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A PRAGMATIC APPROACH TO IS DEVELOPMENT AND SOCIO-TECHNICAL EVALUATION

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Abstract

This paper provides an action research account of why and how UML use cases and socio-technical analysis were combined and used to support the development of an information system, using Multiview/WISDM as the framework of ideas. Significant learning points from, and the motivation for, the research is that a focus on task satisfaction and socio-technical evaluation, rather than on the broader concept of job satisfaction and a full, traditional socio-technical analysis, was more acceptable in practice as it related more clearly to the IS domain. The paper presents a socio-technical evaluation (STE) process, reflects on its application to a particular web-based project, and makes recommendations for its use in future ISD projects. The STE process consists of a task satisfaction survey (TSS), which draws on use cases as a template for investigating users' perceptions of task efficiency, effectiveness, and enjoyment, supported by qualitative interviews in order to systematically identify, verify, and discuss the users' problems and improvement proposals before and after IT implementation. The use cases constitute the context-specific, development-oriented link between the work system, systems development, and the STE process, which in turn helps ensure that the main goal of supporting and improving the work system through continuous development and deployment of an IT system is kept in mind.

Keywords: Socio-technical analysis, UML use cases, Action research, Task satisfaction

1 INTRODUCTION

The literature on information systems (IS) is very clear that the number of IS project failures are unacceptably high; the main reasons for this being 1) the failure to predict and manage the IS Development (ISD) process and the impacts and outcomes of introducing a new IS into an organization and 2) a lack of explicit concern for human and organizational aspects throughout the IS's entire developmental and operational life cycle (Doherty & King, 2005). The lack of concern is often explained by a prevalence of a 'hard' mindset, and therefore a focus on processes, engineering oriented methods, and IT; that is a focus on technical development rather than socio-technical change (Clegg, 2000; Doherty & King, 2005; Mumford, 1997). Moreover, it is explained by limited use of socio-technical approaches outside of an academic context, among other reasons, because practitioners are unfamiliar with these approaches or because they find them too cumbersome, time-consuming, and 'soft' (Clegg, 2000; Doherty & King, 2005; Kautz & Pries-Heje, 2000; Mumford, 1997).

The aim of this paper is to develop, through action research, a pragmatic approach to socio-technical analysis of information systems that draws on and can be used alongside traditional, engineering based approaches to ISD. To this end, we suggest that focus be shifted from a full, traditional socio-technical *analysis* and its belonging concept of *job satisfaction* to a time and resource efficient socio-technical *evaluation* that emphasizes *task satisfaction*. The research contributes to ISD literature and practice with a socio-technical evaluation (STE) process, reflections on its application to a particular web-based IS project, and recommendations for its use in future ISD projects. The STE process consists of a task satisfaction survey (TSS), which uses UML use cases as its organizing structure, supported by qualitative interviews. The process is used both before and after IT implementation. The use cases provide the concrete, development-oriented connection between the particular work system, the IT system under development, and the content and outcome of the STE process.

The structure of the paper is as follows. In the next section we review the literature on traditional, engineering as well as socio-technical approaches to ISD. In the third section the research approach is described. Section four introduces the case organization and describes the action research intervention. In section five the organizational impact and the lessons learnt from the application of the STE process is discussed and implications for future projects drawn out. The final section provides a summary of the research and its main conclusions.

2 BACKGROUND

The number of formalized, engineering oriented ISD methods is vast. Many of these have been developed through a process of taking successful programming strategies and broadening them out into analysis and design. This was seen first with structured programming, which was expanded to structured analysis and design, and now with OO programming and OO analysis and design, where a convergence of 'best of breed' OO methods has led to development of the unified modelling language (UML) notation. The language has become widely accepted as a modelling standard for OO software development (Dobing & Parsons, 2006). It provides a number of techniques for OO analysis and design, i.e. for requirements specification and verification via use case, class, activity, collaboration, sequence, and statechart diagrams as well as use case narratives. The literature often prescribes that UML should be combined with use case-driven iterative and incremental programming.

Despite the predominance of traditional methods concerns have been voiced about their effectiveness and methods, such as ETHICS and Multiview, which combine a focus on the social and the technical have been proposed. ETHICS (Mumford & Weir, 1979; Mumford, 1983, 1995) - Effective Technical and Human Implementation of Computer-based Systems - aims to improve an organizational work system by increasing *both* job satisfaction *and* organizational efficiency and effectiveness. ETHICS provides a systematic, analytic approach for work design that prescribes thorough and well-informed

definition of both social and technical objectives and alternatives as well as evaluation of alternatives in accordance with goal fulfilment, costs, constraints, and resource consumption and emphasizes continuous user involvement throughout the project. It is assumed that high job satisfaction exists when there is a good 'fit' between the employees' expectations and needs and the requirements of the job. The 'fit' can be measured via a questionnaire survey, such as Mumford's (1983) 58 item questionnaire that addresses the overall job satisfaction as well as five areas: knowledge, psychological needs, efficiency, task structure, and ethics. For each of these areas, the 'fit' can be assessed and used as input for formulating design objectives.

Multiview (Avison & Wood-Harper, 1990) is a contingency method that incorporates a focus on both hard and soft aspects of ISD by drawing on and combining known hard and soft methods such as Structured Analysis (De Marco, 1979), Soft Systems Methodology (SSM) (Checkland, 1981; Checkland & Scholes, 1990), and ETHICS (Mumford & Weir, 1979; Mumford, 1983, 1995). Multiview has been continuously developed through action research to accommodate critique and lessons learnt as well as to address emerging application areas (e.g., web development) and new ISD methods (e.g., OO analysis and design via the Unified Modelling Language (UML)) (see, e.g. Avison et al., 1998 for an account of Multiview2 and Vidgen et al., 2002 for a description of Multiview/WISDM). However, despite these efforts an empirical study among former Multiview students turned IT professionals shows that there were only a few examples of direct adoption of the method, because it was considered too soft and time-consuming (Kautz & Pries-Heje, 2000).

A recent development that draws on socio-technical ideas is Alter's (2006) work system method, which is a well described, rigorous, but non-technical approach for communicating about how current work systems operate and how they can be improved, with or without the use of IT. The work system method has much promise, but may come to suffer from the same barriers to method adoption and diffusion as ETHICS and Multiview, namely that it is developed in an academic context, that it advocates a systems concept that goes well beyond IT, and that it is perceived as a comprehensive method despite the author's guidelines on how to use it in a flexible way.

In general, hard methods, such as Structured Analysis (SA) and Object-Oriented (OO) systems development, have had a major effect on teaching and practice, while soft approaches such as SSM and ETHICS have had much influence on the advancement of theoretical ideas and the ISD research agenda, but a much more modest impact on actual practice (Fitzgerald et al., 2002). It is very important to continue the development of, and teaching in, broad and wide-ranging hard and soft approaches, but there also seems to be a need for socio-technical methods and techniques that accept and build easily on the existing hard mind set, thereby allowing a more comfortable route to adoption of (some) concern for the social side, e.g. by supplementing the IS development and deployment processes with a socio-technical evaluation cycle.

3 RESEARCH APPROACH

The research presented in this paper came about as a part of a longitudinal action research (AR) project. The AR project was performed in collaboration with Zenith International, a company specializing in consultancy to the food and drinks industry. It concerned the development of a web-based IS, coined the Research Data Repository (RDR) for the benefit of Zenith's market research department. The project was performed collaboratively by Zenith and the University of Bath within the Teaching Company Scheme (TCS, a government funded programme that promotes collaboration between industry and universities) and involved the active participation of academic researchers. Officially the project lasted from October 2001 to October 2003, and the IS was in operation when the project finished, but researcher involvement and intervention continued, albeit in a less formal and extensive manner, until April 2005.

A number of different types of AR exist (Baskerville & Wood-Harper, 1998). However, the defining features of all AR is intervention into and change in a practical problem situation for the purpose of 1)

solving the particular problem (problem solving cycle) and 2) contributing to the research literature with new knowledge (research cycle). The research presented in this paper aimed to fulfill this dual imperative (McKay & Marshall, 2001) by 1) improving Zenith's internal report production process via development of a web-based IS and 2) creating new ways to understand, support, and improve ISD processes and method usage based on practical experience (Mathiassen, 2002).

Multiview/WISDM (MV) was chosen as the framework of ideas (Checkland, 1991) for guiding the research and problem solving cycles because it offers a structure for web-based ISD that facilitates the construction of a situation-specific method. Thus, MV allows for a research focus on process emergence and method usage as well as practical deployment of ISD methods for the purpose of problem solving. The MV framework does not introduce new methods and techniques. Instead it relies on pre-existing methods that are categorized in a method matrix.

The method matrix comprises a collection of formalized methods and techniques organized according to five different aspects of ISD. It aims to support a socio-technical approach by including methods that emphasize design and construction of technical artefacts as well as methods that address the human and organizational aspects of ISD (Vidgen, 2002). The archetypical methods in the matrix are SSM (Checkland, 1981; Checkland and Scholes, 1990) for organizational analysis, UML (Booch et al., 1999) for information analysis and technical design, ETHICS (Mumford, 1983, 1995) for work design, and web usability (Nielsen, 2000) for the human-computer interface. MV is not supported by a pre-specified process model. Instead the method authors suggest that the focus of attention changes during the process as the IS developers move in and out of the five aspects of the method matrix and that while one aspect might be the focus of attention at a particular time, the other aspects can – and should - still be present in the minds of the developers (Vidgen et al., 2002).

The research presented in this paper is qualitative in nature as we are concerned with questions of *how* and *why*, not how many or to what extent. Moreover, the number of people employed in the market research department (5-6 people) does not allow for quantitative analyses. Even though a questionnaire survey was used to collect pre- and post-implementation data about task satisfaction it was considered a qualitative technique relevant for getting a quick indication of employee perceptions and the results were analysed as qualitative data. However, in another setting, given a sufficient sample size, the survey approach could be used for conducting quantitative research and the questionnaire and its results could be submitted readily to statistical tests for reliability and validity.

| Research cycle, M_R | Problem solving cycle, M_{PS} |
|--|--|
| Interviews: 7 interviews with 5 project participants and 2 future end users (Nov 2002). 4 interviews with Market researcher director and 3 future end users (July 2004). | Information analysis: 4 Interviews with Market researcher director and 3 Market researchers, as input for requirements analysis, (May 2002). 5 TSS follow-up interviews with Market researcher director and 4 Market researchers (April 2005). |
| Documents: Original project proposal, minutes from steering committee and technical meetings, company documents as well as project reports and deliverables, e.g. the requirements specification. | Work design: Pre-implementation: task satisfaction survey, 6 participants, (July 2002). Post-implementation: task satisfaction survey, 5 participants, (April 2005). |

Table 1: Data collection in RDR project

The empirical material is made up of interview transcripts, collected documents, and questionnaire survey data (see Table 1). To write the case description we have read and analysed the empirical data using a narrative-oriented approach, where we continuously asked “and then what happened?” (Pentland, 1999). Moreover, to gain a deeper, more nuanced understanding of the TSS findings we discuss the results in relation to the requirements specification from May-June 2002 and interview data from April 2005. The results of the analyses are presented below.

4 THE INTERVENTION

As described in Vidgen and Madsen (2003), the RDR project was undertaken as in-house development. The steering committee involved 6-8 people and the project team consisted of 3-4 people, with one full time developer and the others being involved in the actual development activities to varying degrees.

The setting for the RDR project was Zenith's market research department, which consists of six full time employees, including the Market researcher director. Each year the department produces a number of market reports, with the two most important ones being the 'Bottled Water' and 'Water Coolers' reports. The reports are based on data gathered from as many companies as possible in a line of business, e.g., bottled water. The reports are then sold to companies in the drinks industry, such as manufacturers (who provided the original detail data), packagers, and distributors. From initiation to publication, each report takes around three to four months to produce. Each report is led by a single market researcher who gains a deep insight into the data and manages the structure of the report. A large volume of market data has to be collected, stored, processed and formatted. The Market researcher director explains the report production process in the following way: "For the 10-11 years the company has been going, we have produced company profiles in Excel format, we have linked each profile to overview tables and have created charts manually in PowerPoint...Charts then pasted from PowerPoint, pictures into Word and put it all together using these packages. Obviously, this is extremely time-consuming..." (interview, November 2002)

The requirements analysis established that "the main requirement for the new system can be encapsulated as 'improving the report production process'." (requirements specification, June 2002). The four stages of report production are (Figure 1):

- Gathering and checking company profile data, approx. 50% of total report production time;
- Preparation of market summaries from company profiles, approx. 25% of total report production time;
- Analysis of markets and trends, approx. 20% of total report production time;
- Formatting the report for publication, approx. 5% of total report production time.

The requirements analysis showed that the key objectives of the RDR application were to: input and store company profiles in the database (stage 1), combine data from company profiles (stage 2) to form meaningful market analysis (stage 3), and automatically generate a formatted report from the database (stage 4).

From the outset the RDR project was conceived as an initiative that would have a major impact on the work practices in the market research department. An early idea was therefore to collect pre- and post-implementation data based on the generic ETHICS job satisfaction questionnaire (Mumford, 1983, 1995) in order to get an indication of the market researchers' job satisfaction before and after the RDR application was put to use. Pre-implementation data would be used by the project team to formulate design objectives and guide the development. Post-implementation data would be used by the project team and other stakeholders, such as company management and the TCS representative, to get an understanding of changes in job satisfaction over time and therefore, whether the employees found the project to be a success or not.

Approval to administer the ETHICS job satisfaction questionnaire was sought from the market research director, who in turn asked the personnel director to review the questionnaire. Both directors found it difficult to see the association between the ETHICS questionnaire, the ISD process, and the RDR project. The personnel director was also concerned that the questionnaire was intruding into human resource territory and, furthermore, considered that the questions were somewhat naive, leading, and that more than half were phrased from a negative viewpoint. For example, 'Senior management is out of touch with the way people feel'. The directors felt that the ETHICS questionnaire had the potential to increase

(and even create) tension between staff and management, undermine the organizational culture, and generate disquiet. At first these concerns came as a surprise for the project team. However, on reflection, the ETHICS job satisfaction questionnaire is a general purpose instrument that does not contain questions directly concerned with IS or ISD, and, clearly, its deployment was not perceived as a meaningful intervention in this situation. The generic ETHICS instrument was therefore abandoned. Instead the project team decided that a way of assessing job satisfaction that was grounded in the specific context of the RDR project was needed.

As a part of the requirements analysis, UML use cases had been developed to understand and document the current work system in a structured and comprehensible manner (Figure 1). After some consideration, it was decided to let the use case diagram form the template for the production of an RDR-specific questionnaire and to create a set of questions that could record user perceptions for each use case in the diagram. With MV as our framework of ideas we looked to the other methods in the method matrix for inspiration for formulating relevant questions. SSM's (Checkland & Scholes, 1990) three E's - efficacy, efficiency, and effectiveness - are used to judge the success of a systemic transformation. Efficacy is concerned with whether the system works: does the use case transformation of input to output take place? Efficiency considers the amount of resource needed to execute the use case; in this context market researcher time is the most precious resource. Effectiveness asks whether the use case contributes to the accomplishment of the larger business process, i.e., the production of a market research report. In addition to the three E's we also ask about task enjoyment, which is related to ethicality and is one of two further "E" evaluations proposed by Checkland (the other being "elegance"). Thus, it was decided to maintain a focus on the market researchers' satisfaction, not with their jobs in general, but with the particular tasks as well as with the report production process as a whole. Use case activity 5 (Figure 1) was excluded from the questionnaire as this activity is executed solely by the market research director. A set of five questions was therefore created for each of the use cases 1 to 4 in Figure 1:

- The use case activity is easy to do (individual business process efficacy);
- The use case activity takes up too much of my time (individual business process efficiency);
- The use case activity takes up too much of the total process time (business process efficiency);
- Spending more time on the use case activity would add value to the overall process (business process effectiveness);
- I enjoy the use case activity (task enjoyment).

Finally, an area for respondents to make open comments was included in the questionnaire.

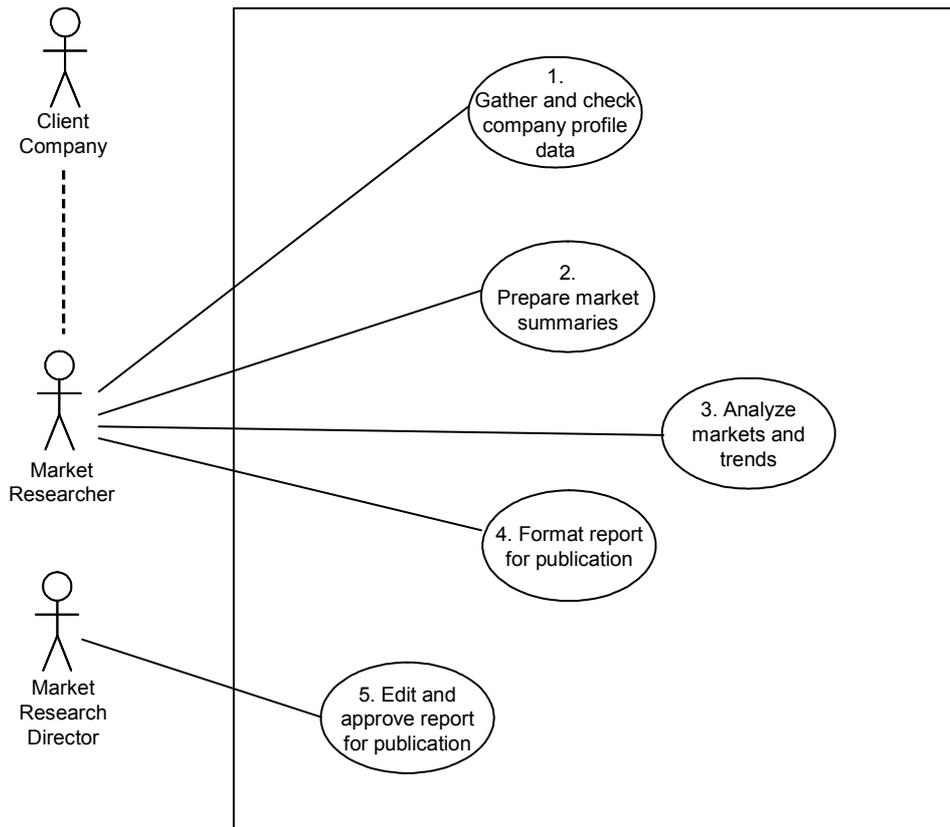


Figure 1: Use case diagram for the research report production process (Vidgen and Madsen, 2003)

In July 2002, prior to the implementation of the RDR, the TSS was administered to the six people involved in report production. All six replied. In April 2005 the survey was re-administered and filled out by five of the six people in the market research department (one person was unavailable when the survey was conducted). Below, the pre-implementation results are presented and the role they played in the ISD process is outlined (section 4.1). Second, the post-implementation data is interpreted (section 4.2) and the organizational impact of the RDR discussed (section 5).

4.1 Pre-Implementation

In July 2002, shortly after the requirements analysis, the pre-implementation TSS survey was conducted. The results of the survey and the implications for the future development of the RDR can be summarized as follows:

Use case 1: there was strong agreement that the task of gathering and checking company profiles is difficult, time consuming, and not very enjoyable. The RDR must improve the efficiency of this task;

Use case 2: feelings about producing market summaries was mixed, being given low and high scores;

Use case 3: users enjoyed analyzing markets and trends and the RDR must free up more time for this activity;

Use case 4: formatting the report for publication is time-consuming, unenjoyable, and error-prone. The RDR must automate this task as far as possible.

The overall business process: there was strong agreement that the process is thorough but that there are too many non-value adding tasks, i.e., company profiles and (use case 1) and report formatting (use case 2).

The results from the TSS were in line with the findings from the requirements analysis, which had already helped the project team understand the report production process and its deficiencies. Thus, the survey confirmed the project team's understanding and helped establish confidence in the 'correctness' of the requirements specification within the project team and among the other members of the steering committee. Enjoyment and Efficiency objectives were explicated, discussed, and on the minds of the project team during development, but the requirements specification was not updated to include the TSS results.

4.2 Post-Implementation

In January through March 2004 the RDR was used for the first time to produce the report for the "UK Bottled Water" market and then again in March through April 2004 for the "UK Water Coolers" market. The UK Bottled Water and UK Water Coolers reports were produced for a second time in 2005. By April 2005 work had begun on producing further reports for among others West Europe Water Coolers and East Europe Water Coolers. In April 2005, the questionnaire was re-administered and used as a vehicle for discussing RDR use, challenges, and potential changes with the individual market researchers than had filled out the survey. The results from the survey and the interview sessions are summarized below.

Use case 1: The RDR has made the task of gathering and checking company profiles easier and less time consuming, but not much more enjoyable.

The interviews reveal a much more complex picture. In the first year (2004) much time was spent inputting, checking, and re-checking the quality of the historic data taken from the existing Excel files. Moreover, *data inputting is, and has become even more laborious with RDR* as it takes place via a cumbersome form-oriented interface with many drop-down menus and entry fields and as it is hard to get an on-screen overview. Suggestions for improvement are to allow for inputting and exporting of data into RDR via Excel and to develop an overview of what has already been inputted and what is missing for each company profile as well as a note facility for storing general and company specific facts and comments.

Use case 2: the RDR has improved the task of preparing market summaries from company profiles.

The market researchers have had to learn how to run the queries or they have to ask the Developer to extract the market summaries they need. Both ways, extracting the market summaries is much easier and they are better than before, because they are based on better and more data. However, developer intervention is not unproblematic, and the market researchers raised concerns about loss of ownership and the relationship between ownership and level of incentive (or satisfaction): "I feel very much like the whole process has been passed over to [IT support]... in the past, you did it from beginning to end... it was completely your baby. I feel like I have lost ownership on that, which in a way takes away some of the incentive ..." (Market researcher, interview, April 2005)

Use case 3: "Analysis of markets and trends", the questionnaire data is ambiguous and it cannot be concluded that the RDR application has freed up time for the task of analyzing markets and trends.

During the interviews, the market researchers explained that the RDR provides more - and more accurate - data and makes it easier to extract data for the purpose of analysis, but the IT system has not otherwise changed the way the analysis of markets and trends is carried out. Interpretation and writing are still the main activities and is done by the market researcher. However, both the Market research director and one of the Market researchers see much potential for the analysis of markets and trends over time as the database gets stronger. They explain that when there is about ten years worth of data for most companies in the database it will be possible to make really strong historic as well as trend analyses.

Use case 4: the RDR has made the task of formatting the report for publication easier, less time consuming, and more enjoyable.

Report formatting has become much easier as it is done more or less automatically, with some intervention from the Developer. The Market researchers explain that “well...you just press a button...[but] in my experience it still takes some time for the [Developer] to do some tweaking.” (Market researcher, interview, April 2005) and that “formatting a report for publication is easy. I mean, again, on that one certainly the profiles are ten times easier, a hundred times easier than what we used to do...” (Market researcher, interview, April 2005).

The overall business process: the RDR has automated the tasks of gathering and checking company profiles and formatting the report for publication, while maintaining a thorough process.

Again, the interview data reveals a much more complex picture. There are indeed time and efficiency savings being made as a result of the RDR. These are mainly related to the semi-automation of the preparation of market summaries from company profiles (use case 2) and the formatting of the report (use case 4). However, further development is needed to get efficiencies in data entry (use case 1). One of the Market researchers states that “...I think it is more a case at the moment that [the RDR] has changed the burden to different parts really... Inputting is the laborious part of it, where previously it was less so. That is disappointing, but on the flip side, extracting the data once it is in there...when you ran the queries, you had full confidence in that data.” (interview, April 2005).

The increase in thoroughness and competitive advantage are due in part to the improvement in data quality. The market researchers trust the database contents and the reports that are produced from the database. Broader data coverage of the markets is also reported.

The report production has been improved but there is more to do. The interviews reveal that improvement of data entry is the key objective for developing the RDR further, and that even though “there is a general sense of buy-in from the staff...you are never going to get 100% euphoria over everything anyway.” (Market research director, interview, April 2005). One of the Market researchers also state that “in general am I satisfied with our process of producing research reports? Not yet. I think it is difficult to get to that stage, where you are 100% happy with it.” (interview, April 2005).

5 DISCUSSION

The organizational impact of the RDR can be summarized as follows. The questionnaire results show that the ‘fit’ for the tasks of gathering and checking company profiles (stage 1) and formatting the report for publication (stage 4) had improved greatly. The interviews reveal that data inputting (stage 1) had become more cumbersome and onerous, while improvements were due to the building of a strong database (stage 1), easier data extraction to form market summaries (stage 2) and the final, formatted report (stage 4). Thus, the two data sources are somewhat contradictory and even though some tasks and sub-tasks have improved a lot, the burden seems to have shifted to other parts of the work process. This suggests that questionnaire data, whether interpreted as quantitative or qualitative data, is best used in conjunction with other in-depth, qualitative data collection techniques, such as interviews, to identify, verify, and discuss the users’ problems and ideas for solutions before and after IT implementation. Moreover, it means that it is difficult to assess whether the RDR is *a success or not*. We suggest that in this case - and perhaps more generally? - it is more accurate to talk about the IS’s *successes and failures* by focusing on how well it supports the different phases and tasks within the particular work system, here Zenith’s report production process. IS development is also better pictured as a sequence of interventions, where each intervention has both intended and unintended consequences as well as predictable and unpredictable outcomes. This goes for systems use too where, even without the intervention of IS developers, the system in use will drift over time as users find new ways of working and work-arounds.

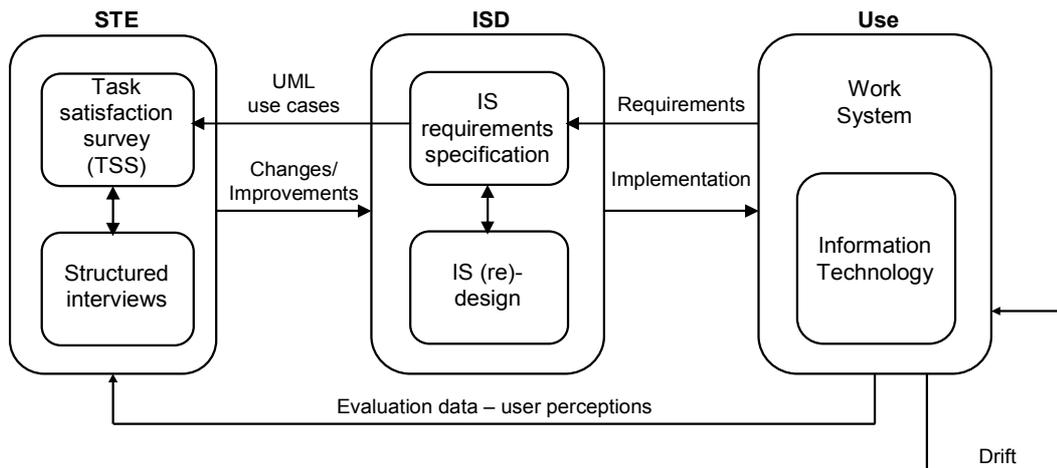


Figure 2: An integrated approach to ISD and socio-technical evaluation

In Figure 2 we illustrate systems use, development, and evaluation as a set of interlocking activities. First, requirements are extracted from the current work system (Use), transformed into an IS requirements specification in the form of UML use cases, and used as the basis for the IS design activity. At the same time, evaluation data collected via a survey and interviews, organized around the use case structure of the requirements specification, is elicited from users of the current system and used to evaluate user satisfaction with the current work system (STE). Then, an intervention (ISD) is made on the basis of improvements identified by the STE in conjunction with the specified as well as emerging requirements from the work system. The process then continues in cyclical fashion moving between evaluation and ISD ad infinitum. The work of ISD is never finished as each intervention “solves” one set of problems while introducing new ones, as we found with the Zenith case. Many organizations will take a pragmatic view about what constitutes a “good enough” solution and cease development. However, environment changes and drift happens and even if no additional ISD is planned the STE process could/should be conducted regularly to verify that the current work system and IT are indeed, or still, good enough.

The lessons learnt from the application of the STE process is that it was a powerful tool before implementation, for verifying and building confidence in the requirements specification within the project team and in relation to the steering committee and after implementation, for identifying areas for improvement and for a getting a nuanced understanding of systems success as each task is investigated, not just the broad picture. A particular strength of the approach is the integration with UML use cases which provide the concrete connection between socio-technical evaluation, IS development, and systems use. However, the TSS should be extended to include questions about the need for variety, challenge, discretion, and autonomy (Mumford, 1995) at least at the overall process level to get an indication of which social characteristics the market researchers value.

We conclude that in future projects it is necessary to increase the STE process’s concern for the human and organizational aspects further although continuing to recognize the need for parsimony and pragmatics if the approach is to be adopted by practitioners. We propose that this can be achieved with relatively few resources and by building on the prevailing technical way of working in practice, e.g., by:

- *Pre-implementation:* conducting a more comprehensive TSS that covers both technical and social task characteristics and combining it with other qualitative data collection techniques to identify, verify, and discuss technical and social system requirements. Both efficiency and enjoyment requirements could/should be documented in the requirements specification.
- *Post-implementation:* re-administering the TSS and conducting follow-up interviews at least once and preferably on a periodic basis, e.g. once a year, to assess systems success and drift

(Ciborra, 2002) and to continue to ‘grow’ the IT system (Truex et al., 1999) and the support it provides for the work system (Alter, 2006).

6 CONCLUSION

The ISD literature recognizes that many IS developers and stakeholders prefer technical rational ISD methods and either do not know the socio-technical approach or are likely to find it too ‘soft’ and time-consuming. A significant learning point, and motivation for, this research is also that in the case of the RDR project it was more meaningful to consider the constrained but more grounded, IS oriented term of task satisfaction rather than the broader concept of job satisfaction advocated by ‘traditional’ socio-technical analysis.

We therefore developed and deployed our own socio-technical approach consisting of a task satisfaction survey (TSS) and interviews to identify, verify, and discuss the users’ problems and ideas for improvement before and after IT implementation. We considered the approach a separate evaluation cycle that supplemented the development activities, and coined it the Socio-Technical Evaluation (STE) process. The STE process builds on the prevailing ‘hard’ mindset towards ISD by taking a task perspective and by using UML use cases as a template for structuring the TSS around a focus on the users’ perceptions of efficiency, effectiveness, and enjoyment of each use case as well as of the overall process and general level of satisfaction. Pre-implementation, the evaluation was instrumental in establishing confidence in the requirements specification within the project team and among the other stakeholders. Post-implementation it facilitated a nuanced understanding of project success, process shifts, and within-task changes as well as identification of areas in need of further IS development. However, too much emphasis was placed on technical characteristics related to the efficiency and effectiveness of tasks and processes, while social characteristics concerned with the variety, challenge, discretion, and autonomy of these activities to some extent were overlooked, both in the application of the STE process and in the design of the IT system.

We recommend that in future ISD projects an even greater concern for the human and organizational aspects of the work system is incorporated by: conducting a more comprehensive TSS that covers both technical and social task characteristics, including both efficiency and enjoyment objectives in the requirements specification, and re-administering the TSS and conducting follow-up interviews on a periodic basis to assess the success, drift, and improvement opportunities of the IT system as these change over time.

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