Failure, Identity Loss and Living Information Systems

Panagiotis Kanellis¹, Mark Lycett and Ray J. Paul²

¹Arthur Andersen, 377 Syngrou Ave. Athens 175 64, GREECE

E-mail: Panagiotis.Kanellis@gr.arthurandersen.com

²Centre for Living Information Systems Thinking, Department of Information Systems and Computing, Brunel University, Uxbridge, Middlesex UB8 3PH, UNITED KINGDOM

E-mail: Mark.Lycett@brunel.ac.uk, Ray.Paul@brunel.ac.uk

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Abstract: Attempting to understand information systems failure is a complex task. Recent approaches described in the literature have sought to reject positivist explanations as being too simplistic, shifting the debate in favor of more ‘web-like’ explanations based on the interpretation of case studies. This paper seeks to synthesize two well-known explanatory frameworks into an enhanced conceptual model that approach information systems failure through the concept of ‘identity loss’. Whilst this synthesis offers explanation, the resulting model also challenges the existing paradigm of information systems development. Utilizing the findings of a case study that investigates the effects of privatization on the systems of an industrial organization, we postulate that, rather than to continue offering palliatives to combat the symptoms of information systems failure, what is needed is a fundamental reconsideration of approach.

1. INTRODUCTION

Numerous ‘public’ cases abound relating to the failure of information systems: ‘*Chief of Stock Exchange Quits in Computer Fiasco*’ - The Times (12/03/93) describing the collapse of the London Stock Exchange ‘Taurus’ (Transfer and Automatic Registration of Uncertified Stock) system; ‘*Home*

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Office Slams Met System Delays - Computer Weekly (09/05/96) reporting on the £4 million Metropolitan Police system in danger of missing its 1997 implementation date; *Computer flop cost taxpayers £59 million* - The Independent (10/02/94) raising doubts regarding a system that was about to be implemented in HM Customs and Excise. Whatever the outcomes of the above, if we judge by the past, information systems will continue to fail. Maybe, as they become more and more institutionalized, the 'entertainment value' of such cases will diminish - making them less attractive contenders for tomorrow's front page. To the organization however, this institutionalization means that as its dependence on these systems increases, they will need to be less and less susceptible to failure. Clearly a better understanding of 'failure' is needed, if not of information systems themselves. With the environment getting increasingly complex, and with inter-organizational systems on the rise, this will become an even more significant issue. Beynon-Davies (1995) argues that the importance of the study of information systems failure holds for two reasons: firstly, as is evident from numerous reported cases, information systems continue to fail despite our increasing knowledge of them; secondly, such cases act as an important resource for validating information systems development practice.

Subscribing to these reasons, the paper begins with a brief overview of the literature falling under this theme. Concentration is focused upon an emergent epistemology in information systems research - that of interpretivism (Walsham, 1995). This questions the validity of deterministic propositions in favor of more pluralistic explanations of the phenomena under investigation. The paper builds upon this idea in two ways. Firstly, we reinforce the unavoidable plurality associated with information systems failure. This is achieved through the development of a model, which stresses the relevance of perception at the individual level concomitantly with the influences on perception at collective levels. In the interest of cumulative research in information systems (Keen, 1991), this builds on the work of Ives *et al* (1980), Scarborough and Corbett (1992) and Tricker (1992). Secondly, this is further developed into a conceptual model explaining information systems failure through the notion of 'identity loss'. This seeks to *synthesize* and *extend* two well known frameworks for 'understanding' information systems failure - those of Lyytinen and Hirschheim (1987) and Sauer (1993).

Whilst this model offers explanation, it also highlights a fundamental flaw within the predominant information systems development paradigm - its 'static' nature. Thus the latter part of the paper reports the findings of a case study illustrating the vulnerability of information systems in turbulent environments, concerns itself with the effects of 'identity loss' on development 'under-

standing', and discusses our own efforts to pragmatically reconsider this understanding.

2. THE TRADITIONAL VIEW OF INFORMATION SYSTEMS FAILURE

There have been numerous attempts documented in the traditional literature that try to identify what causes the success or failure of an information system. The majority of these may be argued to exhibit a positivist view of knowledge and how to obtain it. DeLone and McLean (1992) undertook a literature review of the 'information systems success' thematic and, amongst the 180 references they list, virtually none delve away from the positivist perspective. The sheer volume of this literature makes it impossible to ignore and DeLone and McLean's (1992) work is a good reference point upon which our brief overview is based. This is not intended to be critical but rather to provide the interested reader with a summary of this line of research, and a sample of representative works.

Their extensive survey of the empirical literature resulted in a classification of the existing studies based upon the following variables (used to assess information systems success):

- *System quality*; this refers to the characteristics of the information system itself. This stream of research has been trying mostly to determine system success with respect to how 'good' or 'bad' a system is in technical terms (see, for example: Swanson, 1974; Hiltz and Turoff, 1981; Bailey and Pearson, 1983)
- *Information quality*; the focus here is on the output of the system rather than the system itself. Olson and Lucas (1982) for example, argued for accuracy and the appearance of reports as an indication of information quality. Typical measurement criteria of information quality are precision, timeliness, reliability, completeness, conciseness and relevance (Bailey and Pearson, 1983). Of interest is King and Epstein's (1983) study which attempts to yield a composite measure of the quality and value of information by proposing multiple information attributes such as understandability, decision relevance, sufficiency and freedom of bias.
- *Use*; this refers to a recipient's consumption of the output of an information system. Lucas (1975a; 1975b), most notably amongst others, proposed the 'use of system' as a determinant of information systems success. Similar studies include Benbasat *et al.* (1981); Bell (1984); King and Rodriguez (1981); Fuerst and Cheney (1982); Mahmood and Medewitz (1985); Kim and Lee (1986) and Baroudi *et al.*

(1986). The 'use of system' remains a popular success variable as shown more recently by Markus and Keil (1994).

- *User satisfaction*; this is arguably the most widely used single criterion for measuring the success of an information system. User Information Satisfaction (UIS) is used as a surrogate measure for information systems success, and is defined as 'the extent to which users believe the system available to them meets their information requirements' (Ives *et al.*, 1983; Ives and Olson, 1983). UIS measurement tools usually involve single (Lucas, 1976) or multiple-item rating scales (Bailey and Pearson, 1983). These are divided into two types with one focusing on variables associated with the system itself (e.g. output quality) and the other encompassing issues related to organizational support for development and maintenance (e.g. training) -as well as the system product itself. User characteristics are seen as important to this outcome variable (Zmud, 1979), as are user attitudes and *a priori* involvement (Zanna and Fazio, 1982; Baronas and Louis, 1988; Goodhue, 1988; Melone, 1990).
- *Individual impact*; although it is related to personal and organizational performance, 'impact' can also "... be an indication that an information system has given the user a better understanding of the decision context, has improved his or her decision-making productivity, has produced a change in user activity, or has changed the decision maker's perception of the importance or usefulness of the information system" (DeLone and McLean, 1992: 69). Success variables in this category include information understanding and accurate interpretation (Dickson *et al.*, 1986), problem identification and understanding (Lucas, 1981), improved decision analysis and confidence in decisions (Aldag and Power, 1986), and task performance (Benbasat and Dexter, 1986; DeBrabander and Thiers, 1984).
- *Organizational impact*; this refers to the extent of the effect that the systems can have on organizational performance. Assessing information systems against this variable is particularly attractive to practitioners: information system departments, facing budgetary cuts, constantly need to be able to objectively evaluate and justify further expenditure to top management. As a result, 'organizational impact' is an outcome variable that has been prolifically investigated (Hamilton and Chervany, 1981; Keen, 1981; Rivard and Huff, 1984; Strassmann, 1985; Millman and Hartwick, 1987).

3. BUILDING AN INTERPRETIVE VIEW OF INFORMATION SYSTEMS FAILURE

Lyytinen and Hirschheim (1987) arrived at their conceptualization of failure in much the same way as DeLone and McLean (1992) - by reviewing the empirical literature. After an extensive survey and classification, they defined the overriding generic concept of failure as that of *expectation*. This “. . . stresses the importance of understanding how various stakeholders comment on the value of the IS [information system]: failure is the embodiment of a *perceived* situation” (Lyytinen and Hirschheim, 1987: 264, emphasis added). By ‘stakeholders’ they mean any number of people who have an immediate interest in the information system, be the users or the developers themselves. Such a group is seen as sharing a set of values that define the desirable features of the information system and the ways in which they should be obtained. In those terms, an information system failure signifies a gap between a particular situation that is currently unfolding, and the desired one. Expectation failure is a superset of three other notions that were identified by Lyytinen and Hirschheim (1987), these being:

- *Correspondence failure*; this notion of failure is based on the premise held by the process of stating the design objectives in advance. If consequently these are not met for any reason, the information system is a failure. Although this provides the ultimate rational idea of how failure should be viewed, it is problematic in practice. Objectives are ambiguous and their interpretation is context-driven. At the same time, it is very difficult - if not impossible - to accurately measure the performance of an information system, due to the immense problems related with the verification and validation of the measurement instruments (Hirschheim and Smithson, 1988).
- *Process failure*; this relates to situations where the proposed information system cannot be delivered within a set of given budget constraints. Under this notion, overspending in cost and time is seen as a failure because it eventually limits or negates the global system benefits. In project management terms, process failure “. . . signals management’s inability to achieve predicted resource allocations, to develop appropriate costing and budgeting schemes for systems design, or to predict the implementation difficulties of information technology” (Lyytinen and Hirschheim, 1987: 265-266).
- *Interaction failure*; This conceptualisation parallels DeLone and McLean’s (1992) criteria of ‘information use’ (see above).

Lyytinen and Hirschheim (1987) criticized each of these three 'stand-alone' notions as portraying a highly rational image of information systems development, which in essence views the system as a neutral, technical artifact. To compensate for this, expectation failure conveys a ". . . more encompassing, politically and pluralistically informed view, which helps to analyze relationships among the other failure notions and to understand their social origin" (Lyytinen and Hirschheim, 1987: 268).

It is precisely this explicit plurality advocated by expectation failure that Sauer (1993) does not feel comfortable with. By not giving preference to the interests of any particular group, this notion can in principle ". . . accommodate any kind of shortcoming in an information system. However, it is this very flexibility and scope that prove to limit its value" (*ibid.*: 23). For Sauer (1993), any account of failure should indicate both where to look for the causes of failure and how to respond to them. Expectation failure is thus criticized because it gives equal weight to all interests, and does not provide any indication or explanation as to what might be the most problematic inability to satisfy stakeholder interests. As a result, no indications as to which problems demand priority can be derived, or indeed what types of action might satisfy them. This provides the basis for three criticisms, these being: (1) that some expectations are more reasonable than others; (2) that expectation failure ignores intention; and (3) that some stakeholders have greater capacities than others.

Based on those considerations, Sauer's (1993) thoughts culminated in a conceptualization of information systems failure that encompasses three components: the project organization, the information system itself, and its supporters. The development of information systems in organizations is seen as an innovation process that is characterized and ultimately governed by the dependencies between the three components (see Figure 1). In order to innovate, the project organization depends on the provision of continuous support in the form of material resources and help in coping with contingencies. In turn, this support will only be provided if the stakeholders see a range of potential benefits that can be obtained via the information system. The information system requires the effort and expertise of the project organization for its continued existence. In this context, failure occurs when ". . . the level of dissatisfaction with a system is such that there is no longer enough support to sustain it. The objective indicator is the cessation of all work whatsoever in the system. This means the termination of all development, maintenance and operation" (Sauer, 1993: 27). Sauer refers to this state as *termination failure*.

Figure 1: Triangle of Dependencies: System, Supporters and Project Organisation
(Adapted from Sauer, 1993)

Termination failure is stricter than expectation failure in the sense that a system should only be deemed as a failure when the development or operation ceases. The distinction between expectation and termination can be understood by considering the concept of flaw. Flaw is akin to dissatisfaction; only termination can be failure. Hence, because of the inherent uncertainty that any innovation process, such as information systems development entails, expectation failures (flaws) are seen and accepted as being normal occurrences. These can be corrected within such a process at a cost, or accepted at a cost. Sauer (1993) correctly notes that flaws describe the perception the supporters hold for an undesired situation, which is waiting to be dealt with. Unless the required support is provided, those flaws will have the negative effect of reducing the capacity of an information system to serve its supporters and, in a domino-effect fashion, may culminate in the introduction of even more faults. Over the passage of time, the volume of flaws may become overbearing and trigger a decision to remove support. This would mean the termination of the project and thus failure.

4. UNDERSTANDING FAILURE THROUGH IDENTITY LOSS

Having discussed these two important frameworks for explaining information systems failure, we now build upon them. The purpose here is to 'add value', through synthesis, by developing a conceptual model that: firstly, shows each framework in a complementary light, enhancing the explanatory strength of each; and secondly, challenges the existing paradigm of information systems development. In the first instance we return to Lyytinen and Hirschheim's (1987) criticism relating to the rational image of information systems as neutral, technical artifacts. This is then expanded to cater for their observation that "... a more detailed understanding of the environment in which stakeholders act is required for clarifying why ISs [information systems] fail" (Lyytinen and Hirschheim, 1987: 298).

The past three decades have seen an incredible increase in both the capacity and availability of information technology (see for example, Land and McGregor, 1987). In accounting for this, a study of the meaning attached to information systems may see the evolution of such as moving from their recognition as technical systems to recognition as technical systems with concomitant behavioral and social implications. Land and Hirschheim (1983) argue that this is not the case and that they should be seen, first and foremost, as social systems, which increasingly rely on information technology. However, it is proposed here that the *fluidity* and *interpenetration* between technological and social views makes it increasingly difficult to know, in Scarborough and Corbett's (1992) words, 'the dancer from the dance'.

For the purpose of illustration, it is proposed that this fluidity and interpenetration between technological and social context can be viewed at micro and macro levels. Taking the micro case first, Land (1992) contends that the majority of information systems have three major *information sources*: (1) the real world itself; (2) the designed (or formal) information system - represented as an artifact whose intention is to provide an exact image of the real world; and (3) an informal information system - which may substitute for the formal system, and which is often used to provide qualitative and evaluative information about the real world. How an *individual* employs these sources depends upon a number of *factors* such as cognitive style and preference, knowledge, and memory, and the mode and language of presentation (verbal as against body language for example). In turn, the *operations* of these are often rooted in the individual's culture, education and experience always in parallel with specific environmental and situational factors. We suggest that these factors and operations may be

grouped under the heading of *perception*, which the Collins English Dictionary (1994: 1156) defines as “the process by which an organism [the individual] detects and interprets information from an external world [the information sources] by means of the sensory receptors [the factors and operations]”.

In moving the analyses of fluidity and interpenetration from the micro to macro, we seek here to extend the work of Ives *et al* (1980) who views an information system as the outcome of three distinct internal environments - those of *use*, *development* and *operations*. In turn, we visualise these environments integrated with three circuits defined by Scarborough and Corbett (1992), these being:

- *Circuits of power*; concerned, in the main, with the political considerations of stakeholder groups. In dichotometic terms, this revolves around the tendency for such groups to use the information system to reproduce or expand their power and influence, set against the loss of such power and influence - via the information system - to a wider range of groups, contexts, and knowledge.
- *Circuits of meaning*; where the objectivity of the material form of the information system may disguise levels of subjective intent and knowledge - intentionally or unintentionally. Thus, on one hand, stakeholders may translate their interests and perceptions into powerful and coherent ‘ideologies’ whilst, on the other, implicit and protracted use of the information system may ‘reframe’ the way the real world is perceived - thus reshaping values.
- *Circuits of design*; which can be broadly seen as the flows of knowledge, information and artifacts between the processes of invention, exchange and use (characteristics of the innovation process). This may be seen as the political and ideological ‘frame’ within which new technologies and new ideas may be evaluated. Within such a frame, the perception of the relative efficiencies and utilities of the information system becomes both the validation of the system and the determinants of its success or failure.

Figure 2 illustrates the fluidity and interpenetration of these micro and macro views. The individual is central to the environments depicted and is an integral part of the information system itself. Whilst an individual may bring preconception to an environment, the interplay between individuals is explained through the circuits of power, meaning and design. It is such ‘interplay’ that counters Sauer’s (1993) criticisms regarding expectation that were discussed earlier. However, we would argue that any particular balance of interest could only be observed in context. In addition, the model

Figure 2: Fluidity and Interpenetration of Information System and Environment

acknowledges the mutuality, fluidity and interpenetration between its elements: both internally and at the nexus with the external environment. This recognizes Tricker's (1992: 15) criticism of Ives *et al's* (1980) original model: this being that "... the environment of an information system defines the purposes of, the constraints on, and the resources available for the information system. It does not see the information system as a fundamental part of the organizational model itself". Lastly, we stress the dynamism underlying the process, with individuals and collective concerns changing constantly.

Let us now further our explanation by considering how negative concerns may be formed. Since the widespread touting of the 'software crisis' (Pressman, 1994), systems development has increasingly been seen in terms of increased control and the widespread adoption of formalized systems

Figure 3: Identity Loss

development methodologies (Grindley, 1986; Hirschheim et al, 1995; Fitzgerald, 1996). Though these may be argued to be weak or 'retrospectively constructed' in practice (see Baskerville, 1996; Fitzgerald, 1996), the stalwart of all major approaches is the *specification of requirements*. Thus, we would argue, an *identity* is placed upon a formal information system from the moment a decision is made to put one in place. Current design approaches strive to maintain this identity and, though they may allow for iteration and evolution in the design process, they fail to allow: (1) for any shifts that may occur in the business context; and (2) for any shifts in individual or collective expectation (both with regard to the relative utility of the system and information 'needs').

Identity loss allows us to explain this. Information systems inhabit a time continuum from their inception to their final demise - intentional or otherwise. If we combine the passage of time with the dynamism of our previous model, the contextual change that results has serious implications

for the identity of an information system - it erodes. The concept of identity loss is illustrated at Figure 3 in the previous page.

On the left side of the figure the system has the *strong identity* imposed upon it by the specification of requirements. The second stage in the figure illustrates a *given context over time*. This subsumes the previous model herein and thus contains the environments and circuits previously discussed. Change - realized through the interplay of individuals, environments and circuits - can take any, or a combination, of the following forms: desirable/undesirable, gradual/sudden and temporary/permanent (Kanellis *et al.*, 1996). However, it is this 'contextual change' that has a destabilizing effect on an information system that has no adequate response for it.

With this in mind, we argue that these phenomena can be explained by the following propositions: (1) that the system no longer meets its perceived design objectives (*internal* failure); or (2) that the system objectives are no longer perceived to meet the information needs (*misfit* failure). These two types of failure are not seen as mutually exclusive, both are products of contextual change. A successful business is constantly adapting to change within its environment and, following the argument of mutuality, so should its information systems. However, as has been argued, the 'exacting' identity given to the system inhibits its ability to adapt to shifts in the business context - resulting in misfit failure. Likewise, perceived flaw in the execution of the design, or shifts in individual or collective expectation (either during design or when the system is in use) results in internal failure. Clearly, this is a *mutual* relationship, with contextual factors affecting expectation and vice versa. This takes us to the final stage of Figure 3, which shows the effect of contextual change - the information system iteratively losing its identity. Once this state is reached, there are two options available to the stakeholders affected by the situation: (1) to maintain the system and thus restore its identity; or (2) to terminate it.

In developing the identity loss model, we have purposely sought to avoid producing a model that is prescriptive - i.e., one, which can be used to diagnose the risk of failure and to plan stakeholders' action. However, the interested reader can find empirical application of the philosophies contained herein in Kanellis *et al* (1998). Our aims here are: (1) to provide an understanding of a major theoretical mechanism that produces information systems failure (identity loss); and (2) to provide a fresh conceptual view regarding information systems development. With regard to the former point, the two types of failure that we have chosen to depict within the model are viewed as generic: we would propose that most types of failure that we have discussed would fall within one or the other of those shown. The latter

point now forms the focus of our attention. The case study that follows offers an empirical example of the identity loss model and forces us to postulate that what is truly needed is a fundamental reconsideration of approach to the development of information systems.

5. THE CASE STUDY

In this section we present the results of a case study which was carried out over a period of eight months at National Power (NP). NP is a devolved organization operating within and outside the UK electricity sector. It is one of the world's largest international contenders in the fast – growing independent power market, and the biggest in the UK with an over \$6 billion turnover. NP was moving from a period of relative certainty during the privatization process, to a much more uncertain time in the UK electricity market. This was coupled with an expansion into new, and unfamiliar, international markets.

The fact that it is only price that distinguishes NP's electricity from that produced by its competitors resulted in the company having to set new and clear objectives in addition to a rapid and radical reorganization. NP's information systems were put in place in 1990. Upon its establishment, the company was a 'green field', and the task of putting the IS into place was undertaken by a consulting firm. The classic 'big-bang' approach was adopted for their development using a proprietary methodology. Taking into account the continuing change that they have been experiencing post-privatization, we investigated how their main systems had fared. The rest of the present section offers an interpretation of the situational conditions resulting initially to information systems disappointment at NP, whilst at the same time making possible the emergence of true flexibility in an unorthodox way. The interested reader is referred to Kanellis (1996) for a description of the methodology followed regarding the collection of case study data and the synthesized framework used for the subsequent analysis.

The analysis of data indicated numerous instances of misfit failure being experienced at NP, leading to internal failure and back again in a circular fashion, as depicted in the identity loss model.. For the purpose of clarification, we have termed these as **structural misfit**, **processual misfit**, and **technological misfit**.

5.1 Structural Misfit

The systems at NP were built around the structure of the company, and either just after they were implemented or at the point that they were

implemented, the company changed. A review was carried out in the three months to February 1992 of the suitability of the IS to operate following the devolution of business activities to power stations. The systems in question were mainly the Finance systems and PRISM (a work management system). The findings of the review were that the systems available were suitable for devolved use with some minor modifications. Those modifications represented only those aspects of the systems that could directly prevent devolution. It was also recognized that as those systems were designed prior to devolution, other changes could be usefully made to enhance effectiveness or efficiency. In the time space of almost three and a half years (February 1992 to May 1995), one would expect that the modifications would have been completed successfully, resulting to no misfit at all. However, evidence shows that this is not the case – the process of devolution made demands on the systems that could not be satisfied by simply maintaining them.

The finance systems we put in, we set up for a particular structure, culture – whatever you want to say and that changed in the last couple of years tremendously. It was like trying to fit a square in a rounded hole, and the number of changes requests to the systems increased, and have been coming non-stop ever since.

Procurement for example, was a central activity that had specialist people dedicated to this task. Devolution meant that this task was now undertaken ‘part-time’ by non-specialist personnel, as people were required to be more flexible and to work on different job aspects. This meant that the task was now only four or five hours a week of an employee’s time, resulting in a negative perception about the systems as being geared towards professionals, and hence too complicated and difficult to use.

In the early days, we regretted some of the assumptions that we made, as we used to design systems to particularly reflect the structure of the organization, or the way people worked, and while it may have been true at the time, it wasn’t always true in the longer term... and I think one of the major problem areas was in the procurement side of things, and still is...

The very clear division of the organization into distinct business units provides another example of structural misfit. The systems were designed to fit this structure, but in time the business cycle has come to cross all the function areas; the systems now fit the functional breakdown, but they do not fit the organization as one entity. In addition, systems are perceived as being too ‘big’ for what the organization needs for what it does now. This type of misfit has serious implications for the ways that development projects will be managed in the future. It indicates a change to the structure of the systems development units themselves, and poses a question as to how they will operate in the future. A senior developer explained:

You cannot shrink the business continually and expect those projects of that size to remain unchallenged. So far as the changes concerned, the threat is that if the operation is reduced, we get to a particular financial level where the IS activity becomes disproportionately large in terms of operation. I think that is perhaps the single area where the greatest threat is.

5.2 Processual Misfit

This type of misfit refers to the inability of an information system to keep providing the same level of service to a business process. It would not be an exaggeration to say that no process has remained the same since the early stages of privatization; processes have not only changed but they have kept on changing. IS that support these kinds of business processes are the most vulnerable to change as they deal with voluminous and complicated data at the half-hour level. The systems at the Energy Management Centre (EMC) had to be scrapped altogether and a new breed of systems based on the concept of data warehousing had to be developed to account for the changed processes. A senior manager commented:

The part of the systems that you can define – that you know it has to be a deliverable – your interfaces, getting the data from the power stations and into your offer file – that is the easy part. What it is, it is the analysis of all that – the kind of thinking – the strategy point of view. It is all around the main deliverable for the EMC – that's what is continually changing. It is impossible to define or specify in advance a deliverable. It changes every day!

Processual misfit is also evident with other business units such as Fuel. One manager commented:

I have seen a couple of instances where management IS have failed to cope with the pace of change and have caused the organization to make inappropriate decisions as a result, and we then had to run to catch up with the circumstances.

It is probably this type of misfit with 'intellectual' systems such as MIS and DSS, that hinges to a need for a different approach to development. One developer responsible for developing such systems for the Sales and Marketing and Strategy and Financial Planning units remarked:

If everything is changing which it does do, then one thing that I have found is that it is actually quite difficult to alter the scope of an application whilst under development. You tend to fix your scope at the beginning, and you refine it into more and more detail, and by that stage it is quite difficult to stick your head above the parapet and see if you are still at the same place. Then you show it to the users for acceptance test, and they say "Oh! But that was all very well then – we do things differently now!"

What one might define as 'operational systems', and expect them to be stable, are in fact equally vulnerable to change. For example, although the process of work management might seem as fairly stable, it had changed in the sense that the way the work is done at power stations now is much

different. For a start, there is not the same number of personnel that was available at one time, and there are no planning departments now, which there were before. There was a much greater emphasis on cost-benefit that determines the maintenance philosophy in deciding to change processes or operations. A manager from Generation provides some evidence for our argument:

Some of the changes were never at the outset envisaged as being as extensive as they actually were, which resulted in us making more changes to the systems that we have otherwise had anticipated. It also meant that some of the more refined facilities of the systems have become less used. So yes, they have been inflexible in the sense that it would require a large amount of effort to change or add some functionality.

5.3 Technological Misfit

This type which is caused simply by advancements in technology, seemed to affect all the main systems at NP. As those were designed five years ago, they were character-based and with busy screen representation. In the sense of usability, they are perceived as not being up to current practice standards. This means that in order to use the systems, users have to get familiar with them for some time, and this is not always possible under the current situation – few employees, many tasks, little time. Users have now to be fairly able to switch from one system to another and perform various tasks at the same time. Technological misfit does not immediately mean that an existing process can be performed more effectively with new technology, in terms of the quality of information needed to make a decision. Indeed, managers commented that for many people at NP, that seems to be secondary, and they draw a parallel with the fashion world. They see however this desire to work with the most current and ‘sexy’ system as a natural thing – a progression, but at the same time they are also aware of the fact that it might lead to a diversion from what the business actually wants. Most managers, feeling powerless with this technological evolution have decided to consciously ‘ride’ along with it. What they are finding however, is that the line between ‘going there because it is there’, and ‘going there because you know why you go there’ is becoming more blurred, as the rate of this technological process increases.

In summary, the implications of the three types of misfit that follow are the result of information systems at NP that have not been designed to provide for change. These were:

- ◆ The quality of information provided limits the purpose which particular systems were designed to serve.
- ◆ Accessing the information is difficult. Users are asking for a lot of information but they do not know how to get at it.

- ◆ Users need the information in different ways and at the same time, the number of users who need this information is increasing. This demands a level of sophistication that existing systems cannot provide.
- ◆ The current level of integration between the systems hardly approximates the one required. As a result, the information flows suffer considerably.
- ◆ Management information has been neglected. Attempts to provide for it by combining systems or building on top of operational systems, has produced ones that are over-complicated and under-utilized.

The paper suggests that the identity of a system is bound up with the functionality that it displays. It can be argued that identity and functionality are quite different matters because a system can be successfully maintained, and hence its initial identity in functional terms may be totally lost without the system failing. Although we agree with this point of view, we want to stress out that in a dynamic environment, maintenance produces no results. Change here is the dependent variable, and the initiator of a dynamic process against a predetermined identity given to it and defined by the specification of its requirements. Because of change, repetitive identity loss will finally result to abandonment and termination – disappointment in the beginning and then failure. NP provides a good example of an organization where the rate of change has superseded all maintenance efforts resulting in systems that should be deemed failures in any of the categories defined by DeLone and McLean (1992) [system quality, information quality, use, user satisfaction and individual impact].

In turn, what differentiates the identity loss model of information systems failure from previous ones is the fact that those see ‘maintenance’ as a solution or accept it as a ‘necessary evil’ in information systems development. By rejecting this view, and realizing the vulnerability of information systems in turbulent environments, the value of the identity loss model rests in demonstrating that information systems research and practice should rather stop offering palliatives to combat the symptoms of information systems failure, and begin to reconsider its fundamental assumptions and approaches.

6. THE IMPLICATIONS OF ‘IDENTITY LOSS’ AND THE EMERGENCE OF TRUE FLEXIBILITY

Organizational impact, one of DeLone and McLean’s (1992) success variables refers to the extent of the effect that the systems can have on organizational performance. In the case of NP this gives rise to the

following paradox: how, on one hand, is it possible for such a level of information systems misfit to exist, and yet an organization as heavily dependent on its systems, to be able to flex and adapt successfully to continuous environmental contingencies? Although there was a negative overall perception regarding the fit of the systems, with a large percentage of those not being used as they were supposed to – user activities and tasks did not seem to be disrupted in any way. One would expect otherwise, but we found that users were not tied down by the systems. What explains this phenomenon is perhaps the simple rule of survival: threatened by adverse circumstances, one has no choice but to adapt. One manager from Finance commented:

You think that you have a financial accounting system, and you think you are producing the company's trading account, and one day you find that everybody is doing it in a different way by the spreadsheets. And you could say "You shouldn't do that! It is all there. It is a waste of time!" But people do not waste their time for the sake of it, do they? It is obvious then that they are doing it because there is some great hole in there.

The same phenomenon is evident in what a manager from Generation said:

Systems have fallen away and people are not using them as much as they should. And just about everybody, everywhere, is taking data out of the main systems, and either re-keying it in, or use whatever method is available to them to get data into little applications, so that they can then move the data around and use it the way they want to, because they see that the system they access – the PRISM system – is inflexible. What we are trying to do now is to recognize that this is a key requirement, and just deal with the data – not to deliver them any systems.

The Sales and Marketing business unit makes heavy use of the Finance systems. This is what a manager there said:

As changes occur in the business world, if you cannot get to change the system because the money or the project team has gone – they do it with a spreadsheet – they do not bother with the system that you have spend half of your life to develop – that's a hidden problem as well. I mean, we look at systems and say "Oh! We never change the system. It is a bloody success!" But really, what happens is that the buggers put a Lotus spreadsheet there to do their work with it. I mean our Finance systems are crap. If I wanna know how much money I have spend on contracts at the end of this month, I go and get a bloody spreadsheet. Walker cannot tell me – not in the way I wanna say it. So people do bits and bobs around the edges, don't they?

There were a number of conditions that made possible the development and existence of the above phenomenon. NP upon privatization put in place a number of IS; continuous change since then has practically crippled them with respect to what their initial purpose was; at the same time the policy of the company was such that it gave users almost complete autonomy and freedom with respect to meeting their own systems and informational needs; people used this freedom and have developed small applications of their own, and along with application packages have cannibalized the over-

arching systems to give themselves a system that is working by adapting it to their particular need. A truly flexible information system, but certainly not a planned or intended one.

Information Technology Services (ITS) even had a name for this situation. When we were asking for comments, they were referring to it as the 'Lotus Cult'. An appropriate name we thought – 'cult' signifying a kind of underground alliance – for the groups of users who have a disregard for the formal IS imposed on them, and in a way have taken control of their own 'fate'. We must note however, that this underground activity has come to be seen as essential even by the 'authorities' themselves. One member of the ITS team said that if one ever attempts to take this away, parts of NP would stop operating within a day, and the company would soon collapse.

7. THE NEED FOR LIVING INFORMATION SYSTEMS

The maintenance route, indicated in Figure 3, represents 'where we stand today' with regard to information systems that have to adapt to change. However, as Paul (1994: 392) notes, ". . . the very word maintenance suggests corrective action, as though somehow, the need for change could have been avoided if somehow, we had known better". It is this mentality that guides our current 'understanding' with regard to systems development and pushes us toward more control, rigour and formalization. This 'understanding' is expressed by Paul (1994: 391) in the 'mock' Fixed Point Theorem of Information Systems, this being that:

"There exists some point in time when everyone involved in the system knows what they want and agrees with everyone else".

We have shown, through the development of the first model, that this is extremely unlikely. Unfortunately this understanding is exacerbated by the project-based nature of development (see Grindley, 1986) which, in the current paradigm, necessarily restrains development to a fixed time period. Thus we develop systems around a (hypothetical) point in time, which are then asked to operate across a time continuum. This time continuum, in turn, is characterized by our first model.

Identity is therefore 'lost' because it is static and exacting. That is not to say that identity is not important: it is very important, as it is the way that the stakeholder 'sees' the system. However, what this identity needs to exhibit is a 'plasticity' (see Maturana and Varela, 1973) - allowing the system to remain consonant with its context over time. For us, what is required for living businesses are living systems. These are systems that are not judged to

'right' or 'correct' but that are constantly undergoing change to meet changes in context, need and circumstance.

In retrospect, the concept of identity loss implies a paradigm shift in information systems development - to one where the systems designer will no longer be required to foresee every contingency or articulate every requirement of a design. Information systems will not be given a static identity, but will be developing their own - having been brought in existence as 'infants', with the ability to grow and adapt, as opposed to 'inflexible' adults. It is thus postulated that what is required is an architecture for information systems that is designed for breathing, and thereby adapt to inevitable and unknown change. Such an architecture has less to do with 'what is wanted', and more to do with the creation of a living space within the information system that enables the information system to live.

Our own research into the plausibility of such a development 'understanding' currently takes two forms. Firstly, through external-reference and external-modification: examining 'tailorable systems' as a way of giving stakeholders better 'real time' control over their particular part of an architecture. Secondly, through self-reference and self-modification: examining whether biological theories such as 'autopoiesis' (Maturana and Varela, 1973), in combination with genetic and evolutionary techniques, can provide better architectures for information systems.

8. CONCLUSIONS

We have used the concept of *identity loss* for two purposes: firstly, to draw together existing conceptualizations of failure; and secondly to highlight the static nature of the predominant information systems development paradigm. In addressing the former we have sought to offer a more complete conceptualization of: (1) the 'what' factors that should be considered as part of the explanation; (2) 'how' they interact with each other; and (3) 'why' the outcome of these relationships may produce flaws or, more seriously, termination. The 'what' and 'how' have been accounted for extensively through the concepts of mutuality, fluidity and interpenetration. Sauer's (1993) criticism of expectation failure - that it gives equal weight to all interests - does not apply here. The circuits of power, meaning and design are argued to have different values at different points in time for different groups of stakeholders. Their interrelationships allow that: (1) some stakeholders will have greater capacities than others; (2) some stakeholders expectations may be more reasonable than others; and (3) that they most certainly convey explicitly or implicitly some intention.

The 'why' rests on contextual change. Its projection through the notion of *identity loss* is what we believe differentiates our conceptualization from those that have gone before. We have not actively sought to produce a model that is prescriptive - i.e., one that can be used to diagnose the risk of failure and to plan stakeholders' action. Instead we have used our synthesis of the literature to point toward what we see to be a fundamental flaw in the way that information systems development is currently 'understood'. In addressing this, we have painted our own vision for the future. This rests on developing an understanding of 'living' information systems - that is, information systems that are able to adapt to context, needs and circumstance. However, we would venture that a major improvement in information systems development will only occur when many, if not most people involved, take on the paradigm shift necessary.

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