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Examining the Problems of an Institutional Information System

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Abstract

This paper reports the main problems from the investigation of a student record system. Lessons learned from this investigation are applicable to other types of information system. The system under study exhibited persistent problems, and the aim of the research was to identify the main causes for these, and to understand in particular the human issues involved. Action research was used and this uncovered both proximate and deeper causes for the problems identified. In terms of solutions, well-established approaches were not being employed in the area of strategic information management. But at a deeper level it was clear that aspects of organisational culture also needed to change. Overall, there was a need for a more 'critical' process, encouraging greater openness in response to problems, and in helping planners and participants consider 'social theoretic' aspects of the system. These included the motivation of individuals, information ownership, and the implications of hierarchy and power.

Key words: Action research; student record system; higher education

Topic area: IS Evaluation

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1.0 Introduction

This paper reports findings from an investigation into the problems of a student record system (SRS) at a UK university. This system was a key part of the university's overall suite of information systems, and had shown significant problems over a considerable period. The aim of the research was to bring a wider focus to the analysis of these problems so that more effective solutions could be proposed. While this system was specific to this university, it is recognised that many of the problems uncovered occur in information systems across many types of organisation. Action research was used as it was considered particularly appropriate in identifying not only the problems, but also the deeper causes for the problems that were encountered. For the same reason, the range of literature reviewed to assist the analysis was deliberately set quite wide, as the need was to get 'under the skin' of problems, and in particular, to discover if 'critical systems thinking' could make a useful contribution.

2.0 Literature Review

2.1 The Concept of 'Information'

In this research, information was seen as something used by, and passed between, individuals and groups in a given social environment; and where the information's meaning and utility is determined by people's perceptions at that point in time. These perceptions are influenced, in turn, by the social forces that exist between the individuals and groups involved.

2.2 The Complexity of the 'System'

A 'system' can be defined narrowly as a set of elements combined with the interactions that exist between them. Avison and Fitzgerald (1995) broaden this, stating that a system represents a way of thinking about the set of interacting components. Flood and Jackson (1991a, p. 2) went further still, and defined a system as "a particular way of organising our thoughts about the world". While the narrow definition correctly captures a system in physical terms, the two wider definitions help to focus on the Kantian view that to understand systems in which people play a role it is important to understand the participants' thoughts and perceptions. The history of developing methodologies for the construction of *information systems* has consisted, in part, of trying to come to terms with this question of what is the 'system' being examined. Is it just the data and technology, where people are passive recipients of the information? Or do the people in the system have perceptions that need to be considered; or indeed be changed? Or is it better still to see the people in the system as a complex social group, with a variety of 'mental histories' and viewpoints that control the way that information is generated, distributed and acted upon? These questions are fundamental to the design of information systems if they are to be effective.

2.3 Hard, Soft, and Critical Systems Thinking

The literature review then examined the change that had occurred from 'hard' to 'soft' approaches in information systems development. This change reflected the growing awareness that the introduction of systems needs to fully understand people's *perceptions* of a situation, as well as the situation itself. 'Hard' systems thinking (HST) treats the organisational world as objective, and is appropriate for well-defined

technical problems. But it was often seen as unable to deal effectively with complicated ill-structured situations characterised by human activities (Flood & Jackson, 1991b). 'Soft' systems thinking (SST) thus came into being with its argument that the study of human organisations should be based on subjective meaning and interpretation (Checkland, 1981). However, SST itself was criticised for being unable to help practitioners address the problem of *coercion*, as well as its inability to combine multiple methods. Critical systems thinking (CST) thus developed (Ulrich, 1983; Jackson & Keys, 1984), where this was based on critical social theories and arose from critiques of both 'hard' and 'soft' approaches. As discussed by Clarke (2004, p. ii) 'critical systems approaches, by their ability to address the shortcomings of both technological and human-centred methods, provide a way out of the dilemma'. CST accepts the place of both HST and SST, but also emphasises the oppressing and inequitable nature of many social systems. CST is characterised by three commitments – to *critique* of the process encountered, to the *emancipation* of those involved, and to *pluralism* in the approaches adopted (Jackson, 2000; Jackson, 2003; Mingers & Gill, 1997).

2.4 Organisation and Management Theory

Understanding how people perceive, use and react to information requires a broad understanding of how they behave in various social settings within organisations, and of how the organisations themselves behave. The literature review covered the extensive literature on these issues, and aspects of the performance of the SRS were examined in the light of the various general theories of management. These include environment analysis (Porter, 1990), organisational structure (Morgan, 1986), organisational culture (Schein, 1996; Wit & Meyer, 1999), resource management (Johnson & Scholes, 1993), information needs analysis (Ulrich, 1983; Ward & Griffiths, 1996), strategic alignment (Galliers, 1993; Wit & Meyer, 1999), competitive advantage (Porter, 1980), and managing strategic change (Mintzberg & Westley, 1992). All these approaches help inform the viewpoints and constraints that need to be kept in mind when examining an information strategy.

In addition to the literature review mentioned above, detailed knowledge of the student record system was gained by examining the documents and electronic publications available at the university relevant to this SRS. These included the

University's *Five-year Strategic Plan,* and the following university documents: *Academic Information Management System - User Requirements; IT Standards and Procedures; Academic Computing Services; Administrative Computing Services; Academic and Disciplinary Regulations for Students;* and the *Quality Assurance Handbook*.

3.0 Research Methodology

A review of available research methods showed that probably the most suitable method for this study was action research. This is because it enabled the researcher to directly experience the situation under investigation, and was likely to offer a better understanding of the information obtained from interviews and associated discussions.

Researchers have given a number of definitions for the 'action research' (AR), and it is generally held that AR refers to a class of research approaches, rather than to a single method (Baskerville, 1999). However, these various forms of AR share agreed characteristics: AR is commonly regarded as having an 'action' and 'change' orientation; participation with the people involved in the research process; collaboration among participants; a process that is seen as educative and empowering; and which involves stages (sometimes iterative) of problem identification, planning, action and evaluation. To help plan the research, Maxwell's model for research design was used. This has five components: *purposes, conceptual context, research question, methods* and *validity* (Maxwell, 1996). In terms of the research carried out here, these components are presented in *Table 1*. Among these components, *methods* were key to reach the objectives of the investigation. These included: document review, acting as a system user, conducting discussions, and semi-structured interviews with other users of the SRS, interventions with problems and concerns of co-workers, and feedback and liaison with senior management staff. To improve the research validity, the researcher checked results with the respondents, confirmed findings with daily users of the SRS, and triangulated these data with another investigator of the system. In addition, the findings from the AR were fed into the university's information strategy development process via the university's Information Strategy Steering Group.

Components	Descriptions
Purpose	Provide a context for the development of an evaluative framework for information strategies in HEIs.
Conceptual Context	Serious problems in information provision were identified with the SRS at the selected university; it was considering a new SRS.
Research Question	Identify problems, analyse causes, and suggest solutions for improving or changing the system.
Methods	Use action research; review documents; act as a system user; design questionnaire; conduct semi-structured interviews; report the findings.
Validity	Consult experts; check results with respondents; confirm findings with daily users of the system.

Table 1 Design Components for the Investigation of the SRS

4.0 Empirical Investigation

As the first part of the empirical investigation, the researcher gained access to the SRS by acting as a data-input assistant, working for two weeks inputting student information during the enrolment process at the start of a new academic year. Through this process the researcher acquired not only first-hand knowledge of the main functions of the system, but also of some of its problems, and of the frustrations experienced by system users. During these two weeks the researcher took part in conversations with many system-users concerning aspects of the SRS, including system mangers and administrators, as well as other co-workers. This gave additional points of contact for follow-up of the subsequent interviews. Within this period, it was already possible to identify some of the causes for the problems with SRS. These findings are discussed later in this paper.

The main part of the empirical investigation included a series of semi-structured interviews. Drawing on the background documentation about the SRS, and based also on discussion with colleagues while working within the system as described above, the researcher generated a questionnaire for conducting semi-structured interviews. This had ten basic questions (listed in *Table 2*), and was used to elicit opinions about the system from those involved in, or affected by, the SRS across the university. In designing the questionnaire, care was taken to keep the questions simple to avoid the opportunity for ambiguous answers, while at the same time allowing for flexibility in conducting the interviews with individual participants.

1. What do you think *should be* the main functions of the Student record system (SRS)?
2. What do you use the SRS for?
3. What do you like about the system?
4. What are your main complaints about it?
5. How easily can you access the information required for Subject Review? If this is not easy, what other sources of information do you use in relation to student record?
6. How far did the information available on the system reflect the information you required for managing various programs/projects?
7. What do you think we *ought* to do to manage the input and output of the system?
8. What training has been provided to you for using the system?
9. Where do you go if you have to resolve problems with the system?
10. How do you think the system *should* be managed?

Table 2 Questionnaire for semi-structured interviews on the SRS

Sixty copies of the questionnaire with a cover letter were sent to selected users of the SRS within the university, and a period of one week allowed before further contacts were made with the recipients. Those selected as the potential interviewees were mostly recommended by colleagues on the basis that they had expressed a special interest in, or a concern about, the operation of the SRS. The cover letter of the questionnaire explained that the questions would be the basis of the subsequent interview. It was anticipated that by allowing potential respondents a week to read the questionnaire and prepare for the interview beforehand, more reliable and considered information would be obtained during the interview itself. Overall, there was the opportunity to follow up 32 of the 60 questionnaires on a face-to-face base.

These interviews, each lasting for about twenty minutes, followed the general structure of the questionnaire sent beforehand. The main aim of the interviews was to elicit specific facts about the SRS form the interviewees' point of view, but there was also a need to 'get below the surface' of the issues in a critical systems thinking sense (see questions 6, 7, 9 and 10). As the questionnaire made clear, '*ought*' / '*should*' questions were asked (questions 1, 7 and 10) as well as '*is*' questions. The questions were also intended to raise issues to do with hierarchy, control, and sense of empowerment within the system (questions 8, 9 and 10). Most of those who were

interviewed were interested in talking about the system, and some became animated about the topic.

As this was qualitative research with data derived from documentation, observation notes, formal interviews, and a range of *ad hoc* sources, a fairly large amount of unstructured data was generated which required management. Here the 'interactive model for qualitative data analysis' proposed by Huberman & Mathew (1994) was found useful, as it facilitated the data analysis of the action research. Based on this model, the researcher analysed the data collected via three linked sub-processes – data reduction, data display, and conclusion drawing/verifying.

In analysing the data from the interviews, at the data reduction stage a full transcript was made of the issues discussed at each of the interviews. Once full transcripts were produced individual summaries were made of the key issues discussed. Based on these, the key issues were then categorised into thirty-seven categories in total, with each category generally being mentioned by several, sometimes many, of the interviewees. Typical responses given by the respondents were then listed for each category and, where appropriate, possible causes for the problems identified and solutions suggested.

5.0 Key Research Findings, Proximate Causes And Suggested Changes

The main findings from the investigation of the student record system, drawn from the categorised database mentioned above, are now described. These are presented under the sub-headings of: key functions of the system, main problems identified, the proximate causes for these problems, and suggested solutions.

5.1 Key Functions of the System

The SRS was intended to provide sufficient information about the students so as to meet academic and non-academic needs, as well as internal and external reporting requirements. Specifically, the system - as a minimum - should have provided the following key functions:

Recording information about students - including register applications; and application decisions made by the university; enrol students of all levels on courses; provide look-up of personal details of individual students; maintain assessment grades; and record students' progress within the university.

Facilitating student administration - including generate students' ID numbers; check students' enrolments, programmes, module choices, and fees; set up module and programme codes in the study block tables and map these against UCAS (Universities and Colleges Admissions Services) codes; track applications from international students, and print reports on their admissions and enrolments; set up non-standard fees; generate examination timetables; and maintain the assessment database.

Assisting academic activities – including produce course lists and module lists; generate student transcripts and reports to examination boards; provide student grades in relation to progression and support advice to students with 'Fail and Negotiated Progression' decisions; print and use student transcripts to support advice in relation to student disciplinary procedures, grievances, complaints and fee-waiver applications.

Providing information for external organisations - including returns to HESA (Higher Education Statistics Agency) and HEFCE (Higher Education Funding Council for England); provide progression grades for LEA (Local Education Authorities); provide information for interrogation on behalf of other universities; use student transcripts to produce references and certificates for *students.*

Providing information for decision making - including access information to make a decision on an offer; produce a report on the Faculty's enrolment totals and full time equivalents (FTEs) for budget purposes; obtain summary statistics of the number of FTEs on modules and fields; obtain the student profiles to provide overviews of the students; use the system for management information and for student numbers to assist project planning, and to acquire statistics for Subject Review; and record whether information has been acknowledged by UCAS.

5.2 Main Problems Identified with the System

Through the interviews, a wide range of problems were identified with the SRS where the above functions were not being adequately met. *Table 3* summarises these by placing the key problems encountered into five broad classifications, and giving examples of typical comments from respondents for each of these categories.

Problem Category	Examples from interview
Production of incorrect information	"The system reported that students had not submitted a piece of work, but where the students were able to produce a receipt (from the University's Modular Office) of the work submitted." "At examination boards there were always a high number of students recorded as 'non-attempts', where these students had not in fact attended the modules listed." "Reports provided for examination boards often contained many errors, and thus had to be gone through individually based on the lecturers' notes on hard copy to make sure the information was accurate." "Students contacted the university because they received standard letters regarding absence, but they had graduated several years previously."
Production of ambiguous or unsatisfactory information	"There was no distinction provided on the system between a fail for a referral student who submitted work of poor quality, and a fail for non-submission." "The system was not able to prevent more than 8 modules (the maximum number a student could take) being entered for a student and one student was found to have enrolled on 17 modules!"
Failure in providing sufficient information about the students	"The student's degree classification was not printed on the final transcript. It was also not possible to access the classification result of a student from a previous year. Staff had to refer to paper-based examination reports to write references for students." "No information was carried about a student's other qualifications, age, ethnicity, and so on. And it was not possible to keep a record on the SRS of maternity or long-term sickness breaks."
Frequent failure in providing sufficient information required for key academic activities	"The SRS could not be used by some departments of the university for any purpose other than the generation of an ID number. E.g. for the Research Centre, the statistics needed the completion rates, the length of time needed for a PhD, withdrawals, transfers, etc., had to be calculated manually. And there was no information from the system about the research grants that the university received and details about how much, who for, and from whom." "Module numbers and lists were provided too late to assist with timetabling and the production of lecture materials." "Accurate information on progression rates was required for

	the Annual Course Monitoring Reports, but this had not been provided. A Field Manager had to use the examination board reports to calculate the information on progression manually."
Failure in recording sufficient core data required for HESA returns, HEFCE research, and subject review	"When making returns to HEFCE the number of students included on the return and the number that was recorded on the SRS did not match." "Basic information such as 'unit of assessment' which had to be included in the return to HEFCE was not recorded." "A-level points and occupational codes were not available on the system."

Table 3 Key problems with the SRS and example comments from respondents

5.3 Proximate Causes for the Problems

Investigation of the interviewees' responses led, in many cases, to the identification of proximate causes for the problems classified above. These included lack of system specification, lower data quality, inflexibility of the system, lack of communication within the system, and poor system management. They are described as follows.

Lack of system specification: There was no central person to contact to resolve queries with the SRS and there were few validation routines. Moreover, there were no central definitions for the codes used in standard reports. For example, no clear definitions were given on whether the totals were for FTEs or the actual student numbers, nor whether students on combined programmes or franchise students should be included.

Low quality data: Data errors in the system included missing data, missed fields, incorrect data, and duplicate data. There were even inaccuracies in the basic list of modules that were being run in a given academic year. Too many people, including the temporary staff without proper training (including the researcher herself), were involved in entering data onto the system, especially during the enrolment period. Overall, there was inadequate data verification within the system.

Inflexibility of the system: The SRS did not meet the needs of short-term projects, or non-standard courses. Also it only recorded the current status of students, so no historical view was available. No space had been created in the system to record information on students for previous years, nor to record information such as results of external examinations or students' grades for individual assignments. An overall

grade for a module after referral was not provided on student transcripts and examination board reports. The student progression decision and final degree classification were not included on a student's printed transcript. There was a tight schedule for exam boards but the system was unable to cope, particularly with irregular pathways, and it frequently calculated classifications incorrectly.

Lack of communication within the system: Information was held locally – normally one person held all the knowledge for a particular task. However, there was no timely communication between different sections or departments of the university. For example, there was a lack of communication between the staff who provided the HESA returns and the information for HEFCE research, and those who entered the data. There was also a lack of consultation with users. For example, courses were once re-coded by Quality Assurance without any consultation, and, as a result, codes for the same level and sometimes even for the same course were duplicated. Users were not informed of changes to, and development of, the SRS, and of the scope to access the system to its full potential. Every time somebody changed a module on the SRS, it complicated the student ledger. However, those who were entering data and changing modules were not informed of the impact of their actions. The procedure for student withdrawals and changes of their addresses had not been communicated to relevant staff. Therefore, effort was wasted in sending information/letters to students who had withdrawn from the university and to students' old addresses.

Poor system management: There was no continuity about the way information was handled in different years. Major changes were frequently made to the system just before key activities, such as clearing, enrolment, and examination boards, which resulted in reports not working properly because no time was available for the system to be tested after these changes.

5.4 Suggestions for improving the system

Based on an examination of the above immediate causes for the problems identified with the SRS, a range of solutions were suggested. Improvements subsequently carried out on the system were based, in part, on these suggestions. These improvements covered: quality of data, the system itself, system flexibility, system efficiency, and communication about the SRS.

Improving the quality of data: It was imperative that the information recorded within the SRS be as accurate as possible. To do so, it was recommended that a central core of trained staff with a thorough understanding of the SRS, and preferably with an academic background, conduct the student enrolment, rather than recruiting temporary data-entry staff with little training. In addition, the wider provision of training for users needed to be an integral part of plans for the implementation and enhancement of the institution-wide system. Moreover, errors that did occur needed to be trapped and corrected at the initial data entry level. It was recognised that these enhancements would incur significant additional resources.

Improving the system itself: The main purpose of the SRS was to serve as a database to keep an accurate record of every student registered, what they had achieved in the past and what they were doing at the present. So it was imperative to persuade the systems managers of the need to create the appropriate fields to provide a complete 'fresher to graduate' record of the student easily comprehensible to the system users. There also needed to be a compulsory summary transcript on the system which held basic information about every student. Updated information on students such as the module pass rates, pass rates after referral, progression decisions, final degree classifications and their current status needed to be entered on to the system as soon as possible after referral examination boards to provide a complete picture.

Improving flexibility of the system: Although most of the students in the university followed a conventional full-time undergraduate pattern, there was an increasing number of students who did not, and the range of learning patterns which they followed were becoming increasingly diverse. These patterns needed to be accommodated within flexible administrative systems. *Ad-hoc* systems could not be relied upon to deal with special cases which departed from the norm, as often these introduced errors in turn, and were not cost-effective. The system needed to be enabled to produce tutorial lists for modules, remove duplicate fields, and prevent conflicting information from being entered. Former student records should continue to be treated as 'live' records, and attempts made to continually update the contact details. Links needed to be created between the SRS and other key systems within the university, such as the Library System and the Finance and Personnel systems. Links

were also needed between the SRS and relevant external systems to facilitate the information availability and data transfer process. For example, the university needed to be able to transfer information available from UCAS to the SRS. A person or team needed to be empowered to oversee the system, and make sure it was clear whom to inform when problems occurred.

Improving the efficiency of the system: As mentioned earlier, it was often the case that before the internal and external exam boards at the end of each semester, the SRS was found inadequate in these areas, and there was difficulty in producing timely printouts/reports that were required for the exam boards. To avoid such problems, the system needed to be sized correctly in terms of hardware and software, and be evaluated against predicted level of use.

Improving communication about the SRS: Ongoing consultation was recommended between individual faculties, departments, and users from across the university. For example, system users needed to be able to notify the university's Academic Computing Services of typical problems so that the causes for the problems could be identified and rectified. In addition, before any new information system was introduced, the university needed to conduct a review of the processes that supported the collection and use of the underlying data to ensure that it provided value for money.

The above section has described mostly straightforward suggestions that addressed technical aspects of the problems within the SRS. Deeper causes for the problems encountered are discussed next.

6.0 Wider Issues - Critical Reflections from the Action Research

Analysing the problems with this SRS gave considerable insight into broader issues of the management of information. Four key elements drawn from reflection on the findings from the action research were identified. These were: organisational culture, information needs analysis, managing strategic change, and the implementation of evaluative structures.

Organisational culture: The widespread failings of the SRS pointed to significant problems within the organisation's culture. People were encountering problems with the SRS on a daily basis but were not motivated to, or felt in some way constrained from, getting these addressed. The prevailing culture was one of 'moan about problems' to oneself or colleagues and 'muddle through' rather than actively highlight problems when they occurred and seek cooperation to get them resolved. This was clearly a cultural issue, and one that needed to be tackled head-on.

Information needs analysis: Within the SRS, it was also clear that the information needs analysis had become out of date. Key information were missing, and the information available often unreliable. Some of the contributing factors for this were understandable, including reliance on a 'bought-in' software package; a large increase in student numbers, course modules and module combinations; and increased reporting requirements, both internally and externally. But the SRS failures pointed to the need that a more comprehensive – and participative - information needs analysis to be carried out, with people representing various areas and departments of the university being included and encouraged to express their views on the university's key information needs as a whole. This highlighted the 'emancipatory' aspect of critical systems thinking, with people being empowered to see the organisation's problems as their own, and to use their full capabilities in their work. There is a range of literature on such methods for information needs analysis which could have been drawn on.

Managing strategic change: The management of strategic change was another area where well-established approaches were not being employed. On a technical front, major changes to the SRS were being introduced without adequate - indeed, sometimes any - parallel running; while on the human front system changes were being implemented without adequate discussion or training of staff. In broader terms, strategy was being dictated from the top, with little attempt being made to allow for 'emergent' strategy formation.

In terms of this latter aspect, the solutions to the problems of the SRS were seen, in general, as two-fold: for the university's management to give more strategic attention to the running of the SRS, and for the staff working with the system to be encouraged

to become part of structures that allowed their concerns about the system to improve its operation in a more direct way. Both approaches would have been considered had a more 'critical systems approach' been adopted when system failings were identified.

Evaluative Structures: The lack of evaluative structures was apparent in the fact that the SRS failures had become chronic, and were not being picked up and addressed in any systematic way. Although serious complaints about the system were being frequently heard from the system's users, little had been done to improve the system, as the decision makers of the university had not realised, or were not willing to accept, the problems with the SRS. *Table 4* summarises the four key elements discussed above in terms of '*is'* and '*ought'* activities.

Element	IS	OUGHT
Organisational structure	Strategy was dictated from the top.	Attempt ought to be made to allow 'emergent' strategy.
Organisational culture	Nobody cared about addressing problems with the SRS.	A 'caring and sharing' culture ought to be encouraged.
Resource management	Inadequate resources management led to misuse and waste.	There ought to be in place some sort of applicable resource strategy to monitor the adequate allocation of resources.
Information needs	Information needs was insufficiently analysed.	These ought to be analysed and prioritised before any system development.
Strategic alignment	No alignment was made between various strategies.	There ought to be adequate alignment between information strategy and other strategies (e.g. IT, IS, ICT, L&T).
Managing strategic change	Changes were implemented without adequate discussion or training of staff.	Strategic attention ought to be paid to strategic change and wider participation ought to be included.
Evaluative structure	There was no appropriate evaluative structure.	Feasible evaluative structure ought to be established.

Table 4 'Is' and 'ought' issues related to the SRS

Subsequently, as part of the university's wider move towards an information strategy, it was decided that a specific study of the SRS *ought* to be instituted. This led to a formal evaluation being presented that listed a wide range of individual issues, together with recommended immediate, short-term and medium-term actions; as well as the identification of strategic principles that needed attention.

In summary, some of the issues raised with the system were operational, and could be remedied relatively easily. But many of the issues were more strategic in nature and required a more over-arching plan if they were to be addressed. In the case of the SRS it was clear that whilst it was seen within the university as a 'strategic system', it largely lacked strategic focus, with the result that the operational issues were often poorly dealt with. Specifically, links to other systems, human issues, and general long-term planning all emerged as factors in need of more concentrated attention. Overall, the SRS was seen as an example of an information system, where operational issues took priority over strategic ones.

7.0 Summary and Conclusions

This paper has reported on the investigation and analysis of a student record system (SRS) at a UK university. The purpose of the research was to understand the problems confronted by the system's users with a view to improving the acceptability of the information provided. Action research was used and within this, semi-structured interviews and numerous discussions were carried out across the university to elicit participants' experience and views of the system and to uncover deeper feelings about how the problems connected with the system were being viewed and addressed. The investigation uncovered a wide range of failings with the systems, including incorrect and ambiguous information; and a failure to provide information for some of the key academic activities and university external returns. Analysis of the problems identified a number of proximate causes, and also a range of deeper factors at work. Some of the issues with the SRS were operational and could be fixed relatively easily, but others were more strategic in nature and required a more over-arching approach if they were to be addressed. In particular, aspects of organisational culture associated with the SRS needed change, as people were encountering SRS problems on a daily basis but were not motivated to, or were being prevented from, getting these addressed. In addition, the strategy related to the SRS was largely dictated from the top, with little attempt being made to allow for 'emergent' strategy formation. Overall, the failings of this SRS were typical of many failed information systems. Users exhibited agreement with the system's aims but dissatisfaction with its reality;

there was confusion and blame about what was wrong; little attention to users' needs; and poor motivation of many of those involved.

To address failures of this type in the past systems thinking had moved from 'hard' to 'soft', and more recently towards 'critical systems thinking'. In terms of such thinking, the investigation of this SRS suggested the need for a more critical focus in the methods of inquiry, ensuring openness in response to questions, and in finding ways to encourage both system planners and system users to consider more complex 'social theoretic' issues. The latter included information ownership, motivation of these involved, and issues of hierarchy and power.

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