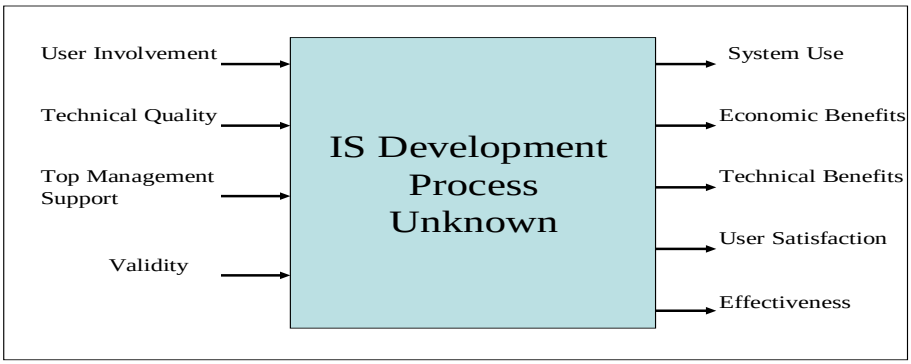

Figure 2 - Early Factor or Variance Studies:
(Multiple sites, multiple subjects,
a-contextual, a-historical, a-processsual)

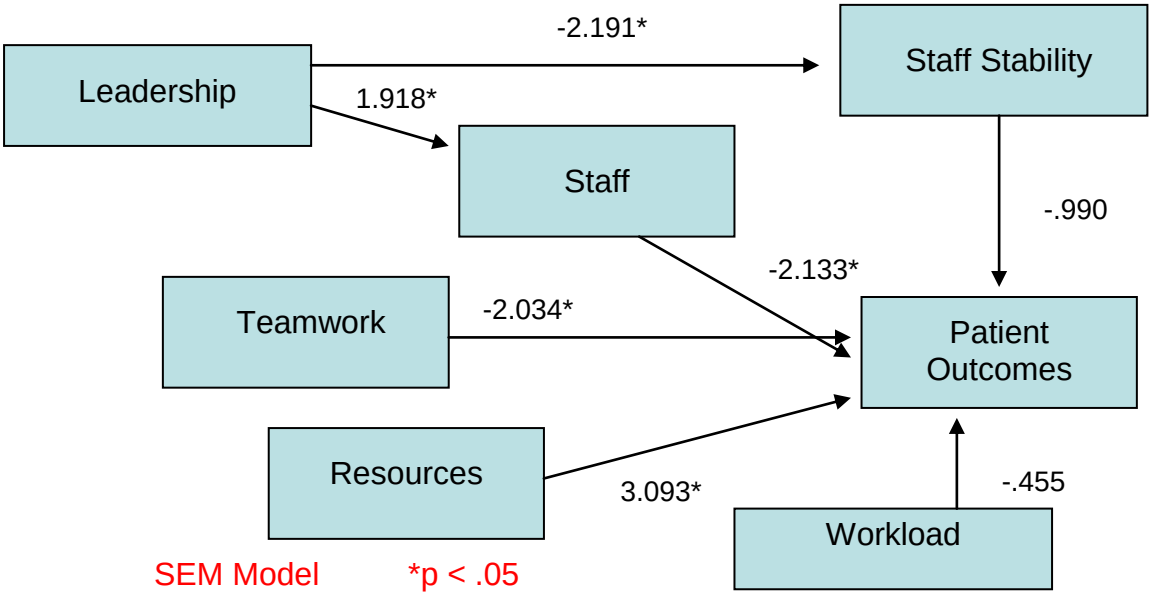

Figure 3 - Variants on Factor Studies (SEM example Houser (2003))

In this example, taken from Nursing research, the dependent variable is Patient Outcomes and some significant relationships with independent variables are revealed. Resources are positively and significantly related to Patient Outcomes which is intuitively reasonable. But a glance at some of the other relationships

reveals some counter-intuitive findings. For example, while Leadership is related positively and significantly to Staff Expertise, Staff Expertise is negatively (and significantly) related to Patient Outcomes which seems bizarre and would require further investigation to unravel its meaning. However, the models themselves are not amenable to this further analysis. So in order to make sense of the relationships we have to examine the process in greater detail.

Process

Studying the whole project implementation process can help researchers get a fuller, richer picture. Rather than focusing on outcomes alone, process models focuses on social change activities by investigating sequences of critical events in which the order of events is often crucial (see Figure 4).

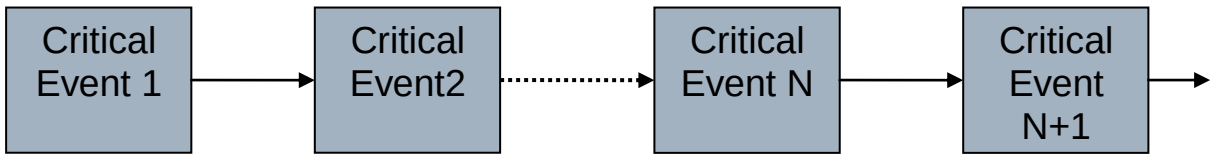

Figure 4: A Basic Process Model of ISD

On the soccer field we could map the critical events (Table 1 and Figure 5). These are usually a sports journalist's attempt to summarise the game which would be a precursor to writing the full story of the game as prose. What they and we are looking for is events that seem to have an impact on the trajectory of the game or subsequent games such as the arrival and departure of players from the field, serious injuries, awarding of yellow and red cards etc. This time we have labelled each event (E) and time (t) in sequence[4].

[4] Note that we could have decided to observe all events on the field as a continuous sequence, using banks of video cameras and microphones try to record the action in a real soccer game. This would be akin in a IS research project to action research or an ethnography where the researchers are immersed in the organization. While these are legitimate research methods we will not be considering them directly in this paper.

Table 1: Critical Events in Summary Narrative Form
(A = Arsenal; MU = Manchester United)

8.00 E1, t1 Kickoff by Saha (MU)
8.15 E2, t2 Serious foul – yellow card to Scholes (MU). Free kick
8.16 E3, t3 Goal from free kick. Henry for Arsenal (1-0)
8.25 E4, t4 Corner for MU. Giggs (MU) takes. Lehmann (Goalkeeper A) saves header from Ferdinand (MU)
8.26 E5, t5 Throw in collected by Reyes (A). Passes to Henry (A) who dummies Neville (MU), comes inside and chips van der Sar (Goalkeeper MU). 2nd goal for Henry (2-0)
8.41 E6, t6 Reyes (A) goes down in penalty area. Poll (referee) gives him yellow card for "simulation"
8.42 E7, t7 Wenger (Manager A) takes off Reyes (A) and brings on Fabregas (A)
etc. etc.

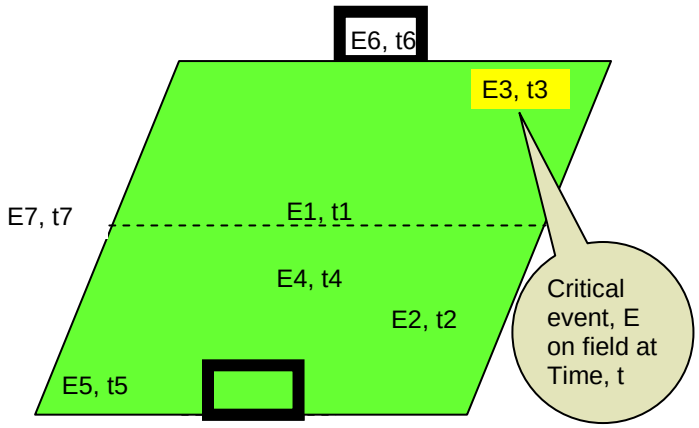

Figure 5 - A Soccer Allegory: Critical Events

Context

Historical context – ("form" or antecedent conditions)

In addition to the critical events, a process model looks at the history or form of the game (figure 6). In the case of a soccer game this might include among other issues a side's recent form (wins, losses, draws), injuries to players, the number of games played, cards (yellows and reds), and the entry or exit of players or manager from the club. These issues are believed to be strongly associated with the current game and the side's chance of winning. Indeed, some pundits talk of teams having slumps and winning or losing streaks[5]. We know that the record of failure to deliver large-scale (IS) in a timely fashion that offer value to major commercial and public organizations is legendary. But we seem to overlook an obvious area in our organizations: what is there to learn from information system development (ISD) historical patterns? Our thesis is that past negative patterns in ISD will tend to repeat themselves (Newman et al., 2006). In other

[5] In the case of soccer there would be a large amount of money wagered world-wide on a particular game with separate odds for a home win, away win or a draw.

words, organizations like football clubs can experience slumps in ISD performance producing and reproducing failure after failure until the organization is mired in a culture of failure (Lyytinen and Newman, 2006).

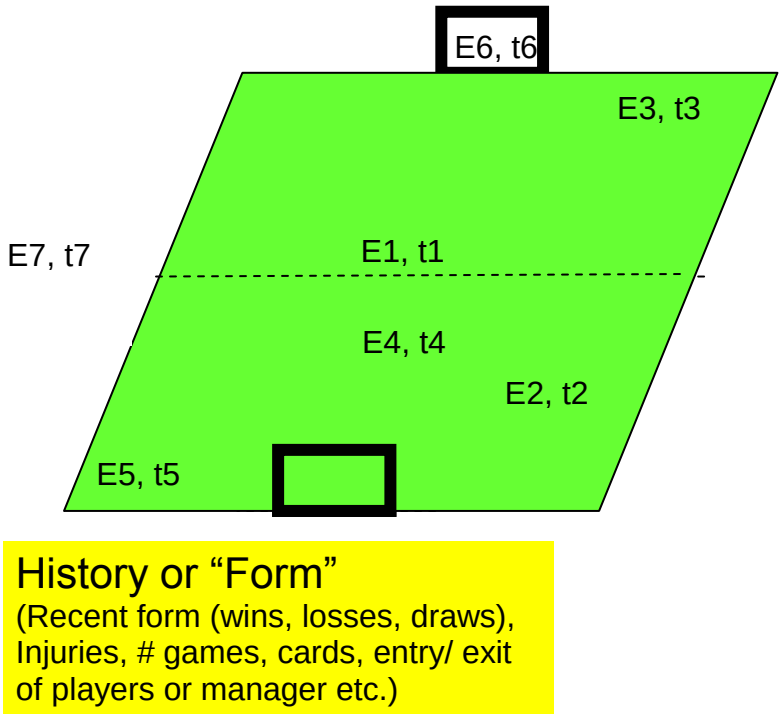

Figure 6 - A Soccer Allegory: History or "Form"

We carry our histories into the future with us. In looking back and learning from our historical ISD form, we can look ahead to more favorable outcomes in the IS we build. Successful processes can then be institutionalized so as to create new, positive histories to build upon (Newman et al., 2006). When football clubs appear to be developing losing streaks, the owners often move quickly to change the manager (and consequently the playing system) and/ or to bring in new players. In ISD projects the timescale often precludes such speedy reactions even though radical solutions may be required to break the cycle of failure (new project managers and other staff, new IT partners, new methodologies, etc. Robey and Newman, 1996).

Process context (inner/ outer)

The importance of context in understanding organizational processes (Pettigrew, 1990, 1992) is well established. We have already considered the historical context or form of a soccer game and showed how form can influence the current chances of success. Now we turn our attention to the context of the soccer game itself: the wider context in which soccer is played as well as the specific context of the current game (figure 7). These include issues about the soccer league, various regulators, and sport in society, soccer regulations, the influence of TV and the wider market for players etc. The context of a particular soccer game would be the weather, the choice of referee, the pitch conditions, playing home or away.

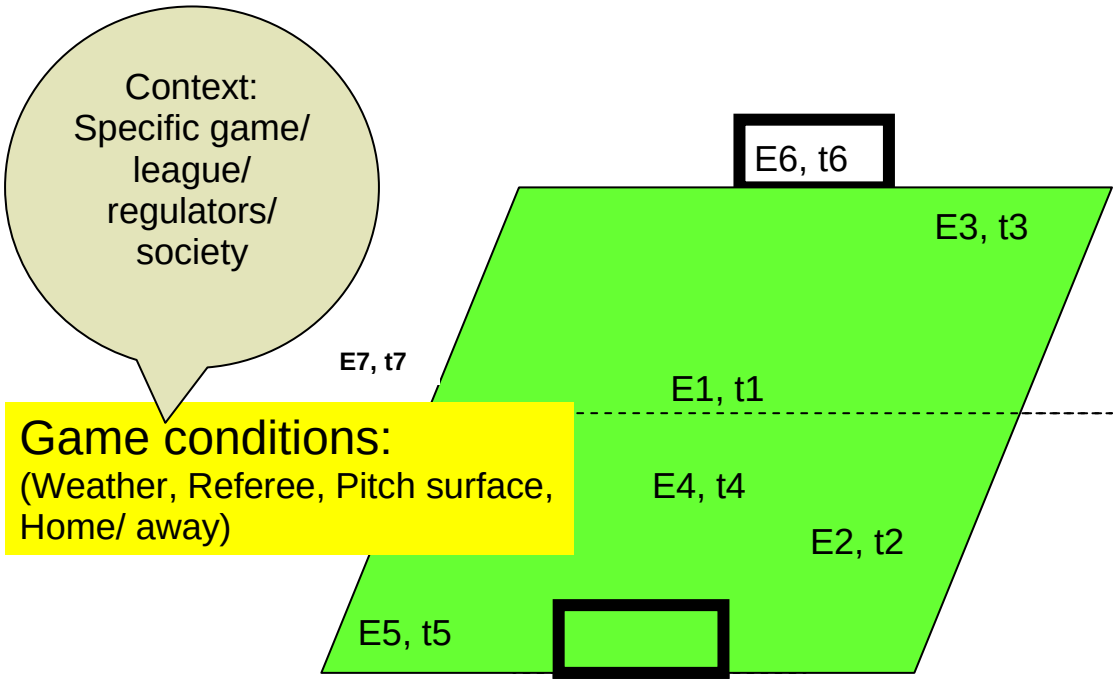

Figure 7 - A Soccer Allegory: context

The parallels are clear when we shift our attention from a soccer game to studying an ISD project. The inner context becomes the organizational context (e.g. technology infrastructure, management, project structure, standards, methodologies etc.). The outer context becomes those influences on the organization relevant to the project (e.g. competitive forces, labour markets, new technology, government regulations etc.). Having examined all the elements of the process model we now attempt to combine them into an holistic model.

Putting the jigsaw together. An holistic approach

If we combine all the elements above, we get a much more comprehensive, holistic view of a soccer game and how to understand the outcome (figure 8). In this model, the outcome becomes a by-product of the process. If you have the history, the process and the context then the outcome is a derivative. In contrast: in factor studies of ISD the outcome is the focus. Returning to the sports report narrative, if we now add the history and context, the process (critical events) can be used to show how got the result (2-1) and how the result becomes part of the future form (a fuller report is reproduced in table 2 below).

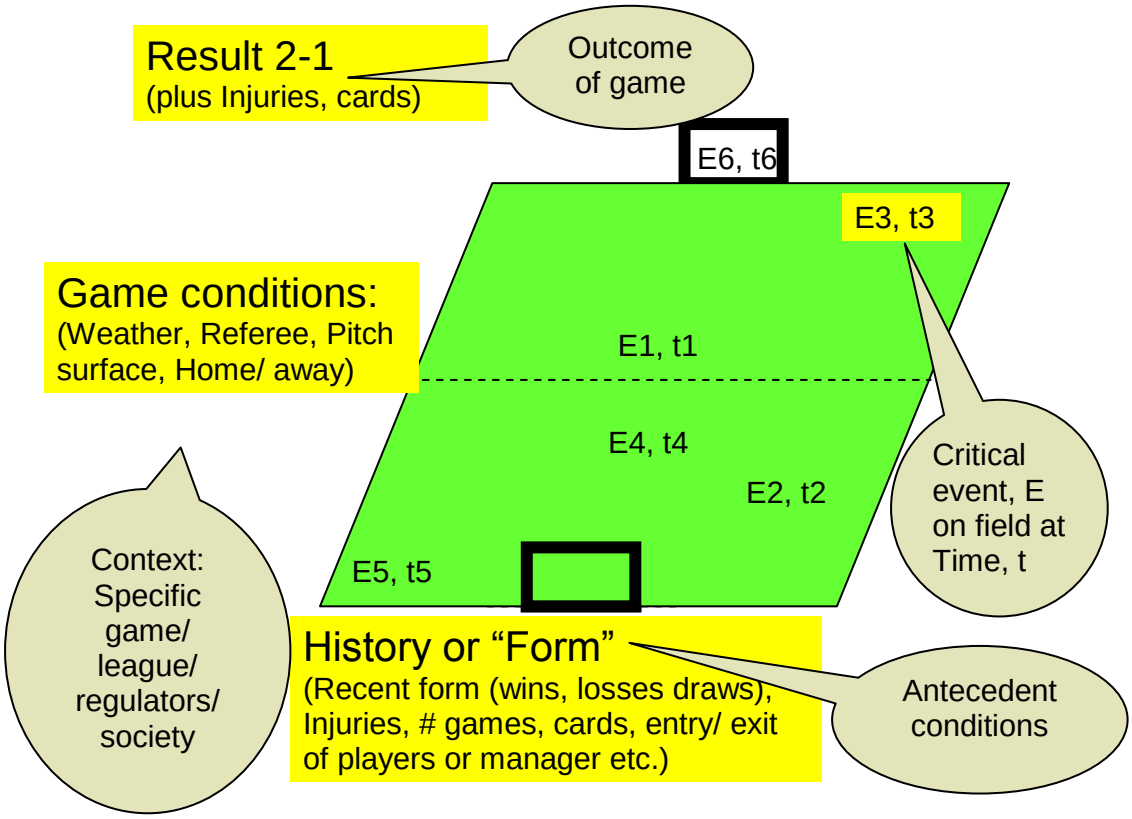

Figure 8 - A Soccer Allegory: an Holistic View

Table 2: Reporting the Story: Events plus Contexts plus Outcome

History: Rooney (MU) on a red card from last game (ineligible to play). Van Nistelrooy (MU) sold to Real Madrid. Last five games (oldest to latest) MU: wlldl: Arsenal: wwdww
Context: rain and high winds, ground soft, referee Graham Poll
8.00 E1, t1 Kickoff by Saha (MU)
8.15 E2, t2 Serious foul – yellow card to Scholes (MU). Free kick
8.16 E3, t3 Goal from free kick. Henry (A). Arsenal leads (1-0)
8.25 E4, t4 Corner for MU. Giggs (MU) takes. Lehmann (Goalkeeper A) saves header from Ferdinand (MU).
8.26 E5, t5 Thow in collected by Reyes (A). Passes to Henry (A) who dummies Neville, comes inside and chips van der Sar (Goalkeeper MU). 2nd goal for Henry (A). Arsenal lead by 2 goals to 0.
8.41 E6, t6 Reyes (A) goes down in penalty area. Poll (referee) gives him yellow card for "simulation" or diving.
8.42 E7, t7 Wenger (Manager for A) takes off Reyes (A) and brings on Fabregas (A)
etc. etc. (further critical events listed here).
Outcome: Arsenal (wdwww) 2 beat Manchester United 1 (lldll), cards: yellow card (Reyes, A)

Again we can draw parallels with studying ISD. In a similar way to a soccer game, we can add historic context (form or antecedent conditions), current contextual features and outcomes to the sequence of critical events previously presented (see figure 9). This type of graphical mapping has been proposed by

Langley (1999) and Pentland (1999) in a general form. Later variants have been constructed to add parallel processes and socio-technical elements and to put them in the context of theories of change such as punctuated equilibrium theory (Newman and Zhu, 2005, Lyytinen and Newman, 2006, Gersick, 1991).

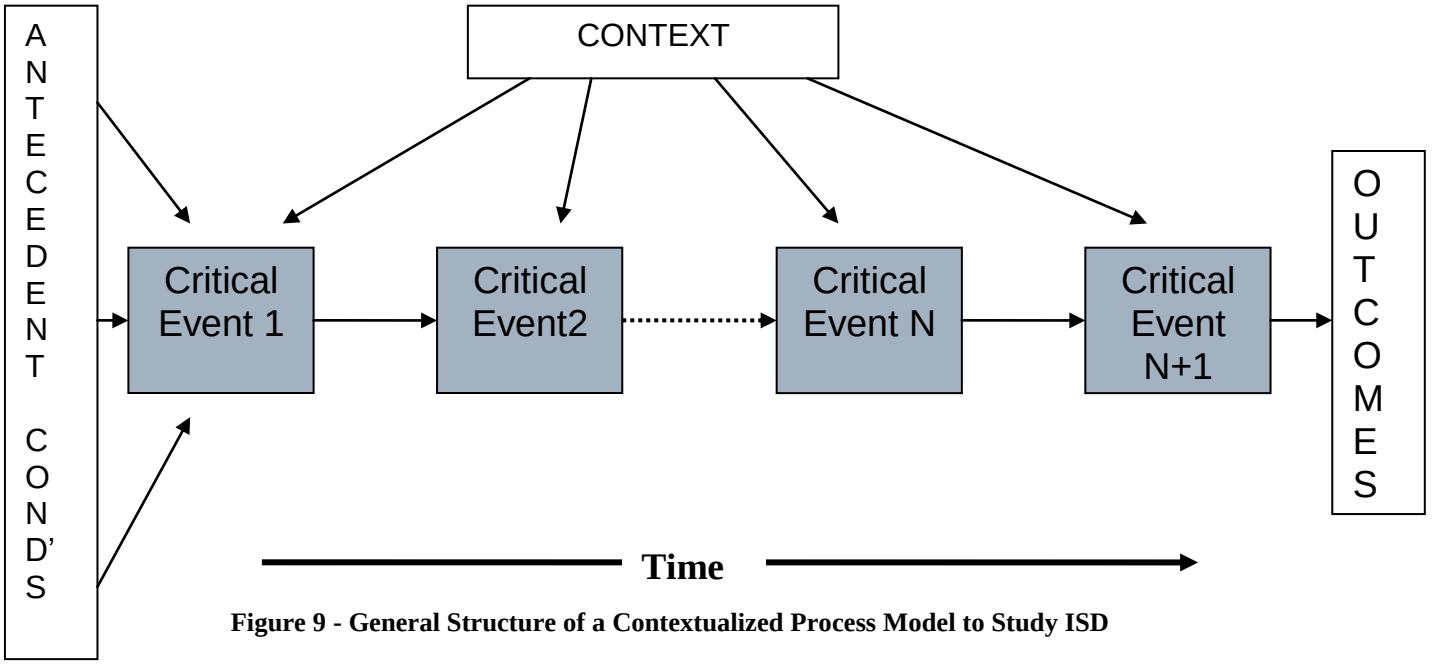

Figure 9 - General Structure of a Contextualized Process Model to Study ISD

Discussion and conclusions

In this paper we have used a sporting allegory to reveal the different approaches to studying Information Systems Development (ISD) and reflect on the two main traditions in ISD research: factor studies and process modeling. Using the allegory from soccer we have shown how studying a soccer game can reveal insights into ISD research. In table 3 we summarize these findings.

Table 3: Soccer, factor studies and process modelling

		Findings ----------Research Traditions----------	
Feature	**Soccer**	**Factor studies/ SEMs**	**Process modelling**
Outcome	**Result of a game**	**Dependent variable (s)**	**By-product of contexts and process**
Process	**Critical events on the field of play as told by sports journalists**	**Usually unknown and unknowable. (A-processual).**	**Explicitly traced by researchers as critical events in a time-dependent sequence.**
Context	**Important especially the current "form" of a club (recent w,l,d sequences)**	**Ignored in surveys of multiple systems in multiple organizations. (A-historical, A-contextual).**	**Historical and current and wider context essential to the understanding of process**
Research approach and	**N/A apart from betting on games**	**Associative statistical tests of hypotheses.**	**Interpretive tradition and elements of longitudinal**

traditions	**using odds of w, l, d. Story-telling.**	**Positivist tradition.**	**work. Single/ multiple case studies. Story-telling. Actors socially construct their worlds which researchers attempt to represent/ reconstruct.**
Role of researcher/ journalist	**Insider. Often in the thick of the action**	**Outsider. Remote from the phenomena studied**	**Mostly an outsider. Attempts to situate the researcher**
Theory	**N/A**	**Often derived from literature. Constructing causal models to test hypotheses**	**Emergent, grounded, explanatory**
Sources of data	**Media (e.g. TV). Inside contacts and knowledge**	**Mail or web surveys and follow-up communication**	**Interviewing, observation and document gathering**
Data analysis	**Journalistic experience. Often an in-house writing style**	**Statistical analysis using computer packages. Null hypothesis testing using factor models and SEMs**	**Textual, linguistic and literary analysis of documents. A faithful reproduction of subjects' multiple stories about ISD**

There were several contributions which are of interest to the IS research community. Firstly we can comment on the proliferation of **factor studies** in IS studies and the latest variations using structural equation modeling. While researchers are able to comment on the significance and strength of the relationships, they essentially treat the process as unknown and indeed unknowable (e.g. Burke *et al.*, 2001; Kanter and Walsh, 2004; Poon and Wagner, 2001; Somers and Nelson, 2001; Umble *et al.*, 2003). In contrast, process studies, while targeting just one or a few cases, focus on the major events, their timing and sequence in order to describe and explain how history, process and outcome are linked. Given the surfeit of factor studies in IS research, we perhaps need to balance these with process studies (Olikowski, 1992; Robey and Newman, 1996, Robey 1994).

The soccer allegory allows us several insights. First, *studying outcomes alone is generally of marginal interest only*. To know that Arsenal beat Manchester United (2-1) tells us very little. With soccer we either want to watch the game live or read an extensive report on the match or even talk with those who witnessed it. It is the unfolding story of the game that brings it alive and enhances our sense-making. By the time you have reached the end of the 90 minutes it is obvious how the result arose from the play. In other words, the outcome is explained from studying the process. But the result itself conveys none of this: *the outcome cannot explain the process*. Similarly in studies of ISD, knowing the outcome of a project (success, failure or indeterminate) is not only problematic (see footnote 3) but it is not very informative. It tells us nothing about the process, history and context.

Second, the report of the soccer game will usually focus on the critical events (e.g. tables 1 & 2). There are often periods in the game when very little is happening. Then there will be (usually) short periods that punctuate the game and that affect the trajectory (fouls, corners, injuries, cards, substitutes, goals, for example). We could have collected video continuous data on "everything" from every angle of the soccer ground but that of course gives us a huge amount of data to process which is largely uneconomic to process. In most *ISD process research we also focus on critical events as defined by the subjects* that we observe and interview. If we are conducting longitudinal research it will normally involve multiple data entry points in which we ask subjects to relate what is currently happening in a project and to look retrospectively at critical events in the past.

Third, contexts are vital to explaining the process of the soccer game. The sports journalist will be familiar with the history or form of the teams including recent win, loss, draw statistics and odds on those events occurring. Sports pundits believe in form as a strong indicator of current performance (slumps, winning /

losing streaks). If nothing changes, the teams are likely to reproduce their current form. This is a vital clue in our study of ISD. Just as soccer teams have form, we would claim that *organizations and ISD project teams also have form* (Newman et al., 2006) which will also be reproduced in the latest project if everything else remains the same. In soccer if the team is mired in a losing streak the owner will often act decisively to change things. There is an obvious parallel in ISD projects: *Repeated cycles of failure have to be broken by decisive action from management*. Furthermore, the context of the game (e.g. playing conditions) have an effect on some teams more than others as does the choice of referee for the game. As we have shown, in ISD projects context (inner and outer) can have a crucial impact.

Finally, if we put all these issues into the contextualized general process model (figure 9) *we can see how our view of research and the researcher are fleshed out* (figure 10). The researcher(s) is situated on the research model and shown as entering the organization several times over the duration of the project. The model depicts the researcher(s) gathering data from a variety of sources (interviews, observations, documents) about the ISD project process (critical events), antecedent conditions (form), context (s) (inner and outer) and if applicable, the outcome of the project.

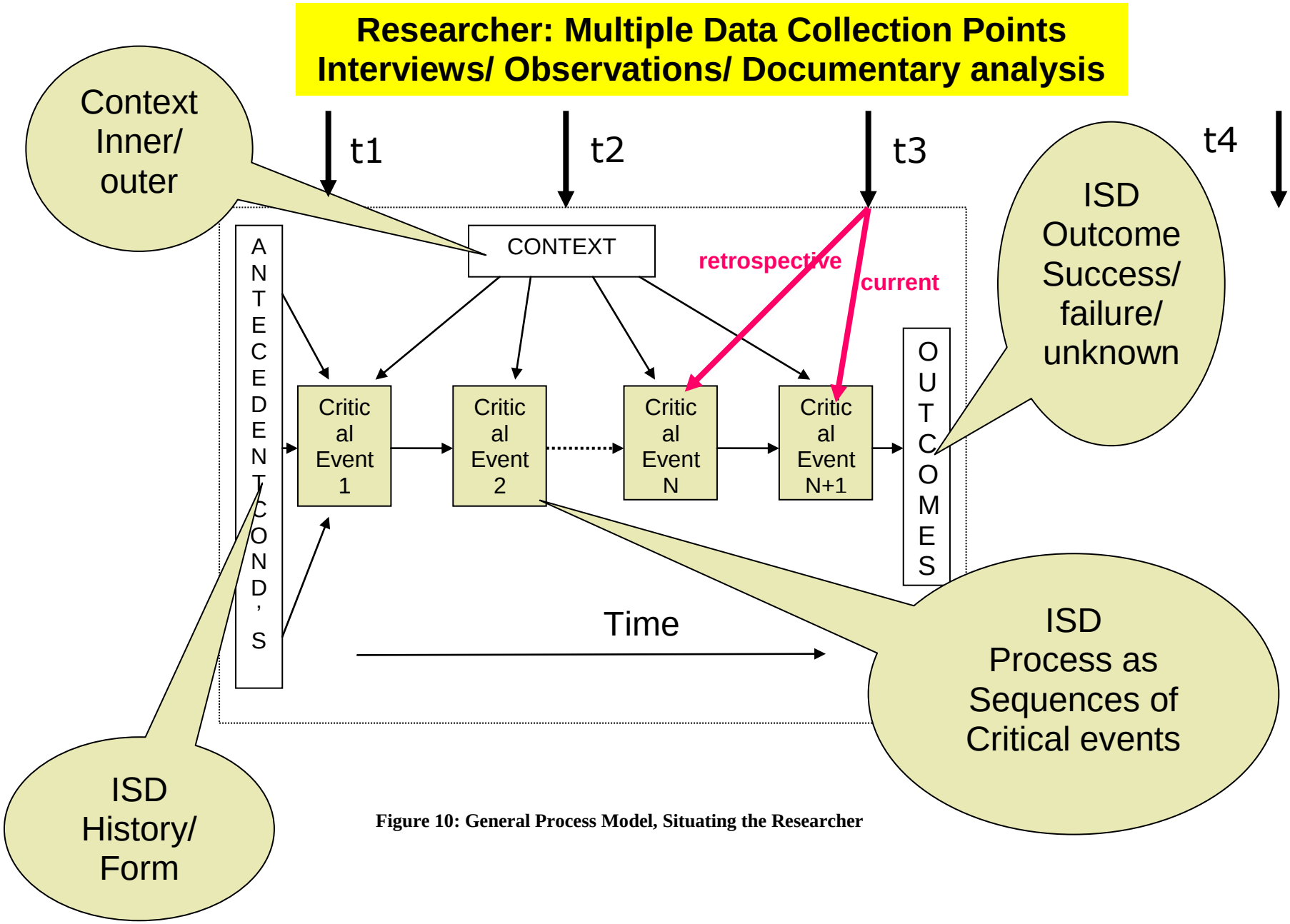

Figure 10: General Process Model, Situating the Researcher

References

Barki, H. and Hartwick J., (1994) User Participation, Conflict and Conflict Resolution: The Mediating Roles of Influence, *Information Systems Research*, Vol. 5, No. 4, 422-438.

BBC news (2006) http://news.bbc.co.uk/1/hi/health/5084596.stm (accessed 16.06.06).

Beynon-Davies, P., (1999) Human Error and Information Systems Failure: the Case of the London Ambulance Service Computer-Aided Despatch System Project, *Interacting with Computers*, Vol.11, Iss.6, pp.699-720

Burke, R., Kenney, B., Kott, K., and Pflueger, K., (2001) Success or Failure: Human Factors in Implementing New Systems, http://www.educause.edu/ir/library/pdf/EDU0152.pdf

De Abreu, A. F., and Conrath, D. W., (1993) The Role of Stakeholders Expectations in Predicting Information Systems Implementation Outcomes, *Proceedings of the 1993 conference on Computer personnel research* ,St Louis, Missouri, pp.408-415, Mohan R. Tanniru (Ed.)

Eglizeau, C., Frey, O. and Newman, M. (1996), "Socrate: An Implementation Debacle". ***Proceedings of the 4th European Conference on Information Systems***, Lisbon, Portugal, July 2-4th, pp. 1233-1244, Ed. J. Dias Coelho.

Gersick, C. J. G., (1991) Revolutionary Change Theories: A Multilevel Exploration of the Punctuated Equilibrium Paradigm, *Academy of Management Review*, Vol.16, No.1, pp.10-36

Hirschheim, R., and Newman, M. (1991), "Information Systems Development as Symbolism: Myth, Metaphor, and Magic". *Information Systems Research*, Vol. 2, No. 1, pp. 29-62.

Houser J. A model for evaluating the context of nursing care delivery. *J Nurs Adm.* 2003; 33: 39 – 47.

IT Cortex Statistics, (2004) http://www.it-cortex.com

Kanter, J., and Walsh, J. J., (2004) Toward More Successful Project Management, *Information Systems Management*, Vol.21, Iss.2, pp.16-21

Kwon, T. H., and Zmud, R. W., (1987) Unifying the Fragmented models of Information System Implementation, in Boland, R. J., and Hirschheim, R., (Eds), *Critical Issues in IS Research*, John Wiley & Sons Ltd, Chichester, pp. 227-251.

Langley, A. (1999) Strategies for Theorizing from Process Data, *Academy of Management Review* (24:4), pp. 691-710

Lyytinen, K., (1987) Different Perspectives on Information Systems: Problems and Solutions, *ACM Computing Surveys*, Vol.19, No.1, pp.5–44

Lyytinen, K., and Newman, M., (2006) Punctuated Equilibrium, Process Models and Information System Evolution: Towards a Socio-Technical Deep Structure of Information System Evolution, Unpublished Working Paper, Case Western Reserve University.

Markus, L. and Robey, D. (1983): The Organizational Validity of Management Information Systems. *Human Relations*, Vol. 36, No. 3 pp.203–226

Mitev, N. N., (1996) More than a Failure? The Computerised Reservation Systems at French Railways, *Information Technology & People*, Vol.9, No.4, pp.8-19

Meyers, M. and Newman, M. (2007) "The Qualitative Interview in IS Research: Examining the Craft". *Information and Organization.* Vol. 17, pp. 2-26.

Newman, M., Pan, S., Pan, G. (2006) "Can Information Systems Development "Form" Teach Us Anything?" Working Paper, University of Manchester.

Newman, M., and Robey, D., (1992) A Social Process Model of User-Analyst Relationships, *MIS Quarterly*, June, pp.249-266

Newman, M., and Zhu, S., (2005) A Contextualised Socio-technical Process Approach to ISD. In K. Soliman (editor) *Information Management in Modern Enterprises: Issues and Solutions***.** IBIMA ISBN: 0-9753393-3-8.

Orlikowski, W. J. (1992) "The Duality of Technology - Rethinking the Concept of Technology in Organizations," *Organization Science* (3) 3, pp. 398-427.

Pentland, B. (1999) Building Process Theory with Narrative: From Description to Explanation, *Academy of Management Review* (24:4), pp. 711-724

Pettigrew, A., (1990) Longitudinal Field Research on Change: Theory and Practice, *Organization Science*, Vol.1, No.3, pp.267-292

Pettigrew, A. (1992) The Character and Significance of Strategy Process Research, *Strategic Management Journal* (13), pp. 5-16.

Poon, P., and Wagner, C., (2001) Critical Success Factors Revisited: Success and Failure Cases of Information Systems for Senior Executives, *Decision Support Systems*, Vol.30, No.4, pp.393-418

Robey , D. (1994), Modeling Interpersonal Processes During Systems Development: Further Thoughts and Suggestions, *Information Systems Research*, Vol. 5, No. 4, 439-445.

Robey, D., and Newman, M., (1996) Sequential Patterns in Information Systems Development: An Application of a Social Process Model, *ACM Transactions on Information Systems*, Vol.14, No.1, Jan, pp.30-63

Somers, T. M., and Nelson, K., (2001) The Impact of Critical Success Factors across the Stages of Enterprise Resource Planning Implementation, *IEEE, Proceedings of the 34th Hawaii International Conference on System Sciences*, Vol.8, http://csdl.computer.org/comp/proceedings/hicss/2001/0981/08/09818016.pdf

Umble, E. J., Haft, R. R., and Umble, M. M., (2003) Enterprise Resource Planning: Implementation Procedures and Critical Success Factors, *European Journal of Operational Research*, Vol.146, Iss.2, pp.241-257