The Eleven Years of the European Conference on IT Evaluation: Retrospectives and Perspectives for Possible Future Research

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Abstract: This paper provides an overview of the papers that have been presented at the European Conference on IT Evaluation during the past eleven years. It considers the main issues, and learning themes addressed in papers presented to these Conferences. The paper also reflects on the possible future direction, which this research may take and three major research themes are suggested. Some 356 papers have been presented at ECITE. Over the eleven year period it is clear that the level of understanding as reflected in the papers has significantly increased. Themes, which were particularly well addressed, include IT and IS value, the multidisciplinary nature of evaluation, the importance of stakeholder analysis, organisational learning and life cycle management. Three issues are identified as particularly important for further research. These are, the theoretical underpinning of IT evaluation, improving the data sets for research and establishing a more common core of concepts.

Keywords: IT, IS, Evaluation, Theoretical frameworks, empirical research, case studies, questionnaires, core concepts, corporate politics, data sets, research maturity.

1. Introduction

This paper describes the research conducted by those who have presented papers at the European Conferences on IT Evaluation (ECITE). It is a high level overview of the proceedings of these Conferences and is based on the papers published during the first eleven proceedings. The purpose of this paper is to facilitate an understanding of the thrust of research in this field of study and to reflect on its possible future direction.

The objective of ECITE, which has remained constant throughout the eleven-year period, is to provide a platform for academics and professionals to join together and discuss the theory and practice of the evaluation of information technology. The first ECITE was held at Henley Management College on the 13th-14th of September 1994.

The first paper in the first issue of the conference proceedings concludes by stating: ‘….. IT costs have been growing by rates of about 15% p.a. over the last decade.’ ‘This rate of growth is far in excess of the growth in the underlying businesses and cannot be sustained into the next century’ (Dier and Mooney, 1994, p.11). This statement, although perhaps a little naïve, clearly indicated the relevance of the research. Considering the current state of the IT industry it also illustrates that evaluation research may be thought of as being unable to achieve a soft landing. This overview of the 10 conferences, therefore, addresses what might be regarded as research highlights in terms of vision and practical relevance and at the same time it also considers problems such as industry impact.

Questions addressed in this paper are:
- What type of researchers contributed to the IT evaluation conferences?
- What type of research questions were addressed?
- What were the most prominent research findings?
- What other interesting research questions are suggested?

2. Background of participating researchers

ECITE has always been a small specialist Conference. It was never intended that it should attract large numbers of papers or attendees and thus the focus of the Conference has been retained. During the eleven years 513 authors contributed to the conference. Of this group 458 were academics and 55 authors had an industry background (11%). A number of authors...
contributed on multiple occasions to the conference. In the second and third conference 30% of the authors had also contributed to previous ones. As the conference grew so this ratio changed. For the last three years this number was 9%.

The conference has been held in the UK, in the Netherlands, in Ireland, in France and Spain.

Although the conference is referred to as a European conference, ECITE has always welcomed contributions from authors around the globe and there have been papers presented from 38 different countries. Of these 38 there have been 17 different European countries as well as the USA, Australia, South Africa, New Zealand and several Asian countries. The largest number of contributions to the conference have come from the UK (34.9%), Australia (9.4%) and Netherlands (9.4%) as shown in Figure 1.

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**Figure 1:** Nationality of researchers

With only 11% of conference attendees coming from industry it is clear that this combination of academics and practitioners could be improved. For two of the years the conference supported a doctoral colloquium.

### 3. How the research papers were focused

The evaluation of IT encompasses many topics and this diversity is reflected in the papers. A total of 356 papers were published in the proceedings. It is interesting to note that the majority of the papers are based on case study research, representing 52.7%.

There was a diverse range of topics and this paper considers the research under the following categories:
- Types of information systems;
- Industry sectors;
- Geographical areas;
- Organisation of the overall information function;
- Development of particular evaluation methods;
- Theoretical foundation of evaluation.

#### 3.1 Types of Information Systems researched

A plethora of information system types have been investigated. Examples are:
- Executive information systems (ElKordy, et al., 1997; Carlsson, 1998).
- Strategic information systems (Spil, 1995; Deitz, 1995; Savolainen, 2000).
- Electronic data interchange (EDI), (Hoogeweegen, et al., 1994).
- Manufacturing information systems (Wheeler and Chang, 1994; Bonner, 1995; Ezingeard, 1998; Coronado, 1999).
Knowledge based systems (Clark and Soliman, 1996; Poon, 1999; Savory, 2001; Tyndale 2002).

Workflow (Kueng, 1998; Grunden, 2002).

Intranets (Magrill and Brown, 1997).

Electronic commerce (Miller, et al., 1999; Stamoulis, 1999; Lee, 1999; Cherian, 2001; Al-Mashari and Al-Samad, 2002; Beyno-Davies, 2002).

Groupware (Josefsson and Nilsson, 1999).


Infrastructures (Renkema, 1997).

Development tools (Addison and Sutherland, 1995).

Evaluation of Transhuman technology (Bannister 2004)

These papers typically addressed ex ante assessments of the above systems investigating the potential value of investment in these areas. In general the researchers are quite successful in this type of investigations. However, it is clear from the analysis of these papers that the authors are also often uncertain about the correctness or validity of their outcomes. This is probably caused by the fact that the researchers are not often able to study the actual realisation and outcome of the projects researched. However, most of these information system based papers also lack a theoretical underpinning of their methodology, which results in additional uncertainty about their measurement instrument. Due to the labour intensiveness of case study research the number of involved organisations was also limited.

3.2 Industries researched

Many papers refer to particular industry sectors. Examples are:

- Healthcare, which is also the most often researched topic overall (Kaplan, 1995; Lock, 1996; Murray and Dhillon, 1996; Peterson and de Wit, 1997; Salmela and Turunen, 1997; Vlug and Lei, 1999; Niss, 1999; Orr et al., 1999; Protti, et al., 2000; Suomi and Takhapaa, 2001; Bergamaschi and Ongaro, 2001; Turunen, 2001; Ammenwerth, et al., 2002; Carson et al, 2004

- Telecom industry (Peterson and de Wit, 1997; Demkes, 1997; Lampikoski and Rusi, 2002; Cheverst et al, 2004).


- Financial services industry (Nijland and Berghout, 2000; Maimbo and Pervan, 2002; Diniz et al, 2004).

It is clear that evaluation research requires insight into specific industry practice. Without this contextual knowledge the assessment of competitive advantage or organisational improvements is extremely difficult. Through focusing on a particular industry sector, researchers are better able to understand industry contexts and validate elements of the evaluation framework. However it is interesting to note that authors frequently do not retain the industry specific focus when discussing their conclusions. And thus too much is sometimes made of the finding from what is essentially a narrow focused study.

3.3 National focus

Many studies have referred to a particular geographical area. Examples are:

- United Kingdom (Miller and Dunn, 1997; Stansfield, et al., 2000).

- The Netherlands (Nijland and Berghout, 2000; Stansfield, et al., 2000).

- Spain (Arribas, 1996; Arribas and Ingusta, 1997).

- South Africa (Hart, 1999; Sutherland, 1994, Pather et al, 2004).

- Australia (Cronk, 1999; Myles, et al., 2000; Singh and Byrne, 2004).

- Belgium (Deschoolmeester and Braet, 2000).

- Romania (Avram, 1999; 2000).

- Greece (Mitris and Serafeimidis, 1994).

- Denmark (Andersen, 1999).

- Ireland (O’Donnell and O’Regan, 2000).
Saudi Arabia (Al-Turki, 2000)  
Sweden (Frisk and Planten, 2004)  
Finland (Kontio, 2004)

These papers often suggest that they provide state-of-the-art overviews of IT evaluation in a particular country and thus these studies do include regional specific elements of evaluation. The way groups or cultures deal with corporate dimensions such as power, user participation and risk are major influences on the evaluation. Country studies typically include representative data sets.

3.4 Organisation of the IT function

Besides evaluation of IT projects or operational information systems, the evaluation may also refer to the overall IT function (see, Watad, 1995; Shin, 1997). In particular, issues relating to outsourcing is an object of study (Willcocks and Fitzgerald, 1994; Currie and Irani, 1999; Khalfan, Gough, 2000; Lin and Pervan, 2001).

Papers in this area all refer to measurement problems and evaluation i.e. the evaluation of an outsourcing decision requires some form of measurable objectives and processes. These papers also typically address the boundaries of measurement (not everything is measurable) and also consider some of the arguments related to the nature of the measurement activity (every measurement potentially raises another measurement problem).

3.5 Evaluation methods

A number of evaluation methods are especially noteworthy. Those that received more attention then others include:

- The Balanced Scorecard (Grembergen and Bruggen, 1997; Hillam and Edwards, 2001; Deschoolmeester and Braet, 2000).
- Simulation as analysis tools for examining the effects of an envisioned information system (Jong, 1999; 2000; Anderson, 2000).
- DSDM (dynamic systems development method), as an approach to enhancing a system development methodology with an evaluation approach (Barrow and Maylew, 2001).

Given the focus of the conference, the number of papers that actually develop evaluation methods is modest. The discussion about evaluation methods has primarily been taken place outside the conference (Parker and Benson 1988; Remenyi and Sherwood-Smith, 1997; Thorp, 1998: GAO, 2000) and was published in book form. Perhaps this is due to the fact that any discussion on the development of evaluation methods requires much more detail than can be reduced to approximately 5,000 words.

These methods are all of a multidisciplinary nature. Financial approaches receive relatively little attention except for the option theory approach (see next Section for references).

3.6 Evaluation theory

Evaluation is a multidisciplinary topic and many theoretical approaches have been applied to study evaluation practices and explain the various phenomena. Examples of theory-based approaches are:

- Economics/accounting theory (Dier and Mooney, 1994; Dirks and Lent, 1997; Bannister and McCabe, 1999; Maanen and Berghout, 2001; Svavarsson, 2002;)
- Interpretative approach (Serafeimidis and Smithson, 1994; McBride and Fidler, 1994; Abu-Samaha, 2000)
- Critical approach (Nijland, 2001; O’Donnell and Hendriksen, 2001; Jones and Basden, 2002)
- Structuration theory (Vaujany, 2001; Jansen and Nes (2004))
- Grounded theory (Jones and Hughes, 2001)
- Contingency approach (Turk, 2000)
- Soft Systems Methodology and process theory (Kefi, 2002; Stansfield et al., 2000)
- Cognitive mapping (Newman and Hang, 2002)
- Option theory (Jong, et al., 1997; Clare and Lichtenstein, 2000; Mehler-Bicher, 2001; Svavarsson, 2002;)
- Social theory (Berghout et al., 1996)
- Post-modernism (Remenyi and Sherwood-Smith, 1996)

Theoretical underpinning of IT evaluation research is a major issue, because this very well demonstrates the level of understanding of the topic. The variety of approaches already illustrates that there is
little consensus in this area. It is even extremely complex to make a statement about more or less promising approaches. Option theory has not been very successful from a practical point of view. However, it remains noteworthy from a theoretical perspective explaining the economical aspects of evaluation. The interpretative approach such as that advocated by Walsham, (1993) received the widest attention. Elaborating upon a theoretical foundation of IT evaluation research is certainly an urgent issue.

4. Research results
In this section the conclusions of the 298 papers are summarised into four main research findings as follows:
- The untangling of IT value;
- The multidisciplinary nature of evaluation;
- The importance of stakeholder analysis;
- The importance of organisational learning and life cycle management.

4.1 The untangling of IT value
The untangling of IT value is discussed, first, through elaboration on IT cost, second, through elaboration on IT benefits, and third, through elaboration on IT value creation.

4.1.1 Untangling IT cost
Many of the 298 papers deal with the notion of cost as a resolved issue. However, a number of papers illustrate that this is perhaps not the case (Bannister and McCabe, 1999; Maanen and Berghout, 2001; Dirks and Lent, 1997; Dier and Mooney, 1994). Costs associated with developing or operating information systems are primarily of a fixed and indirect nature. Calculating IS cost, therefore, always implies the allocation of cost and there are many unresolved issues regarding such allocation.

Bannister and McCabe present a list of difficulties associated with understanding IT related costs (Bannister and McCabe, 1999):
- Identification problems. IT is always part of something else, being a project or departmental unit. For example, to what extent are user-cost included in IT costs?
- Data capture problems. Besides general accounting failures, there are typical non-recorded costs, such as, implementation cost.
- Overhead allocation problems. Cost accounting of IT includes many charging issues making this a personal and political problem.
- Accounting conventions. Different standards regarding amortisation and capitalisation are applied between and within countries.
- Disbenefits. This typically refers to the negative consequences of introducing IT, such as, increased risk of fraud and decreased flexibility of operations.

A cost-based approach also seems to be more adequate for investment analysis than cash flows. Examples of cost that would be unaccounted for using a cash flow analysis could be hardware cost, when the IT investment would not directly result in a purchase of additional hardware.

In contrast to what is suggested in many of the conference papers, there are many issues still unresolved regarding IT cost. There is little knowledge of the cost behaviour of information systems and few, if any tested methodologies or even theories to manage and control IT cost. IT costing is a complex issue, which is well suited for further research.

4.1.2 Untangling IT benefits
Most of the papers deal with the complex issue of untangling IT benefits. Sometimes this is done in great detail (Bannister, 1998; Remenyi, 1999; Bannister, 2000; Lillrank, et al., 2000; Remenyi, 2002). Remenyi identifies four major problems with IT benefits measurement and management (Remenyi, 1999):
- Benefits such as intangible performance improvements. Unlike cost, such benefits primarily impact processes inside an organization and seldomly associated to goods or services sold on an outside market. Their value is, therefore, predominantly dependent on individual judgement and not on market prices.
- The issue of information reach. Even for the most straightforward application it is never simple to understand exactly what the results will be of bringing together information about different
business issues. There will nearly always be knock-on effects, especially when such a system results in integrating business processes.

- Tangible and intangible benefits. Some aspects of an information system may produce hard or tangible benefits which will directly improve the performance of the firm, such as reducing cost and will therefore be seen in the accounting numbers of the organisation as an improvement in profit and perhaps in return on investment. However, other aspects of this system will only create soft or intangible benefits, which will make life easier in the organisation, however, will not directly lead to identifiable performance improvements. In a competitive market cost reductions are primarily transferred to customers and the associated prevented competitive loss may also not show up in the accounting numbers of the firm.

- Benefit evolution. Many information systems will have some easy to identify or obvious benefits which will be sustainable over a period of time. However, as the development of the project proceeds and the ramifications of the system more fully understood, new ideas about potential benefits will also become apparent. This will have been due to the process of creative dialogue between the principal stakeholders, which will bring to light new business processes and practices. In short, potential benefits should not be seen as being static, but rather evolve as a greater understanding is gained of the organisation and the role which the system will play in this. Given this observation, some researchers developed techniques to actively manage benefits (Lilrank et al., 2000; Remenyi and Sherwood-Smith, 1997).

Notable is that most researchers define value in a multidisciplinary perspective and very few restrict themselves to a purely financial analysis. There is, however, no consensus about the operationalisation of the measurement and management of benefits.

4.1.3 Untangling IT value creation

Given the problems encountered with untangling IT cost and benefits, it may be expected that there will also be difficulties with untangling the notion of IT value, and this is certainly the case. However, some common understanding has also developed in this area.

Process models have been developed to illustrate the process of value creation at a higher level of detail. Well-known examples of such models from outside the conference are Trice and Treacy, (1986), Weill (1990), Soh and Markus (1993). Conference papers regarding process models include McKeen et al. (1996), Jurison (1999), McAuley (2000), Remenyi (2002).

Similar to the discussion around benefits there is a prominent role for individual perspectives and the multidisciplinary nature of value.

Almost all studies presented at the conference evaluate the value of IT on an organisational level and, remarkably, few on higher levels, such as, governments or countries (Shu, 2001, Bannister and Remenyi 2003). There are also few publications regarding the lower individual level (exceptions are Bannister, 2002 and Hughes, et al., 2002). The country studies that have been presented focus on the use of evaluation techniques in a particular industry or organisation and not on the effects of its impact upon the country or the society. Although, the mission of the conference explicitly includes macro economic studies, these papers still have to find their way to the conference.

4.2 The multidisciplinary nature of evaluation

There has been a special interest in the multidisciplinary nature of evaluation since the first conference, see for example the papers McBride and Fidler (1994), Serafeimidis and Smithson (1994), Brown (1994), Jurison (1994). Section 3.6 already provided an overview of the various theories that have been suggested or used. However, there is no common understanding regarding the methodology necessary to understand a multidisciplinary field of study. Difficulties with finding appropriate data sets and issues related to how handle these have yet to be resolved.
4.3 The importance of stakeholder analysis

Regardless of the research approach or theoretical underpinning, an analysis of the objectives and influence of the various stakeholders has become a common part of evaluation studies (see for instance Serafeimidis (1999), Hughes and Jones (1999), Jones and Hughes (1999), Khalifa, et al. (2000), McAuley and Doherty (2001). Although a stakeholder analysis appears to be an essential element of an evaluation study, the methodological consequences remain relatively unexplored (Grembergen and Bruggen, 1997; Deschoolmeester and Braet, 2000; Hillam and Edwards, 2001). First studies that contain a methodology to include stakeholder perspectives are Jones and Hughes (1999), Barrow and Mayhew (2001), Remenyi (2002). These approaches all focus on a continuous value management: the more traditional accounting viewpoint of pre and post implementation studies is abandoned. These types of continuous management are typically suited to managing scope dynamics of projects and emergent values (Remenyi, 2002). These approaches seem to be, however, far from robust.

4.4 The importance of organisational learning and life cycle management

In line with the multidisciplinary nature of evaluation and stakeholder analysis is the importance of organisational learning and life cycle management. The organisational and strategic impact of IT primarily depends on organisational and market characteristics, such as the ability to adapt new working methods, as well as, the willingness to pay for additional product information. Information about already completed projects is, therefore, essential to improve ex-ante or up-front assessments (Alsen and Linde, 1994; Kaplan, 1995; Ward, et al., 1995; Serafeimidis and Smithson, 1995; Swinkels, 1997; Nijland and Berghout, 2000).

Many researchers observe problems in this learning process (see Nijland and Berghout, 2000). Several reasons are given:

- The project objectives were defined in an uncontrollable fashion.
- The priorities of other tasks are higher.
- The outcome differs from the initial perspective and the various stakeholders try to avoid discussing who is to blame for this.

As a consequence evaluation researchers are confronted with the situation that evaluation practice is relatively poorly developed, case studies are unable to validate the more advanced elements of evaluation methods and practitioners are reluctant to use untested methods.

There is also the issue of diminishing value of additional evaluations. Although continuous evaluation and life cycle management do seem to be an obvious route for the development of evaluation methods, there is always the risk over ‘over-measuring’. This issue has, so far, not been explored at the conference.

5. Perspectives

In this Section three issues are presented that we consider particularly interesting for further study. Given the complex nature of this field of study and the relatively short time it has been of interest to academic researchers the number of topics that could be explored is, of course, almost endless. However, based on the observations in the previous Sections we conclude that some issues might have a higher priority than others. These issues are:

- Theoretical underpinning of IT evaluation.
- Improved methodological understanding of which data sets are appropriate and how they may be used in this type of research.
- Establishing a more common core of concepts.

5.1 Theories used to underpin IT evaluation

As presented in Section 3, the number of different theories used in the studies of the past nine years is significant and there is certainly no commonly accepted understanding of which of these might be most appropriate.

Accounting theory and interpretive analysis are most frequently applied. Interpretive analysis has been supported since the first days of the conference (Serafeimidis and Smithson, 1994). In this
case IT evaluation is viewed as a socially embedded process including formal and informal procedures and where actors try to make some sense of their situation. Other researchers encouraging this approach are (Abu-Samaha, 2000; Jones, 2001; Agerfalk et al., 2002; Kefi, 2002).

Several researchers refer to Habermas’ theory of social action, where the "world" is explained as a whole (Jones and Basden, 2002). Habermas’ theory is centred on communication and seeks to clarify the conditions, means, content, constraints and objectives of socially organised human behaviour (Habermas, 1984). Researchers that encourage this approach are O'Donnell and Hendriksen (2001) and Jones and Basden (2002).

5.3 Common concepts

IT evaluation researchers are still far away from a generally agreed and accepted use of common concepts. This is a major problem and can cause substantial misunderstanding and disagreement. For example, costs and cash flows are sometimes confused. Putting more effort in the creation of more commonly accepted concepts will probably also reveal that we left many issues unattended in the scientific rush forwards.


6. Summary and conclusions

The purpose of this paper is to present an overview of eleven years of an IT evaluation conference. In these conferences 407 authors contributed to 298 papers. The number of different approaches to IT evaluation was considerable and this diversity of the papers reflected the complexity of this field of study.

One of the most obvious conclusions, which may be reached from this analysis, is that this field of study is still active across a wide range of issues and that there has not been any major attempt to focus the breath of topics researched. This eclectic approach to the research may reflect the fact that there has been only a marginal improvement in the maturity in this field of study over the past eleven years. On the other hand the view can be taken that although a substantial amount of research has been conducted in IT evaluation there are still many problems to be addressed and many of the problems, which have been addressed as yet are still to be fully resolved.

Clearly there is no single, superior, theoretical underpinning for research in this field of study. And this issue in itself is a major problem which deserves much attention.

5.2 Improved data sets

Business research is primarily built on empirical data and often in the form of case studies and questionnaires. This is a logical situation given the relative immaturity of this research. Comparable with medical sciences, most medical breakthroughs historically originated from observations of initially successful patients and were not the result of double blind testing. However, the internal and external validity of some case studies is a matter of concern to the rigorous researcher.

The issue of what data is appropriate and how to use it in reaching conclusions is by no means agreed and needs much more attention.

Three suggestions are made:- firstly, it would be useful to focus more research on
the reasons why IT evaluation is important and also on why it is not conducted by practitioners as much as perhaps the academic community feels it should. The fact that there is a political dimension of evaluation is well known but more work needs to be undertaken in this direction. Corporate politics and power relationships within organisations are not a well researched area perhaps because of the difficulties of getting to the root of the problems. But this should not discourage academic researchers. This research into power relationships should include careful study of how investment analysis both ex ante and ex post is performed for other functions in business or in government and if it is correct that IT projects are regularly singled out for more sever scrutiny and more thorough analysis than other similarly sized investments.

Secondly, research attention needs to be focused on the question of data or evidence. Are case studies and questionnaires really relevant to researchers in this field of study? Do these research techniques really lend themselves to the delivery of useful insights in this field of study? Should for example action research not become the main paradigm in the field of IT evaluation? Clearly in the light of our first suggestion concerning power relationships there would appear to be a need for more research employing a critical theory perspective. Furthermore given the availability of certain data sets then what are the implications for the academic researchers’ ability to analyse it and which are the most effective tools.

Finally, the question of trying to define the core of this field of study and in so doing create some degree of understanding and perhaps even consensus as to the important concepts which are required to be able to evaluate IT investment, needs to be addressed. This amounts to developing a theory of IT evaluation. This is not a simple matter as this field of study is intrinsically eclectic and thus draws on a wide range of theoretical and practical thinking. To integrate this so that IT evaluation could be regarded as having its own theoretical foundation is a major challenge. As it stands IT evaluation is very fragmented and to the outsider it looks quite disjointed. As mentioned above it is clear that misunderstandings creep into research because of this lack of consensus. Also there is a tendency for many novice researchers to try to reinvent or define basic concepts again and again. The notions of value and benefits to mention only two ideas are churned over again and again with virtually no progress to should for this debate. This need for theoretical underpinning is perhaps the most difficult area of IT evaluation research to tackle and one which needs the most philosophical and theory building attention.

In general there is no doubt that IT evaluation is a field of study, which very is complex. Its scope is exceptionally wide ranging. There are still many challenges and it is perhaps for this reason that it is so attractive to some researchers. However there are other fields of study which are complex and which have been able to arrive at a higher degree of maturity. In this respect is it not now time for IT evaluation research to catch up?

References


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Understanding the Impact of Enterprise Systems on Management Decision Making: An Agenda for Future Research

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Abstract: Enterprise systems have been widely sold on the basis that they reduce costs through process efficiency and enhance decision making by providing accurate and timely enterprise wide information. Although research shows that operational efficiencies can be achieved, ERP systems are notoriously poor at delivering management information in a form that would support effective decision-making. Research suggests managers are not helped in their decision-making abilities simply by increasing the flow of information. This paper calls for a new approach to researching the impact of ERP implementations on global organizations by examining decision making processes at 3 levels in the organisation (corporate, core implementation team and local site).

Keywords: ERP, decision-making, organisation, MIS

1. Introduction

An Enterprise Resource Planning (ERP) system can be considered as being composed of a basic transactional system, which dictates to users how to process business transactions, and a management control system, which facilitates the planning and communication of business targets and goals.

Sammon et al. (2003) describes these 2 components of ERP systems as the solution to "operational" integration problems and "informational" requirements of managers. These are the same concepts expressed by Zuboff (1988) in describing the use of technology not only to automate manual tasks, but also to "informate" management tasks, such that "events, objects and processes become visible, knowable and shareable in a new way".

ERP systems are therefore expected to deliver the following benefits: (1) reduce costs by improving efficiencies through computerization; and (2) enhance decision-making by providing accurate and timely enterprise-wide information (Poston and Grabski, 2001).

Whether these centralized information systems really are capable of delivering both types of benefit has been a topic of debate for some time. “The notion that a company can and ought to have an expert (or a group of experts) create for it a single, completely integrated supersystem – an MIS – to help it govern every aspect of its activity is absurd”, according to Dearden (1972).

The Gorry & Scott Morton framework (1971a), which focused on understanding the evolution of MIS activities within organizations, criticized the “total systems approach”, maintaining that the integrated company-wide database is a misleading notion and would be exorbitantly expensive.

We now know that not only is it possible to build such systems, but that they are exorbitantly expensive. This has not prevented 40% of companies in the USA with revenues greater than $1 billion implementing ERP systems (Stefanou, 2001). The total market for ERP software has been estimated at $1 trillion by the year 2010 (Bingi et al. 1999).

Despite this strong push to implement ERP among today’s business organizations, there is a lack of understanding of the real post-implementation benefits of these integrated systems, and more insidiously, little awareness among adopters of the longer-term organizational impacts (positive or negative) that may ensue.

Much of today’s research in the area of organisational learning and knowledge management deals with the difficulties of creating and harnessing the value inherent in employees know-how and ways of doing business. This begs the question as to why so many companies are willing to throw out what they have learned in favour of practices they know nothing about. And, when they do so, what evidence is there to suggest that companies do achieve their stated aims of improved efficiency by adopting these industry best practices?
Gorry (1971) found that managers can use models to help them understand the environment they are operating in, and that this should be considered an "educative" process, rather than being related to the ability to improve specific decisions. He does argue, however, that managers often possess the knowledge and experience vital to "parameterising" business models without necessarily understanding the dynamics of the model itself.

Of course one of the aspects of employing what vendors call "best practice" is that all transactions must fit in the same system model, regardless of the relative importance of the transactions. The implementation dictates that this is an "all or nothing" scenario, where all purchases and revenue transactions must be entered into the system, successfully ignores the 80:20 rule as elaborated by Orlicky (1975), in what is probably the definitive book on MRP, according to Browne, Harhen & Shivnan (1996). If 20% of the components account for 80% of the cost, why apply the same rigour to recording transactional movements of inventory across 100% of components? Thus, the extreme standardisation of business process inherent in ERP systems creates huge volumes of data without providing a clue for how to exploit it and may therefore not beneficial from a decision-making point of view.

In this paper, decision-making theory and models are reviewed, focusing on how an ERP implementation might impact on these constructs. The next section of the literature review looks at how IS systems have striven to satisfy both operational and informational requirements in the past. This is followed by a summary of the existing research on the impact of ERP systems, which concludes by confirming that much research has been focused in the past on implementation, but that there has been much less work done on the post-implementation impact on the organisation of these systems.

Having established in the literature review that centralisation of decision making in an organisation may have an impact on performance at a local level, the role of information systems (and particularly ERP) in compounding this de-responsibilisation of local employees is explored.

Finally, a number of key questions for research in enterprise integration are asked, and the paper concludes with some initial findings from the field study.

2. Literature review

2.1 Decision making models

Much research in decision making during the last century was focused on the difficulty of defining a rational model for an ever-changing process that also allows for the irrational or contextual factors that make up the myriad decisions made by management in organisations. Most of the literature can be positioned along a continuum between two poles, with the cerebral rationality of Simon’s sequential theories (bounded rationality) at one end and the anarchical processes of the garbage can model at the other (Langley et al. 1995).

In Simon’s (1972) theory for decision-making, he posits that no business could process satisfactorily all the "zillion things" affecting the marketing of a product, in the hope that the right answer for maximising profit would pop out at the end. That was classical economic theory, he said, but it was "a ridiculous view of what goes on". Rather, a business tried to make a decision that was "good enough". He called his theory "bounded rationality" and invented a name to describe it: "satisficing", a composition of the words satisfy and suffice.

Much of the debate surrounds whether management decisions can be structured into distinct phases (eg. intelligence, design and choice from Simon, 1977), or whether the complexity of factors influencing an individual decision will mean that there can be no pre-determined outcome.

When these questions are considered in the context of an ERP implementation, we can anticipate that there may be impacts at all levels in the decision domain:

- The actors concerned may have changed as roles and responsibilities may be reassigned to adapt to the new template processes. At a minimum, their contribution may have changed towards less autonomy and less control.
- The decision process may have changed in that there will be new or modified sources of information and / or different steps to the process.
- The decision itself may change as the system may have incorporated some of the conditions and exception traps which were previously dealt with manually. This
may be perceived as less freedom or additional constraints by the decision maker.

The question of whether a decision is subject to programming is a key concept of organisational learning. Following the implementation of an ERP system, information that was tracked manually or not at all will now have to be recorded unambiguously in the system in order for automatic triggers to be activated allowing transactions to move on to the next stage in the process.

Langley (1995) identifies 3 aspects of decision-making which render it a difficult subject for empirical research:

- Many decisions do not imply distinct identifiable choices, and are difficult to pin down, in time or in place
- Decision making processes do not necessarily proceed as a linear sequence of steps, rather they are driven by the emotion, imagination and memories of the decision makers, punctuated by sudden crystallisations of thought
- It is difficult to isolate decision processes, as decisions typically become intertwined with other decisions.

Gorry (1971) explores the relationship that managers have with information and how models are one way of reducing complexity to understandable dimensions. His argument is that the expansion of information systems into higher management functions has resulted in an exaggerated focus on information quality, at the expense of an emphasis on decision making models and their components – ie: constraints, goals and other parameters.

Interestingly, the implementation of an ERP system will only serve to exacerbate this lack of managerial models for decision-making. Firstly, each ERP package uses operational models as underlying frameworks and these models can differ in terms of how they operate. Both Oracle and SAP are based on the principle of “work orders”, for example, which correspond to unique production jobs which consume inventory as they progress. However the manner in which they tie back to sales orders is different from one package to the other. Understanding and being able to communicate this new process blueprint and how it differs from the old way of working is a huge challenge for managers going through an ERP implementation.

Secondly, managers may not initially understand the reasoning behind some of the configuration options embodied in the business template as implemented by the ERP project team. Only a select number of project team members are privy to the logic behind the configuration decisions that are made during the implementation stage, and furthermore, once implemented, users will usually be dissuaded from any course of action which implies changes to these decisions. The effect of this will be to create a “fuzziness” around the meaning of some pieces of information, thereby reducing the scope of a managers decision domain.

Thirdly, there is a wealth of information important for decision-making, which lies outside the traditional ERP boundaries (Stefanou, 2001). For example, information from external sources, such as published statistics, market data, and experts’ opinions are not easily accommodated within the ERP environment. Legacy systems may contain years of historic data that can be crucial in determining trends and patterns.

Managers require decision-making models to help them decipher the complexity of the real world. ERP systems, while providing solid transactional engines at Anthony’s (1965) operational control level, tend to increase the volume of information available to managers, but in so doing, add even greater complexity to decision making at the management control level.

Furthermore, because the refrain of ERP vendors is liberally sprinkled with the notions of “best practice” and “zero modifications”, the perception is that the processes embedded in these systems is not up for question by individual managers. Equally the tight timescales for their implementation allows little margin for questioning the corporate template being rolled out. Hence managers are expected to take on models that are not their own, with parameters they had little influence on, and deal with the corresponding increase in information volume.

Little’s (1970) observations would seem to bear this out:

“People tend to reject what they don’t understand. The manager carries responsibility for outcomes. We should not be surprised that he prefers simple analysis that he can grasp, even though it may have a qualitative structure, broad assumptions, and only a little relevant data, to a
complex model whose assumptions may be partially hidden or couched in jargon and whose parameters may be the result of obscure statistical manipulation.”

Winter (1985) warns however, the wider the range of situations subsumed by the routines and the better the routinised performance, the fewer reminders there are that something outside routinised competence might be useful or even essential to survival. This can lead to “irresponsible or slothful” inattention, whose consequences are “made to seem tolerable”. Furthermore, if the routines are perfect, being alert to their limitations is wasteful.

Pfeffer (1992) discusses the selective use of information in management to rationalise decision processes, and how, under conditions of uncertainty, individuals would prefer to use data and decision-making processes “with which they are comfortable”.

However, from the broader perspective of the organisation, rather than the individual, integrating mechanisms are adopted which increase its information processing capabilities (Galbraith, 1974). ERP systems could be considered mechanisms of integration, in Galbraith’s parlance, allowing routine and predictable tasks to be automated. This would equate with Winter’s (1985) notion of routinised or high volume mechanistic decision making, which implies the use of some sort of system.

Gorry & Scott Morton (1971) excluded a certain category of straightforward “information handling” activities from their MIS framework, arguing that despite the structured nature of these activities, there were no decisions involved. Winter (1985) suggests that there is conscious choice in the selection of which matters to treat mechanistically, and which deserve to be treated with some deliberation. Suppressing the genuine choices about some matters may be the only way to make genuine choices available in other matters.

The choices inherent in implementing and configuring ERP processes do, in effect, eliminate or suppress the choices to be made by process users (employees), thereby reducing the onus on employees to make decisions for day to day routine work. Taking procurement as an example, if Purchase Order approval levels are parameterised within an ERP such that certain PO’s with amounts that fall within acceptable limits can be approved automatically (i.e. don’t require manager sign-off), as long as they are from a recognised list of items from an agreed set of corporate suppliers (the only ones available in the system), then the decision making has been reduced to a mechanistic level. This will improve the efficiency of the procurement process by allowing faster PO approval for those “standard” items, and should yield monetary benefits as well, in terms of volume discounts from suppliers.

Earl & Hopwood (1980) refer to the tendency in the MIS area to perceive uncertainty as “threatening rather than inevitable”, and, rather than exploiting information for its “educative” (Gorry, 1971) potential, information systems professionals tend to design models that mask reality with “assumed certainties”.

In the next section of the literature review, how information systems have striven to satisfy both operational and informational requirements in the past is reviewed.

2.2 Using information systems to satisfy managerial requirements

Since the early days of data processing, designers of information systems have been striving to satisfy the requirements of both operational and managerial users. Much debate has centered around the ability of integrated information systems to satisfy both the operational requirements for managing basic resources and the managerial requirements for planning and control of these activities.

Anthony (1965) developed a taxonomy of managerial activity to help to differentiate the types of support possible from information systems. Allowing that the boundaries between these categories are not clear, he defined managerial activity as consisting of:

- strategic planning (setting objectives, assigning resources, policies)
- management control (ensure resources used effectively and efficiently)
- operational control (ensuring specific tasks are carried out effectively and efficiently)

Gorry & Scott Morton (1971) describe the characteristics of the information required by these 3 categories of activity as significantly different. Operational control activities require information that is detailed, real-time and based on the actual use of internal resources. Managerial control, on the other hand, requires more summary information, not necessarily
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The framework for management information systems proposed by Gorry & Scott Morton (1971) is very applicable to today’s situation, over 30 years later, where the promise of ERP systems has been clearly to support all types of management activity. Although it is tempting to believe that improved management control should stem from mastery of the detail contained in operational systems (and certainly the language used by ERP vendors would encourage this perception), Gorry & Scott Morton (1971) would argue that these are 2 distinct levels of activity, with different information characteristics and therefore requirements. The databases to support management and strategic decisions would be quite different to those used in operational control.

It is interesting to note, in passing, the support for these categories of activity afforded by ERP systems. Questions of operational control are addressed by “hardwiring” the execution and monitoring of specific tasks into standard processes. Assisting managers with their management control duties, however, is not necessarily addressed, and this for the simple reason that employees are assigned to data entry “roles” that are pre-ordained by the ERP software, regardless of the number of people available to fill those roles. Standard reporting is not geared towards the monitoring of the “efficient” or “effective” use of people.

Ackoff (1967) suggests that most managers have some conception of at least some of the types of decisions they must make. Their conceptions, however, are likely to be deficient in a very critical way: the less a phenomenon is understood, the more variables are required to explain it. It was Ackoff’s contention, well before the age of global ERP systems, that most managers suffer not from a lack of relevant information, but rather from an over-abundance of irrelevant information. Gorry (1971) decries the tendency to assume that improved decisions will result from increasing the information provided. This warning was echoed by Benjamin and Blunt (1992), suggesting that “managers and workers are in danger of dying from a surfeit of communication”.

The emphasis in information systems design has therefore shifted towards systems that provide managers with the information they require in a broader sense rather than just one specific decision and also that support their communication needs. Executive Information Systems (EIS) and Executive Support Systems (ESS) have been put forward as the solution to the problems of information provision to senior managers. On the basis of a few famous examples (exceptions at the time), Rockart and Treacy (1982) have claimed that ESS (a term they first coined in 1982) was going to allow a revolution in executives’ use of computers.

2.3 Existing research on impact of ERP implementations

ERP software is a semi-finished product with tables and parameters that user organisations and their implementation partners configure to their business needs (Shang & Seddon, 2000). It is the complete set of configuration options (often called the template) selected by the customer implementing the software that defines how a system will work.

In order to provide a framework for the review existing research in the area of impact on the organisation, 3 separate models of ERP project phasing were considered: Bancroft et al (1998), Ross model (1998), and Markus et al. (1999).

These 3 models can be compared in terms of their nomenclature (see Figure 1).

![Figure 1: Comparison of the different project phase definitions](image-url)

In a study of academic activity related to ERP systems, Esteves & Pastor (2001) scanned 180 ERP related articles in key IS journals and conferences during the period 1997-2000 and found that almost 79% of research work was in the ERP project lifecycle. 43% of all the...
research focused on the implementation phase, and this in the form of case work.

Figure 2 shows this breakdown in graphic format (according to the Markus & Tanis nomenclature):

<table>
<thead>
<tr>
<th>Charter</th>
<th>Project</th>
<th>Shakedown</th>
<th>Onwards &amp; upwards</th>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>43%</td>
<td>9%</td>
<td>21%</td>
<td>21%</td>
</tr>
</tbody>
</table>

**Figure 2:** Breakdown of ERP research into project phases (adapted from Esteves & Pastor, 2001)

Among the 9% of articles researched carried out on post-implementation issues ("Shakedown" in Figure 2), benefits, limitations and factors that affect ERP usage are the main topics. Some studies analyse the impact of ERP systems in particular functions (e.g., management accounting). It is suggested that topics for further research should include ERP impact on organisations at all levels (technological, organisational, and business).

Shang & Seddon (200) classify the types of managerial benefit that can be achieved (gained from review of IT value literature since 1970). Based on data from 233 published ERP-vendor success stories, the authors found that every business achieved benefits in at least 2 dimensions:
- Operational benefits (quoted in 73% of cases)
- Managerial benefits
- Strategic benefits
- IT infrastructure benefits (quoted in 83% of cases)
- Organisational benefits

The 21% of articles in the "Onwards & upwards" phase consist of work carried out in the Evolution and Education phases. Authors in the Evolution phase have been focusing mainly on the analysis of new emerging ERP technologies and business models (web, data frameworks, workflow, knowledge handling, application integration,). Education research includes the analysis of IS curricula with respect to ERP and the adoption of ERP in Universities.

The 21% of articles that were non-lifecycle related ("General" in Figure 2) consisted of the following subjects:
- Research issues (benefits, value, …)
- Organisational knowledge (skills, culture, …)
- Business modelling (tools, OO-approach,)
- ERP development issues (interfaces, architecture, …)

There is relatively little research on the area of organizational impact of ERP systems. Few studies have looked at the post implementation period of ERP systems to determine how and why business benefits evolve over time (Staehr et al., 2004).

The last section of this paper outlines the key questions for further research in this area.

### 2.4 Key questions for researchers on enterprise integration

Management decision making can be said to be made up of a combination of structured information "handling", and the application of knowledge based on information and experience that is unstructured. The application of highly integrated systems such as ERP to business activities is further evidence of the "evolutionary nature of the line separating structured from unstructured decisions" (Gorry & Scott Morton, 1971).

Research on ERP experience in industry suggests that the single most important factor in their successful implementation is the organisation itself, that is, the readiness of employees to embrace change. This is comprehensible, given that the alignment of resources to the new ERP enshrined business processes means that roles, responsibilities and therefore job descriptions will be impacted at the operational level.

However, it is our contention that there has been little research on the effects of these changes at the managerial level, whose job it is to ensure that "resources are obtained and used effectively and efficiently in the accomplishment of the organisations objectives" (Anthony, 1965).

Researchers should strive to understand the longer-term effects of the impact of ERP systems on management decision-making. In evaluating the impact, the critical criteria will be the standardisation of processes and the centralisation of responsibility for decision-making.

Pounds (1969) stated that managers had difficulty being explicit about the process by
which their problems are selected. Does the increased standardisation of business processes inherent in ERP implementations help managers to identify the problems to treat, prioritise those problems and assign scarce resources to them? In theory, time that might have been spent designing more efficient procedures can now be spent on more analytical tasks. Further research is required to establish to what extent they are equipped to deal with this more “tactical” work.

Furthermore, as responsibility for decision-making tends to be more centralised in the post-ERP world, managers may find themselves with a perception of having less control over their decision domains, and with less autonomy to take new or different approaches to the resolution of issues.

Fundamental research questions are the following

- What models are used in the post-ERP organisation to identify and prioritise the problems which managers focus on?
- To what extent does the ERP system provide the information required by managers to make decisions?
- Has the standardising and centralising effect of ERP systems helped managers in their goal of ensuring the effective and efficient use of resources?

ERP projects in research literature have been treated like large IS projects, using many of the analytical tools from traditional information systems research. Our approach to research in this area is to acknowledge that the biggest impact to the company has been on people and their jobs, and that these effects are better defined in terms of organizational change. Using constructs adapted from the study of organisations rather than the study of information systems will give researchers the lens to view ERP implementation impacts in the context of the bigger picture of organizational driving forces.

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Using the Balanced Scorecard to Evaluate ICT Investments in Nonprofit Organisations

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Abstract: For nonprofit organizations (NPO’s), ICT is crucial to fulfil their social objectives. However, it is rare that ICT investments have monetary returns; ICT also has indirect impact on the social activity of NPO’s. So it is very difficult for them both to decide about ICT investments and to evaluate their contribution to performance. NPO’s should therefore define an appropriate evaluation framework, to understand if, where, what and how much to invest in ICT, to better achieve their mission. The evaluation framework described in this paper is based on the peculiar characteristics of nonprofit organizations, on the multidimensional evaluation criteria and on the balanced scorecard, adapted to the specific nature of nonprofit activities.

Keywords: nonprofit – investment decisions – balanced scorecard – multidimensional evaluation

1. Information technology and nonprofit organizations

Information technology is a key issue in organizations of all types, nonprofit as well as for-profit. Nonprofits spend approximately 4% of their resources on IT investments on average (Computer Science Corporation, 2004). There are several reasons for the diffusion of ICT in nonprofits.

- The main concern is the progressive reduction of ICT costs, which increases the convenience of ICT investments also for nonprofits, which traditionally have scarce financial resources.

- Another reason for the increased use of ICT is the bigger dimension of nonprofit organizations; indeed they need more and more ICT to overcome some typical big corporations problems, such as management, coordination, communication, administrative expenses, and so on. They need ICT in administration processes, to support decisions, to integrate their geographically dispersed units.

- Several nonprofits are also discovering the usefulness of Internet; they understand that this technology is a very effective instrument to extend their communication power. Communication is a core process for nonprofits, which are based on social consensus and need to be known all over the environment in which they work.

However, there are also several problems about ICT in nonprofit organizations, these problems can reduce the use of ICT and the investments amount, and cause the failure of ICT projects. We classify these problems in two groups (Mason 2003).

The first group is concerned with the ICT investment decisions, that is, the ex-ante phase in automation processes.

- The main problem is related to prioritising technology investments, with respects to other investments. The scarcity of financial resources, typical in nonprofits, is a crucial aspect in investment decisions. Nonprofits tend to concentrate their investments in social actions and programs, that is, activities directly related with the social impact of their work. So they tend to neglect investments in support activities, such as information technology.

- There is also a great difficult in identifying the more appropriate ICT solutions for specific nonprofits needs. The lack of best practices concerning ICT in nonprofits and the specific nature of these organizations need the design of ad hoc decision support instruments.

- The third concern is identifying the appropriate level of ICT investments. The lack of a direct relation between the investments amount and the financial returns makes it impossible to evaluate the resources allocation in ICT.

The second group is concerned with the ex-post ICT evaluation, that is the measurement of ICT performance. The goal is to determine if the ICT project has been useful in supporting specific action and fulfilling social objectives.

- The main problem is related to the indirect relations between the ICT and the nonprofit mission. Generally, nonprofit actions consist in furnishing social services not including technology. ICT is instead used primary for support and administration activities. Therefore there is no direct impact of ICT on social effectiveness of nonprofit actions.
Nonprofit organizations have no profit goal, so a common evaluation language is missing. Whereas profit serves such a simple common language for communication, delegation and coordination within for-profit firms, decisions in nonprofits have to be made with reference to the mission. These concerns reveal that nonprofit organizations need evaluation systems, to facilitate automation analysis and decision-making and to understand and improve ICT performance. These instruments have to be designed ad hoc for nonprofits, using their specific characteristics and implementing performance measurement focused on achieving milestones on their initiatives.

2. Performance evaluation in nonprofit organizations

Before to analyse the role of ICT in nonprofit organizations and to design an evaluation framework to support investment decisions and to measure the impact of technology, it is useful to describe the peculiar nature of performance in nonprofits and their evaluation. The core of nonprofit organizations is the primacy of their mission. This is also the base of an evaluation system. We can describe the nonprofits scheme as in Figure 1.

At the core of nonprofit organization is its mission, which is the reason for which the organization has been settled. The mission defines at a general level the goals of the organization, but it is necessary to define strategic subgoals and objectives: both short term and long-term objectives. These objectives system is the start point for the action of the nonprofit organization, to which all activities, processes, actions have to be coordinated with. Resources allocation – both financial and human resources – have also to be allocated in respect with the mission and its subgoals (Sheehan 1996).

Human resources are the core competences for nonprofit organizations, because they are mainly volunteers and the real engine of the organization. They are not only informed, they share the organization goals and values and take part in its activity.

People offers financial and work resources: work is either voluntary or paid, financial resources are loans or donations.
One of the main evaluation activities concerns the process efficiency, related with the use of available resources. The resources portfolio in nonprofits is both the instruments and the constraint to their action. The use of scarce resources has to be monitored, in order to maintain a correct relation between inputs and outputs, in respects of economic efficiency. However, the qualitative nature of inputs and outputs and the absence of market prices make evaluating processes efficiency more complex than in for-profit firms; financial reports are to be replaced with quality performance indicators, built around measurable but non monetary objectives.

The actions planned and executed from nonprofits need to be oriented to the fulfilment of social goals. Processes efficiency and actions effectiveness have to be coordinated with respect to organizational goals, both in short and in long terms. Because of the lack of financial measure of organizational success, also effectiveness should be measured by qualitative indicators, related to the quality and timeliness of offered services and the fit between these services and the expectations of recipients (Atkinson et. al. 1997).

Actions effectiveness is not sufficient for defining the fulfilment of social goals. Effectiveness monitoring is useful to coordinate the resources allocation and the fit between processes and actions, but success should be measured by how effectively and efficiently nonprofits meet the expectations of their stakeholders, that is, recipients, volunteers, donors, the public opinion. Each of these aspects needs a specific evaluation instrument, right to control the fit between the action of nonprofit organizations and the opinion of stakeholders above them.

The complex relation between the nonprofit organization and its heterogeneous stakeholders takes also the definition of specific disclosure programs and instruments, both financial and social, that allow verifying the fulfillment of social goals and the correct use of resources.

Figure 2: Nonprofit organization scheme and evaluation activities

These documents have a double role:
- they put the nonprofit organization in touch with the environment and its stakeholders, and make it possible to know, control and sanction the organization work when it is not suitable with the mission and the main values declared from the organization;
- they contemporary are an internal disclosure instrument, useful to offer guidance about how the organization should select and run actions and initiatives.

These evaluation activities are exposed in Figure 2 and can be used also to support ICT investment decision and to evaluate ICT impact, with appropriate adjustments.

3. Non profit organizations and ICT investment decisions

The same activities exposed in Figure 2 are useful to evaluate the role of ICT in nonprofit organizations, both to decide about investments and to understand the contribute of technology to the performance of each organization. Therefore, it is possible to define an evaluation framework, arranged to be focused on ICT, instead of on the general management of nonprofits.

The main concern of this evaluation framework is that ICT usually is not directly related with the actions that nonprofits carry out to fulfil their mission (Barton 2002); therefore direct relations between ICT and social performance are not easy to note. In addiction, ICT absorbs part of the scarce financial resources of nonprofit organizations, that are felt disguised from primary social goals and spent in projects.
that are difficult to justify, because returns are not proved (Cilek et al. 2001).

<table>
<thead>
<tr>
<th>Processes</th>
<th>Activities</th>
<th>Objectives</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Activities carried out to introduce ICT into the nonprofit organization processes</td>
<td>Efficiency objectives related to the ICT project</td>
<td>Identify one or more process efficient dimension on which ICT is expected to impact</td>
</tr>
<tr>
<td>Action</td>
<td>Social actions interested from ICT project and expected improvements</td>
<td>Effectiveness objectives expected from social action and impacted from ICT</td>
<td>Identify one or more action effective dimension on which ICT is expected to impact</td>
</tr>
<tr>
<td>Resources</td>
<td>Resources used to carry out the ICT project, in quantity and quality (when possible to quantify hours of labour and expenses amount)</td>
<td>Objectives related to rational and economic use of resources; eventual specific financial aids obtained from government or other institutions</td>
<td>Identify relations between use of resources in ICT projects and savings of resources grace to automation of processes</td>
</tr>
<tr>
<td>Services</td>
<td>Social services involved in the ICT project</td>
<td>Objectives connected with ICT project in terms of offered services</td>
<td>Identify positive impact of ICT on quality, quantity and timeliness of services</td>
</tr>
</tbody>
</table>

All these evaluation activities could be gathered in an evaluation system described in a descriptive diagram (Figure 3). This diagram exposes:

- in lines, all the dimensions of the organizational scheme of nonprofit organizations, that is: processes involved in automation, social actions impacted from ICT, resources used for the ICT project, obtained services;
- in columns, the link between automation activities, social objectives and the impact of ICT.

The first, we have to individuate which processes are connected with the new ICT application: in our case study, the communication process about the service to be performed. Using the web, we want to communicate to the greatest number of recipients in one time, all the information about the expected treatment. To introduce ICT into this communication process, we have to perform several activities: to design the web site, to test it, to advertise it to our patients. We have also to train our personnel in use of this web site and to favourite the passage from the traditional communication way to the new instrument. The objectives of this project are related with a more efficient communication, especially in terms of timeliness and quickness. So we can identify timeliness and quickness as the dimension of ICT impact.

The second, we have to link the ICT project implementation with social actions and to understand if this efficiency improvement is useful to our social goals. In our case, we have to understand if to improve timeliness of communication by our web site is useful and appreciate from our customers. We can describe the objectives of the improvement of investments in terms of indirect but real impact on the social goals and finally on the fulfilment of the mission. In this way, nonprofit organizations aim not only at the pursuit of their objectives, but also at the obtainment of social consensus essential for their survival.

**Figure 3: Ex-ante evaluation diagram**

Ex-ante support for ICT investments evaluation should therefore comes up to several expectations.

- It should individuate main processes in which ICT would be used and expected benefits due to improved efficiency of their processes.
- It should link the increased processes efficiency to an effectiveness improvement of specific social actions.
- It should demonstrate that effectiveness improvement is relevant for core services quantity, quality and timeliness.
- It should also define disclosure able to explain to stakeholders this positive impact of ICT, so that they can perceive the appropriate use of scarce resources in ICT.
our action in terms of more satisfaction of our recipients, because they are better informed about the time and the person who will perform the service. We can identify the increasing satisfaction as the impact of ICT on social actions.

The third, we have to identify the resources to be allocated to the project. In this case, we should count both the persons involved and the time spent for the project, and also the money spent to realize the web site. We should not forget to count also the time spent to training the personnel and the efforts spent to win their resistance to change. We should also evaluate if money and persons allocated to the ICT project are disguised from the organization usual activity and if there is a damage or worse health service for our percipient. We should compare the resources absorbed from the project with the savings in money and persons, obtained from the ICT project. In our case, to publish information in our web site saves to phone to each patient to inform him; there is obviously a save of time of volunteers, who can be devoted to other activities.

Finally, all these aspects should be gathered to describe if our social service is better, with a better use of scarce resources and increased satisfaction of recipients. We have to connect the effectiveness of the communication service with the quality of our main service, that is, the physiotherapeutic treatments. Only if the ICT impact is effective on our mission, we can say that automation is useful for our organization.

Figure 4 shows the ex-ante evaluation diagram for the Information web site project. This diagram report the result of our analysis, as previously explained.

### 4. Information web site project – ex-ante evaluation diagram

<table>
<thead>
<tr>
<th>Processes</th>
<th>Activities</th>
<th>Objectives</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Creation of a web site</td>
<td>Timeliness and quickness of communication</td>
<td>Reduced time spent to phone to each patient</td>
</tr>
<tr>
<td></td>
<td>Training of personnel</td>
<td>about health services</td>
<td>Timeliness of information about health</td>
</tr>
<tr>
<td></td>
<td>Advertising among the</td>
<td></td>
<td>service</td>
</tr>
<tr>
<td></td>
<td>patients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td>Changement</td>
<td>Use of the</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4: Case study for the ex-ante evaluation diagram

The drawing up of a qualitative and descriptive diagram that explains the virtuous cycle of ICT in nonprofit activity is useful to answer to several questions about ICT investment decisions.

- **Prioritising technology investments.** The lack of a direct relation between ICT and social goals of nonprofits often forces to attribute low priority to ICT investments, respect to other investments more related to the specific organization’s mission. To describe the positive impact of ICT on processes, actions and – indirectly – on offered services to recipients makes it possible to compare ICT projects with other projects and perform a more informed choice, because ICT also reveals its importance.

- **Selecting the more appropriate ICT solutions.** Defining specific ICT objectives and ICT impact on nonprofit organizations goals is useful to support automation decisions also in terms of selection of the most suitable ICT solutions and applications. Indeed, the descriptive diagram identifies the relations between processes efficiency, actions effectiveness, offered services and therefore it is possible
to understand the more urgent and strategic ICT projects just for the specific nonprofit aims. It is not necessary having quantitative indicators in this phase, because improvement in services and in stakeholders satisfaction are expected, not increase in financial or economic measures. Qualitative indicators are therefore able to furnish the right information to support the ICT investment decision.

- The descriptive diagram is also useful as internal and external disclosure instrument. Indeed, this diagram describes all the automation objectives and ICT impact on processes, actions, services, used resources. Stakeholders receive all the necessary information to judge the organization choices.

5. The evaluation of ICT impact in nonprofit organizations

If it is sufficient a descriptive diagram to support ex-ante decisions process for ICT investments in nonprofits, it is necessary a quantitative evaluation system to evaluate ICT ex-post impact. This evaluation framework should not be based on financial measurement, but be able to demonstrate the organization performance due to the use of ICT. The better instrument to be used is a balanced scorecard, based on the specific nature of both nonprofits and ICT (Bannister – Remenyi 1999).

\[
\text{Mission:}\quad \text{Objectives}\rightarrow \text{Balancing scorecard parameters} \\
\text{Stakeholders:}\quad \text{Contributors, impacts, expectations, reviews, and satisfaction} \\
\text{Actions/services:}\quad \text{Quantity, quality, timeliness in services} \\
\text{Processes:}\quad \text{Efficiency, support activities, costs, reduction, in work used in non-social activities} \\
\text{Resources:}\quad \text{Effectiveness in resources allocation, as a constraint in ICT investments} \\
\]

Figure 5: The balanced scorecard general scheme to evaluate ICT investments in nonprofits

To build a balanced scorecard of this type, it is useful to start form the general scheme showed in figure 4 and related to the functioning of a nonprofit organization (Kaplan 2000). These characteristics are important to define the metrics and indicators to be used in the balanced scorecard. The model here designed put together all the specificity of nonprofit organizations:

- the mission is at the core of the nonprofit;
- the stakeholders satisfaction and consensus are the first objective related to the mission and the organization success;
- actions, processes and resources are the instruments to be used to fulfil the social objectives that define the mission.

As we can see in Figure 5, the balanced scorecard puts the mission and the stakeholders’ satisfaction at the top, resources, actions and processes at the base of the scheme. The elements that form the balanced scorecard and should be used to evaluate the ICT projects are therefore the same defined as structural for nonprofits functioning.

The balanced scorecard is then built associating objectives to measures, as explained in Figure 6.

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Objectives</th>
<th>Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceptions</td>
<td></td>
<td>Number of satisfied recipients</td>
</tr>
<tr>
<td>Donors</td>
<td></td>
<td>Level of percipients satisfaction</td>
</tr>
<tr>
<td>Volunteers</td>
<td></td>
<td>Level of donors</td>
</tr>
<tr>
<td>Participation</td>
<td></td>
<td>Increasing in fund raising</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increasing in volunteers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Level of volunteers consensus</td>
</tr>
</tbody>
</table>

| Actions/services              | Quantity   | Increasing in the quantity of services |
|                               | Quality    | Increasing in the number of percipients |
|                               | Timeliness | Increasing in the value of services   |
|                               |            | Timeliness in services                |
|                               |            | Frequency in services                 |
|                               |            | Services innovation                   |
|                               |            | New services                          |

| Processes                     | Efficiency | Support activities costs reduction   |
|                               |           | Reduction in work used in non-social activities |
|                               |           | Better integration between organization units |

| Resources                     | Effectiveness in resources allocation | Balance between costs for primary activities and for support activities |
|                               | Resources as a constraint              | Ad hoc fund raising for ICT |
|                               |                                        | Shift of resources from support activities to primary activities, due to ICT |

Figure 6: The balanced scorecard to evaluate ICT impact in nonprofits
Resources are considered as a constraint; therefore, performance in resources allocation is measured with the ratio between resources used in the ICT project (financial and human resources) and saved resources (for example, volunteers not more employed in support activities and now employed in social activities); this measure should be also related to resources allocated to social actions, to resources allocated to other support activities, to the total amount of resources owned by the organization.

Processes should be evaluated in terms of increased efficiency, for example time reduction, costs reduction, labour reduction, owing to processes automation.

Actions should be evaluated measuring the impact of automation on the social services; this impact should be related to the quantity of services, their quality and the timeliness and frequency in answering to the requests of recipients, but also to the innovation in old services or to the offer of new services due to ICT.

Stakeholders’ satisfaction and consensus should be evaluated with ad hoc instruments, such as interviews, etc. but could also be understood from an increasing in donations, volunteers and so on.

6. Conclusions
The ICT investments evaluation in nonprofit organizations could not be carried out using traditional instruments, based on economic and financial methods. Indeed, the mission of nonprofits is not profit, nor revenue or cash flows maximisation, but to furnish social services to several recipients, with the aim of better satisfying their expectations and obtaining consensus from their different stakeholders. This particular nature of nonprofit organizations needs ad hoc evaluation instruments, focused on the specific links between ICT investments and the organization mission fulfilment.
To solve this problem, it is useful to design an evaluation system not based on financial or economic metrics, but focused on the relations between the allocation of scarce financial and human resources and social actions. That is a balanced scorecard built contemporary on the subject of the evaluation – the nonprofit organization – and the object – the ICT projects. It requests the definition of new evaluation dimensions, new metrics, and new methods for the analysis of ICT investments and related objectives and expected returns.

The models here proposed is built upon a functioning scheme of nonprofit organizations; it puts the mission and its short and terms objectives at the core of the organization; around the mission, people, resources, processes, actions are disposed because they contribute at the objectives achievement. ICT contributes at this virtuous cycle too, by means of its role in processes automation and services effectiveness, absorbing resources but also releasing qualitative benefits.

In this framework, several performance indicators are identified, that allow individuating the direct or mediate impact of ICT on the mission. This impact is measured by increasing in processes efficiency, actions effectiveness, services quality, stakeholders' consensus, recipients satisfaction (Dameri 2001).

This model is therefore designed just for nonprofit organizations; however, it could be used also in for-profit firms, when they need to evaluated ICT projects non directly concerned with economic or financial impact, but focused on improving some qualitative business conditions, such as customers and employers satisfaction, products and services quality, the social and environment dimension of the production impact (Drucker 1989). In these cases, indeed, it is impossible to apply financial evaluation systems, but it is possible to link ICT projects to the qualitative aspects of business strategies and mission, identifying appropriate metrics for the impact of ICT on the fulfillment of business goals.

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Broadening Information Systems Evaluation Through Narratives

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Abstract: The purpose of information systems post-evaluation ought to be to improve the use of systems. The paper proposes the use of narratives as a tool in post-evaluations. The potential in narratives is that they can convey meanings, interpretations, and knowledge about the system, which may potentially lead to action. The paper offers three main suggestions: 1) evaluations should form the basis for action; 2) narratives make evaluation more relevant; and 3) post-evaluations should be done with the aim of improving use. Narratives should be viewed as a complement to traditional evaluation methods and as a way of making evaluation more formative and thereby moving away from the more common summative perception of evaluation. The conclusion of the paper is that narratives can advance IS evaluation and provide a richer evaluation picture by conveying meanings not included in traditional evaluations.

Keywords: Narratives, information systems evaluation, measurements, measure, stories, action.

1. Introduction

The aim of this paper is to contribute to information systems evaluation by introducing narratives in the evaluation process. The potential with narratives is that they can convey meanings, interpretations, and knowledge (learning) about the system, which can be used for further action. The aim of the paper should be viewed in relation to some practical issues in IS evaluation, such as evaluations is a problematic (Irani and Love 2001) and complex process (Jones and Hughes 2001), which becomes more difficult with increased complexity of IS (Farbey, Land and Targett 1995), and the growing concern that information systems do not deliver business value (Irani and Love 2001).

The literature describes several roles for IS evaluation. Serafeimidis and Smithson (2003) described control, sense-making, learning and exploratory orientations in IS evaluation. The view taken on evaluation of information systems in this paper is pragmatic: Once a particular system has been implemented, the focus of evaluation should be on continuously improving the benefits received. The pragmatic approach is based on three assumptions about evaluation in this context.

- Firstly, evaluations should form the basis for action: do not measure if you cannot act on the measurement.
- Secondly, post evaluations ought to be carried out with the goal of improving the use of system, not only assessing the worth of a system.
- Thirdly, narratives can grasp the complexity of information systems better than traditional evaluation approaches, such as return on investment or total cost of opportunity.

The paper builds on research from interpretive research in information systems, such as Klein and Meyer (1999), Serafeimidis and Smithson (2000) and Walsham (1993; 1995; 1999); post-modern institutional theory (Meyer and Rowan 1977); and narratives in accounting (Llewellyn 1998), knowledge management (Snowden 2002; Swap, Leonard, Shields and Abrams 2001), and requirements engineering (Jarke, Bui and Caroll 1998). The first two are primarily used as theoretical ground for the use and relevance of narratives whereas the latter is used as a source of practical and methodological inspiration. Thus, the aim of this paper is not to try to improve the understanding of the evaluation process as such, which is common in interpretative research (see for instance Walsham 1993), but to provide inputs to how we conceptually can advance IS evaluation.

The paper is organised as follows. The following section addresses and discusses evaluation and role of measurement in evaluation. Following this is the theory of action and learning is described, which is the theoretical ground for improvement driven evaluation. Narratives and the use of narratives, which should be interpreted as the means for action, in evaluations are then explored and discussed. The paper ends with a discussion.
and conclusion on the practical implications for information systems evaluation.

2. IS evaluation and measurements

While it is reasonably easy to evaluate tangible implementation costs, e.g. software license, hardware, consultancy, and training, other intangible cost are much more difficult to measure and evaluate (e.g. productivity dip and resistance to change). As a response to these difficulties both practitioners and academics have developed a number of methods and tools to support the process of determining the costs and value of IS. These issues and others have lead to extensive research into IS evaluation. The remainder of this section highlight some research contributions, which are important to understand the role of narratives in IS evaluation.

Evaluation is not a simple and straightforward process (Jones and Hughes, 2001) and may have many purposes, e.g. control projects, govern change management, communication, improvements, resource allocation, motivation, and long term planning (Sinclair and Zairi, 1995). In addition, Remenyi and Sherwood-Smith (1999) described two practical and very relevant issues in IS evaluation. The first is the so-called evaluation gap. This occurs when the evaluator distance themselves from the project and lose sight of the business objectives. The second concerns that business objectives of the IS project, e.g. organisational change and change management, are often forgotten or superficially attended to in evaluations.

As the field of IS evaluation has matured the view of IS evaluations has changed over the past years. Today there is an increased awareness about the importance of an ongoing evaluation process. There is also a growing number of IS researchers arguing that IS evaluation should focus on how IS supports businesses – the use of system, i.e. a formative evaluation process (Remenyi and Sherwood-Smith, 1999). However, a practical issue is that the purpose of IS evaluation is often to close the project (Kumar, 1990; see also Seddon et al., 2002), with emphasis on ROI (Murphy and Simon, 2002). Hirschheim and Smithson (1998) also Seddon et al., 2002), with emphasis on financial accounting. Measurements are invariably used in complex sense-making processes where both translations and interpretations take place, usually several times in different steps (figure 1). This, as Hoebeke (1990) points out, makes the concept of relevance a lot more important than objectivity - there has to be a shared meaning of the interpretations and their impacts by those who play a role in the process of collecting, translating and interpreting the measures, as well as those who act on decisions based on said measurements. Hoebeke’s main point is that in organisational sense-making processes such as evaluation it is impossible to have a fit between measure and action, because of the interpretations taking place.

A common factor in all evaluations is the use of measurements (Venkatraman and Ramanujam, 1986). Strassman (1985, p. 100) stresses that: "You cannot measure what is not defined. You also cannot tell whether you have improved something if you have not measured its performance", i.e. the need of an operational definition. This is, however, difficult since "figures never are facts" (Hoebeke, 1990). Hoebeke (1990) made this comment in relation to a discussion regarding the use of measurements based on calculations, e.g. financial accounting. Measurements are invariably used in complex sense-making processes where both translations and interpretations take place, usually several times in different steps (figure 1). This, as Hoebeke (1990) points out, makes the concept of relevance a lot more important than objectivity - there has to be a shared meaning of the interpretations and their impacts by those who play a role in the process of collecting, translating and interpreting the measures, as well as those who act on decisions based on said measurements. Hoebeke’s main point is that in organisational sense-making processes such as evaluation it is impossible to have a fit between measure and action, because of the interpretations taking place.

Figure 1: Chain of activities that take place in organisational sense-making

Farbey et al. (1995) implicitly addressed sense-making problem. They proposed a model which is based on the perception that it is possible to stratify different types of organisational change and connecting it to different IS. Their model consists of eight levels, and while the classification is not rigid, it still implies that higher levels of change increase the potential benefits, but also increase the uncertainty of outcome. Potential benefits and level of uncertainty are both cumulative, thus systems classified on a certain level may have all the benefits (and accumulated uncertainty) from any or all the levels below. Farbey et al. (1995) conclude that for the implementation of systems on the 8th level (business transformation) "... benefits stem from the transformation as a whole. IT
provides only one component of what is often a complex series of changes. It is not possible to attribute a portion of the benefits gained to any one factor” (p. 49). It would then be highly unlikely that any two implementations will have identical requirements or consequences, even if they are based on the same generic software packages. While the potential benefits might be articulated, it makes the actual benefits from implementing an IS hard to define, predict, and evaluate.

In summary, we argue that evaluation should be used as a basis for action. IS implementations are only limited in time in the most abstract sense and governed by other organisational activities; project plans, budget years, top management changes and organisational strategic decisions. Implementing a complex IS are deeply interconnected with organisational change and for the lifetime of the system, it remains a large part of the organisations formalised internal framework. Evaluation in this context should be performed continuously, combined with process reviews and organisational development, aiming to get the desired alignment and fit over time. To get the most out of a large organisation, the result of evolution has to be evaluated and new requirements formulated in an iterative process. The key to getting the most out of any IS is the use; use in this perspective is regarded in the broadest sense, including other use, miss-use, abuse and non use of system by humans and connected IS. To achieve the intended use of the system in the organisational context, organisational goals and beliefs have to be communicated to members of the organisation. Organisations use myths and narratives to make sense of equivocal situations and they are used as precedents for future actions, serving as “blue-prints” for desirable behaviour (Alvarez and Urla, 2002). The following section presents theory of action as theoretical ground and justification for the use of narratives.

3. Theory of action and narratives

Human actions are not always what they seem to be. Humans invariably employ text rich documents to propose ideas, argument cases and give verdict on actions taken. Therefore, by including narratives in the continuous IS evaluation process, we predict that business managers and IS users can increase their learning capacity and increase the value of the investment.

One source of theoretical foundation of our ideas can be founding Argyris and Schön (1974), who suggest that people act in accordance with their mental maps rather than the theories they espouse. People are not aware of the mental maps or theories they do use (Argyris 1980). One could say that there is a split between theory and action. Argyris and Schön suggest that two theories of action are involved. “When someone is asked how he would behave under certain circumstances, the answer he usually gives is his espoused theory of action for that situation. This is the theory of action to which he gives allegiance, and which, on request, he communicates to others. However, the theory that actually governs action is theory-in-use” (Argyris and Schön 1974, p. 6-7, our italics). As humans invariably think and express themselves using the full depth of language - by telling “stories” - it is therefore conceivable that unless external observations “verifies” the stories. Stories told do not reflect theory-in-use but espoused theory.

A model of the processes involved is required to appreciate fully theory-in-use. Argyris and Schön (1974) initially looked to three elements: Governing variables, Action strategies and Consequences. Argyris (1976) proposed the double loop learning theory, which concerns changing underlying values and assumptions, i.e. learning. The focus of the theory is on solving problems that are complex and ill structured and which change as problem-solving advances. Typically, interaction with others is necessary to identify the conflict. There are four basic steps in the action theory learning process: (1) discovery of espoused and theory-in-use, (2) invention of new meanings, (3) production of new actions, and (4) generalization of results. Double loop learning involves applying each of these steps to itself. In double loop learning, assumptions underlying current views are questioned and hypotheses about behaviour tested publicly. The result of double loop learning should be increased effectiveness of action and better acceptance of failures and mistakes.

Narratives are used to persuade, convince, and make people act and behave in certain ways – a tool for learning and action. The alternative in organisation for reasoning, learning, and persuading is to use numbers and calculations, including financial statements, investment calculations, and time reports (Llewellyn 1998). Clausen (1994, p. 45) states that: “Using narratives in the system development process seems to be a way in
which designers will be able to come up with the kind of descriptions that are asked for."
Besides everyday life narratives that are used by all people, a theoretical ground for narratives can be found in institutional theory. Meyer and Rowan (1977) suggests that ‘rationalised myths’ contribute to the understanding of organisations. Narratives or stories that convey myths are powerful tools that make the irrational become rational (Llewellyn, 1998).

In accounting, management, human computer interaction (HCI), knowledge management, strategic management, and software engineering narratives are common. Llewellyn (1998) discusses how narratives are best understood, constructed, and used in accounting and management research. In HCI, research narratives are used to improve the communication between end-users and developers for designing user interfaces, task modelling and prototyping, and supporting the specification of user interfaces (Bødker 2000). The role of narratives as conveyer of tacit knowledge is explored in knowledge management (Swap et al. 2001). In strategic management, scenarios are used to explore future alternatives where scenarios are “tools” in the “strategists arsenal” (Porter 1985, p. 481). Software engineering on the other hand uses narratives and scenarios to gather and validate requirements (Antón and Potts 1998; Jarke et al. 1998). It should be noted that there are different underlying philosophical reasons for the use of narratives. Llewellyn (1998), Bødker (2000), and Clausen (Clausen 1994) represent an interpretive research tradition, whereas Porter (1985) together with Jarke et al. (1998) and Antón and Potts (1998) can be classified as belonging to a more positivistic research tradition.

In IS research narratives have also emerged as an alternative approach. Hirschheim and Newman (1991) use the concept of myth to interpret social processes during information systems projects. Clausen (1994) develops a model for how information system designers can use narratives to make descriptions of information systems that people understand, cf. traditional methods such as structured languages and formal specifications. Brown (1998) examines the use of narratives to explain and create meaning in power struggles in information systems implementations. Dube and Robey (1999) analyse stories, by competing groups in information systems development project, as symbol of organisational values or myths to gain insights into the interpretation of management styles. Alvarez and Urla (2002) describe the use of narratives in requirements specification of ERP systems. Finally, Alvarez (Alvarez 2002) examines the role of myths to construct an ERP system as an integrated system and to elaborate the existing organisational values.

Alvarez and Urla (2002) describe three sources of benefits from narratives in relation to IS. First, narratives may provide a pragmatic view of the systems, i.e. how the users perceive the system and offer insights into how the system is actually used. This may reveal institutionalised work practice, inefficiencies of the system, and how users manage those inefficiencies. This type of narratives may be used to convince consultants or managers about necessary changes in the system. Secondly, narratives functions as mediums to convey that the system is a part of the larger organisation and not an isolated thing. Thirdly, narratives are especially for complex IS, since complex IS often affect organisational function by imposing process logic on the organisation. Other large affects imposed through complex IS may also be communicated within the organisation through narratives, e.g. integration, standardisation of work processes, implementation of business rules.

4. Integrated model and discussion
In this section we present a model narrative based evaluation. The model integrates organisational sense-making and double loop learning. The model is depicted in Figure 2 and the logic of the model is the following. Organisational sense-making, which forms the overall process in evaluation consist of four iterative steps: action, narratives, interpretation and decision. Action refer to the use of IS, which can be individuals, groups, organisations, or society. The four groups of IS users are based on four out of five groups defined by Seddon et al.’s (1999). External parties, i.e. independent observers, are excluded since they are not users. The next step in the model is narrative, which refer to the task of producing and diffusion of narratives, which can be performed by any user group, stakeholder or external auditors. Note that we have replaced Hobek’s measurement with narratives. Narratives should be perceived as one tool among many others, see for instance Deschoolmeester et al.’s (2004) excellent summary of different evaluation tools and methods. The third step in the model is interpretation of narratives. Interpretation can be done by any one having decision power or potential of influencing the
behaviour of IS user. It can be the individual user or the management. Decision is the last step and the beginning of a new sense-making process refers to the decisions which are guided towards changing behaviour, i.e. action.

Double loop learning is integrated into the model in two ways. First, interpretations influence an affects the narratives leading to modifications of existing narratives. Modification refers to both reflection and learning in process of making sense of narratives prior deciding on which actions to take. Second, the narratives produced include criteria of success which are used in the decision process of which actions to take. Narratives make the case that effectiveness results from developing congruence between theory-in-use and espoused theory, i.e. both the creation and interpretation of narratives. Reflection is a key tool to reveal the theory-in-use and to explore the gulf between espoused theory and theory-in-use or in bringing the later to the surface. Provided the two remain connected, and then the gap creates a dynamic for reflection and for dialogue. As humans invariably think and express themselves using the full depth of language - by telling “stories” - it is therefore conceivable that unless external observations “verifies” the narratives. Narratives told do not reflect theory-in-use but espoused theory.

![Figure 2: Proposed schematic evaluation process](image)

Narratives used could range from talks among employees to published business cases describing the “good” use of IS. Thus, the actual implications for practice might not be so great, since narratives are used in business to convey meanings and to persuade people to act.

Due to their nature, narratives can carry much information and handled with care they can be used to reach procedural results and process improvements at the same time. Used as for evaluation, they are perhaps the best-suited tool for doing continuous improvements of both subject and evaluation process. The narratives interpreted and may lead to action (decisions) or be modified. New action creates the foundation for new narratives which include both the formal success criteria and the users perceived success stories. Narratives and stories may take role of communicating how to use IS better, e.g. to spread “best practice” use. Social and complex tasks are difficult to convey by other means than stories, which may develop and grow through face-to-face communication. Stories might inspire users of information systems, within the organisation or in other organisations, to investigate the possibilities in systems and ultimately change their mental models, which can lead to better use of information systems. Narratives is a communication medium with a high degree of media richness, which a suitable approach when there is a high degree of uncertainty and equivocality (Daft and Lengel 1986; Daft, Lengel and Trevino 1987). Other stories might reveal institutionalised work practice, inefficiencies of the system, how users manage those inefficiencies and to be used to convince consultants or managers about necessary changes in the system, where narratives can be used as tools to make the irrational become rational.

The use of narratives as an approach to measure and evaluate information systems might involve paradigm shifts in the existing control system and how to evaluate information systems. Changes of existing norms, behaviours, and procedures are difficult (Weick 1996). Resistance to change is likely to come. This is a rational behaviour for those who are affected by any change and not a dysfunctional behaviour (Markus 1983). The formalisation of narratives might also create new positions, such as chief storyteller. Storyteller might become the new power position. Narratives are powerful tales that can be manipulated by different stakeholders, such as managers, project leaders, and storytellers. The process of changing the organizational culture to accept narratives will be a challenging process for most organizations and business managers. Besides changing the culture, there is a need for developing support tools, e.g. story boards, and procedures to create, store, and spread stories (Snowden 2002; Swap et al. 2001).

A last issue discussed in this section is the validity of the proposed model. The validity of the evaluation model can be assessed by three particular criteria: the integration of the model (logical coherence), its practical and theoretical relevance, and relative explanatory power.
The evaluation model steps are casually inter-related: including not just the tools and methods, but also the impacts and consequences of the proposed use of narratives in evaluation. An important aspect of the model is the feedback loop, modify and employ and change success criteria, i.e. the learning process. Failure to interpret narratives might lead to less learning and no improvement of system use. Potentially, this also clarifies some of the practical problems with action theory and what it is that should be learned in relation to system use.

The evaluation model is characterised by an integration of various theoretical perspectives, and addresses the interdependency between the evaluation and the actions taken based on the evaluation. There are other studies addressing the same issue. One notable study is Remenyi and Sherwood-Smith (1999) who proposed a formative evaluation process, which in idea is similar to the proposed one. The main difference that Remenyi and Sherwood-Smith (1999) evaluation approach address evaluation during the development of IS, whereas the proposed model address evaluation during use of system. Another difference is that the proposed model suggest narratives as a tool in formative evaluations.

5. Conclusion

The literature (e.g. Hirschheim and Smithson 1998; Walsham 1993) have proposed interpretative approaches to information systems evaluation. Hirschheim and Smithson (1998) suggest that interpretative approaches are a way of gaining a deeper understanding of the process itself. Symons (1991) supports this by suggesting that evaluations mean understanding the different perspectives of individuals and Walsham (1993, p. 179) states that “interpretative evaluations designs focus on learning and understanding” however, none has yet explicitly mentioned narratives as an interpretive evaluation approach. Neither has “doing better next time” (which would be typical process improvement) been replaced by “doing better all the time”. Learning continuously about the possibilities and difficulties we believe is the key to successful understanding of an information system before and during and installation, and use after an installation. Organisations use myths and narratives to make sense of equivocal situations and they are used as precedents for future actions, serving as “blue-prints” for desirable behaviour (Alvarez and Urla 2002). Narratives appear to be aptly suited as tools in furthering understanding of and support for improved system.

Still there are research implications and opportunities by acknowledging narratives as an evaluation approach of information systems. The implication is that narratives should not only be used as inputs in research, which is the traditional input in case research, it should also be a research output (Llewellyn 1998), where narratives can be used to reason and learn. Quantitative data can also form the bases of narratives. For instance, instead of stating the correlation between X and Y in statistical term it can put in words. The consequence of narratives as research outputs is that researchers have to be able to interpret and evaluate stories in the same way as other research output.

Thus, we conclude that information systems evaluation is highly contextual and measurements of impact on organisations from large and complex information system on business performance are interchangeable with measurements of general improvements. For such measurements to be relevant they have to be used over a long period of time and the measuring would have to be initiated before the implementation is started (Hoebeke, 1990), e.g. in the requirements specification phase. As Strassmann (1985) claimed, we argue that we need to measure impact of information systems with the same measurements that are used on a specific organisation before the implementation, and that any changes recorded are attributable to a combination of information system implementation, organisational changes and changes in method of measurement. Thus, measuring or quantifying isolated impact from information systems implementation is close to impossible. Instead of trying to measure the impossible, we propose the use of narratives as the means to spread knowledge, which ought to lead to better action and improvements during the implementation and usage of systems.

References


Common Gaps in Information Systems

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Abstract: Information systems and databases in six Finnish organizations are evaluated in this multiple case study research. The main idea of the research was to describe the main gaps in information systems in the case organizations. In each case the gaps are presented with authentic descriptions. The research identified altogether seven different categories of gaps. These are first abstracted to four common categories of gaps: 1) data, 2) infrastructure, 3) turning data into information and 4) people working with the information systems. Finally, the four categories are further abstracted to two common categories of gaps: 1) information and 2) infrastructure.

Keywords: Information Systems, IS-Gaps, Databases, Case Study

1. Introduction

Information systems are natural parts of the business processes in all kind of organizations. Information systems are of vital importance to many organizations across a wide range of sectors of the economy (Waema et al. 1994). In many cases information systems are the core players in doing the business. Typically these information systems are taking care of some specific part of the business. These information systems must however be able to communicate with each other, because strategic decisions usually require information from several functional areas within an organization. This fluent alignment of information systems to serve business is also one of the biggest concerns among managers. For example, in a ranking of top IS management issues, optimizing enterprise-wide IS services and optimizing organizational effectiveness were the top two issues in 2001 (CSC 2002). Thus, any means that can help organizations to process and manage information presents an opportunity they cannot ignore (Walsham 1993).

The business data is managed through the information systems and stored in the databases. Organizations need to be able to process this data and use the information efficiently in order to succeed (Walsham 1993). However, according to a recent study more than 25 percent of critical data is incomplete and inaccurate (Gaudin 2004)! This kind of poorly managed data presents real problems for the management of large organizations. These information-related issues have been ranked very highly in several studies. For example, in a Norwegian study IS managers were asked to rank today’s key IS management challenges in order of importance and developing and implementing information architecture came fourth (Christensen et al. 2000). The same paper studied other similar research results and concluded that making effective use of the data resource was in second place. Another study came up with similar results when ranking critical IS management issues: developing and implementing an information architecture was ranked fourth and making effective use of the data resource was in seventh place (Brancheau et al. 1996). Yet another study ranked organizing and utilizing data third out of top IS management issues (CSC 2002). The same survey also studied the important technology trends and in the Europe the top two issues were 1) Real-time information access through innovations in data storage and management and 2) Open data exchange extending the reach of information across the extended enterprise.

All the above motivated to a multiple case study. The aim is this research was to evaluate the information systems and the databases in a group of different organizations. In this article the focus is on presenting the gaps of their information systems. The article is organized following. In section 2 the research and the used methodology is presented. In section 3 some descriptive data of the studied information systems and databases is presented and the specific gaps in each case are described. Finally in section 4 and 5 discussion and conclusions are presented.

2. The research

2.1 Research methodology

Methodologically this is a multiple case study research. This research methodology was selected, because the goal of the research was not to achieve statistical generalization rather analytic generalization (Yin 1994). A case research aims for in-depth understanding of the context of a phenomenon (Cavaye 1996). A case study examines a phenomenon in its natural setting, employing multiple
methods of data collection to gather information from one or a few entities (Benbasat et al. 1987). Furthermore, a case study is particularly appropriate for practise-based problems (Benbasat et al. 1987).

This research follows the interpretive tradition of the case research. Interpretivism means that there is no objective reality, which can be discovered by researchers and replicated by others (Walsham 1993; Broadbent et al. 1998). Interpretivism aims to understand phenomena from the point of view of participants directly involved with the phenomenon under study (Cavaye 1996). In this research it means that the information systems and databases are not directly examined rather through interviews.

2.2 Research design

The main idea of this research was to evaluate information systems and databases in a group of different organizations. The focus was especially on describing the gaps of their information systems and producing common categories of the identified gaps. The main research question was:

“What kinds of gaps organizations are dealing with in their information systems and databases?”

Six Finnish organizations were selected to this research. In every organization multiple information systems and database were analysed. Thus this is a multiple case study with multiple units of analysis (see Table 1). Multiple cases are desirable when the intent of the research is description, theory building or theory testing (Benbasat et al. 1987). Multiple cases also enable analysis of data across cases (Cavaye 1996). The organizations were selected some general rules in mind (size, business, private/public, not competitors, not IS producers). Every organization also serves a specific purpose within the overall research (Yin 1994), since they all had some specific field to study within this research.

Table 1: The case organizations

<table>
<thead>
<tr>
<th>Organisation/abbreviation used in this research</th>
<th>Line of business</th>
<th>Private/Public</th>
<th>Turnover2002 (million EUR)</th>
<th>Employees 2002</th>
<th>Specific research field</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOK corporation/SOK</td>
<td>Co-operative society (main businesses food &amp; groceries and hardware)</td>
<td>Private</td>
<td>2998</td>
<td>4645</td>
<td>Data modeling for application integration</td>
</tr>
<tr>
<td>Salon Seudun Puhelin Oy/SSP</td>
<td>Telecommunication</td>
<td>Private</td>
<td>28</td>
<td>121</td>
<td>Management of information systems</td>
</tr>
<tr>
<td>State Provincial Office of Western Finland/WEST</td>
<td>Regional administrative authority</td>
<td>Public</td>
<td>350</td>
<td></td>
<td>Managing inquiries with databases</td>
</tr>
<tr>
<td>Statistics Finland/STAT</td>
<td>National statistics</td>
<td>Public</td>
<td>52</td>
<td>1 074</td>
<td>Storing spatial data in databases</td>
</tr>
<tr>
<td>TS-Group/TS</td>
<td>Printing services and Communications</td>
<td>Private</td>
<td>293</td>
<td>2 052</td>
<td>Managing customer information in databases</td>
</tr>
<tr>
<td>Optiroc OY/OPTI</td>
<td>Building materials</td>
<td>Private</td>
<td>149</td>
<td>388</td>
<td>Maintenance and customization of IS</td>
</tr>
</tbody>
</table>

2.3 Data collection

Multiple data collection methods are typically employed in case research studies (Benbasat et al. 1987) and this research do not make any exception. The main method used in data collection was semi-structured interviews. Interview was selected since with it very targeted and insightful observations can be perceived (Yin 1994). Data was also collected from existing documents, which provided stable, unobtrusive, exact and broad coverage of the cases. (Yin 1994) These additional documents (annual reports, memos, publications, presentations) were received during the interviews.

Altogether 54 interviews were arranged (see Table 2). The average length of interviews was approximately 100 minutes and the total time of interviews was over 91 hours. The interviewees were selected with the organizations’ contact persons, typically the CIO of the organization. The interviewees represented various positions, but they were normally persons in administrative positions.
toward the information systems like CEO, CIO, IT Manager, IS Manager, Project manager and Main user.

The themes of the interview were delivered beforehand to interviewees and all the interviews were recorded and notes were taken during the interviews. One of the themes concentrated directly on gaps within the information systems and databases. Gaps came up as well when other themes were discussed. All interviews were transcribed to a database application specially designed for this research. Working in this way the large amount of the collected data was more easily managed and later analysed. This solution also answered to Benbasat et al. (1987) definition that the researcher should be meticulous in record-keeping and to Yin’s (1994) second principle of data collection: create a case study “database”. The transcript of the interview was produced from the database and emailed to the interviewee for corrections and possible additions.

### Table 2: The interviews.

<table>
<thead>
<tr>
<th></th>
<th>SOK</th>
<th>SSP</th>
<th>STAT</th>
<th>WEST</th>
<th>TS</th>
<th>OPTI</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviews</td>
<td>12</td>
<td>10</td>
<td>7</td>
<td>10</td>
<td>8</td>
<td>7</td>
<td>54</td>
</tr>
<tr>
<td>Interviewees</td>
<td>14</td>
<td>10</td>
<td>6</td>
<td>10</td>
<td>8</td>
<td>7</td>
<td>55</td>
</tr>
<tr>
<td>Total length of interviews in hours</td>
<td>26</td>
<td>17</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>13</td>
<td>91</td>
</tr>
</tbody>
</table>

### 2.4 Data analysis

The interview materials were analysed inductively with methods of qualitative content analysis. This means that the content categories were formulated as a result of interpretation of the interview material instead of using deductive approach and theory based categories. The analysis identified seven different categories of gaps (see Table 3).

### Table 3: The categories of gaps.

<table>
<thead>
<tr>
<th>Category name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logical structure of database</td>
<td>The database design has not succeeded in capturing all the necessary elements or the logical structure should be designed or that the requirements have changed during the time, but changes has not been implemented to the database.</td>
</tr>
<tr>
<td>Data integrity</td>
<td>Refers to the validity and consistency of stored data (Begg et al. 2002). These problems were usually originated from the duplicated relevant data.</td>
</tr>
<tr>
<td>DBMS</td>
<td>All the problems relating to the DBMS in use. There were gaps like stability/reliability of the DBMS, lacking tools, limited capability to manage the data and other similar gaps.</td>
</tr>
<tr>
<td>Response times and hardware</td>
<td>Gaps relating to hardware performance and hardware age.</td>
</tr>
<tr>
<td>Integration</td>
<td>Gaps in transferring data from one information system to the other.</td>
</tr>
<tr>
<td>Reporting</td>
<td>Gaps like insufficient reporting tools and difficulties in producing reports.</td>
</tr>
<tr>
<td>Personnel</td>
<td>Lack of qualified persons or recent changes in the personnel.</td>
</tr>
</tbody>
</table>

These categories are used when presenting the gaps in information systems and databases in each case organization. When the case results are introduced real names of the information systems are not used. Information systems are only numbered and the nature of the information system is told.

### 3. Description of IS related gaps in the cases

#### 3.1 Descriptive data of the information systems

The research analyzed altogether 44 different information systems that were classified in four categories (see Figure 1).

**Figure 1**: Distribution of types of the information systems

Over half (52 %) of the information systems and the databases studied during this research are critical to the business and they are used in business-critical processes. Figure 2 shows how business critical information systems are distributed in the different IS-categories. Most (65 %) of the business critical information systems are OLTP-systems.

**Figure 2**: The distribution of business critical information systems
The average implementation year of the information systems is 1997 and the average age of the information systems is almost 7 years. Within different cases the average age of information systems range from 4,6 to 10,7 years (Kontio 2003). The average implementation years in different IS-type categories is presented in Table 4. The DBMS solution behind all studied information systems was relational database.

**Table 4: Average implementation years in different IS-type categories**

<table>
<thead>
<tr>
<th>Category</th>
<th>Average implementation year</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLTP</td>
<td>1995</td>
</tr>
<tr>
<td>DSS, Reporting</td>
<td>1998</td>
</tr>
<tr>
<td>ERP</td>
<td>1998</td>
</tr>
<tr>
<td>Information channel</td>
<td>2001</td>
</tr>
</tbody>
</table>

Table 5 shows what type of gaps the interviewees identified in their information systems and databases. Keep in mind that these gaps do not exist in every information system and database of the organization, but these are the gap areas the organization has to deal with in some of the information systems and databases.

**Table 5: Identified gap categories in cases**

<table>
<thead>
<tr>
<th>Case</th>
<th>Logical structure of database</th>
<th>Data integrity</th>
<th>DBMS</th>
<th>Response times and hardware</th>
<th>Integration</th>
<th>Reporting</th>
<th>Personal</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOK</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SSP</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEST</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>TS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>OPTI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2 SOK Corporation (SOK)

The S Group has organized itself into a cooperation network comprising the regional cooperative societies and SOK Corporation. SOK Corporation’s task within the S Group is to help the cooperative societies produce services and benefits competitively for their customer-owners by focusing on providing support and procurement services for all the S Group’s companies. (SOK-Yhtymä 2003)

The interviewees identified a total of 22 essential information systems and databases. The average age of these systems is little over seven years. Within these 22 analyzed information systems of SOK Corporation all the categories of gaps exist. However the different information systems and databases suffered naturally from different gaps if none. Table 6 presents how interviewees described the gaps of the information systems and the databases. The interviewees mentioned no remarkable gaps in seven information systems and databases.

**Table 6: Gaps in SOK Corporation’s information systems and databases.**

<table>
<thead>
<tr>
<th>Information System</th>
<th>Described gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Customer data)</td>
<td>The information system is developed in a “quick-and-dirty” way and now every little change is very expensive and you never know when everything collapses. The documentation of the IS is also not satisfied and interviewee’s guess is that there is plenty of overlapping information. Also the logical structure of the database is suspected.</td>
</tr>
<tr>
<td>2 (Accounting)</td>
<td>The integration of this and other information systems is a very toilsome task and it requires lot’s of manual work. Also reporting and analyzing possibilities are insufficient.</td>
</tr>
<tr>
<td>3 (Organization)</td>
<td>Gaps are mainly logical gaps i.e. how the data should be managed. The environment is unestablished and the concepts are still changing.</td>
</tr>
<tr>
<td>4 (Products)</td>
<td>Integration with cash systems is not satisfactory while the present integration solution poses unnecessary delays in data transfer. These batch transfers present additional middle phases and non-transparency in processes.</td>
</tr>
<tr>
<td>5 (Room reservation)</td>
<td>A gap is the integrity of customer data. Customer data is transferred from central reservation system to hotels and other way around. The IS in hotels does not check the existence of a customer automatically from the central reservation systems and this leads easily to situations where customer is stored in the database multiple times. The supplier of the information system has been careless when implementing new version of the information system and this has resulted in considerable fall in performance and non-functionality of scandinavian alphabets. The database management systems is also quite unreliable. It corrupts</td>
</tr>
</tbody>
</table>
Real estate security and control systems.

(SSP 2001)

The interviewees identified a total of 4 essential information systems and databases. The average age of these systems is six years. Within the 4 analyzed information systems of SSP four categories of gaps exist. These categories are Data Integrity, DBMS, Response Times and Hardware and Reporting. Table 7 presents how interviewees described the gaps in these information systems and databases.

Table 7: Gaps in SSP’s information systems and databases.

<table>
<thead>
<tr>
<th>Information System</th>
<th>Described gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Telephone Network)</td>
<td>Some of the features of the information system are not exploited and additional training is needed to fully exploit the information system. This system also stores customer data although the same information is available in information system two. Integration to that information system is missing. The server is very old and the performance of it is descending.</td>
</tr>
<tr>
<td>2 (Calls)</td>
<td>The main operative system is working very well. Some gaps deal with the skills of the users and the way user enter data in the system. Users are not given any training how to use the system. This has lead to a situation where insufficient and even false data is inserted in the database. Also the importance of this information is not clear to everyone. Second gap is the definition of data owners that is currently lacking. Third gap is that information systems offers only limited possibilities for marketing actions and analysis.</td>
</tr>
<tr>
<td>3 (Reporting)</td>
<td>The reporting system is suffering from limited capacity of the database management system. The performance of the system is also varies very much depending on the amount of data managed.</td>
</tr>
<tr>
<td>4 (Accounting)</td>
<td>The accounting system works very well and reliable, but it has suffered poor performance.</td>
</tr>
</tbody>
</table>

3.3 Salon Seudun Puhelin Ltd (SSP)

The vision of Salon Seudun Puhelin Ltd:n is to be the closest, most reliable, best quality and most useful partner in telecommunication for Salo region now and in the future. The role of the company is to build and develop networks for telecommunication and services for people, companies and communities of Salo region.

The focus areas of the company are:

- Broadband telephone network and services
- Mobile network and services
- Regional network
- Cabel televion network and digital services
- Internet portal (Allu)

3.4 Statistics Finland (STAT)

The mission of Statistics Finland is to combine collected data with its own expertise to produce statistics and information services for the needs of society, promote the use of statistics and develop national official statistics. Statistics Finland operates administratively under the Ministry of Finance, but is fully and independently responsible for its activities,
services and statistics. Statistics Finland has personnel of around 1,100, of whom 200 are employed as statistical interviewers. (Tilastokeskus 2003)

Table 8: Gaps in Statistics Finland’s information systems and databases.

<table>
<thead>
<tr>
<th>Information System</th>
<th>Described gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Locations)</td>
<td>The data is transferred and transformed from one format to another and this might lower the accuracy of the data. Same data is stored in different scale in different places. Many storage places lead to traditional update gaps. The naming of the data is also inconsistent and same data has different names in different places.</td>
</tr>
<tr>
<td>2 (Categories)</td>
<td>There are pressures to alter the logical structure of the database because present structure does not serve all use cases.</td>
</tr>
<tr>
<td>3 (Companies)</td>
<td>The data is transferred from different sources regularly, but at different points of time. This makes the management and the utilization of the data a bit uncomfortable when other data source is claiming something else than some other data source.</td>
</tr>
</tbody>
</table>

Within the specific field of study (geographical information systems) in Statistics Finland the interviewees identified a total of 3 essential information systems and databases. The average age of these systems is ten years. Within the 3 analyzed information systems of Statistics Finland three categories of gaps exist. These categories are Logical structure of the database, Data Integrity and Integration. Table 8 presents how interviewees described the gaps in these information systems and databases. In addition to gaps in these specific information systems and databases they also assessed the overall environment of their information systems and databases. One of the biggest gaps that the interviewees mentioned is the difficulties in combining different data sources when statistics are produced. This combining requires additional work thus presenting unnecessary costs. Another major gap is that there is no central storage for spatial data and changes in spatial data are very difficult if not impossible to audit.

3.5 State Provincial Office of Western Finland (WEST)

The State Provincial Office of Western Finland is a joint regional administrative authority of seven ministries. The agency is divided into eight departments. It promotes governmental and regional goals by taking care of duties in judicial administration, rescue and fire administration, education and culture administration, physical education and juvenile administration, agriculture and forestry administration, traffic administration, consumer, competition and groceries administration, welfare and health administration and jurisdictional district and register administration.

Regionality of governmental administration means also that every State Provincial Office is responsible for evaluating the basic service regionally and locally. (Länsi-Suomen lääninhallituksen peruspalvelut arviointiryhmä 2002) The State Provincial Office of Western Finland collects large amount of data to produce the evaluation report. The interviewees identified a total of 2 essential information systems and databases that provide information for the evaluation. The average age of these systems is eight years. Within the environment of State Provincial Office of Western Finland three categories of gaps existed. These categories are Logical structure of the database, Integration and Reporting. A major gap is the poor management of collected evaluation data. At present there is no adequate information system and database in use. The collected data is disorganized and therefore also awkward to use. Spatial data is also becoming more and more important, but at present the management of it is separated from other evaluation data. Thus extra work is needed also here. Another gap is that additional evaluation data is collected from other information systems in a way that need quite much manual work. The evaluation report is published as a book, but more and more people are asking parts of the evaluation results in electronic format. At the moment the production of this kinds of special reports is a very laborious task.

3.6 TS-Group Ltd (TS)

The TS Group is a communications group, which processes and provides information, as well as develops, produces and markets graphics products and related services. The group’s parent company, TS-Group Ltd, is responsible for subsidiaries, real estates and
administration of the whole group. In addition it publish newspapers and the main newspaper is Turun Sanomat. (TS-Yhtymä Oy 2003)

The interviewees identified eight essential information systems and databases. The average age of these systems is almost seven years. Within the eight analyzed information systems of TS-Group Ltd five categories of gaps exist. These categories are Logical structure of the database, Data integrity, DBMS, Response Times and Hardware, Integration and Reporting. Table 11 presents how interviewees described the gaps in these information systems and databases.

Table 9: Gaps in TS-Groups Ltd’s information systems and databases.

<table>
<thead>
<tr>
<th>Information System</th>
<th>Described gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Customers)</td>
<td>Centralized customer database functions well, but it does not give a full picture of a customer and this has initiated to the CRM-project. The server is also quite old and interviewees present ideas about upgrading it. There has been gaps with data integrity occasionally when a customer duplicate is accidentally created.</td>
</tr>
<tr>
<td>2 (Order entry)</td>
<td>The information system emphasized too much ordering process itself and do not offer enough support for marketing and selling. The database contains lot of data about customers, but any easy query-system does not exist. The information system has also certain limitations that hinder versatile use of the system. Addresses and coordinates have become increasingly important for example in following the delivery of newspapers, but the information system has limitations in managing spatial data.</td>
</tr>
<tr>
<td>3 (Advertisements)</td>
<td>The management of customer data in marketing is mentioned as a gap. It is difficult to segment customers and to become aware of the profile of the customer. Another gap that the interviewees mentioned is the lack of browser-based user interface. Version upgrades cause also gaps since computer-specific setups are needed. Finally integration with their partners’ information systems has some faults that slow down the processes.</td>
</tr>
<tr>
<td>4 (Printing)</td>
<td>A major gap in this information house)</td>
</tr>
<tr>
<td></td>
<td>systems is the slow performance that cause frustrations among users. The interviewees mentioned that the server, the database and the information system are all partly reasons for the slow performance. The database management system is also critized, since it does not offer any tools for ad hoc –queries, it trappes occasionally, it has insufficient indexing possibilities and the lock management is poor. The documentation of the information systems is also critized; there are many documents but they are somehow ambiguous. The information system has also internal incapabilities like moving from bid to order that is not supported at present.</td>
</tr>
<tr>
<td>5 (Accounting)</td>
<td>This information system has gaps in reporting. The viewer of reports is old and not compatible with newer operating systems. It is also very difficult to compare different years. Another gap deals with integration. The integration with data sources is risky and errors have been detected.</td>
</tr>
</tbody>
</table>

3.7 Optiroc (OPTI)

Optiroc Ltd manufactures mineral-based materials for both buildings and other civil engineering projects. Optiroc Ltd is part of HBE-group that is part of Heidelberg Cement group, but organizationally Optiroc Ltd is however a very independent unit.

The interviewees identified five essential information systems and databases. The average age of these systems is over four years. Within the five analyzed information systems of Optiroc Ltd three categories of gaps exist. These categories are Response times and hardware, Reporting and Personnel. The interviewees had conflicting ideas about the information systems in Optiroc Ltd. Some interviewees were very satisfied with the present state of art, but others were much more critical. The criticism concetrated on the Order Entry system and on the Reporting system. Other systems received no criticism. A fundamental gap in Optiroc Ltd is the lack of IT/IS-strategy that could define the guidelines for most of the issues that originated the criticism.
Table 10: Gaps in Optiroc Ltd’s information systems and databases.

<table>
<thead>
<tr>
<th>Information System</th>
<th>Described gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Order entry)</td>
<td>The critical comments mentioned that the main operative system is a failure since it just replaced the old one, but did not develop the processes of the company at all. During the design of this system the requirements of marketing and sales were bypassed as well. The information system is a very customized solution and some interviewees identify risks because the maintenance of the information system is a responsibility of a few consultants. It is also mentioned that tiny changes to the information system are done too often. The user interface is also criticized although some interviewees are very satisfied with it.</td>
</tr>
<tr>
<td>2 (Reporting)</td>
<td>Optiroc has own reporting tool, but the gap is that the users lack the skills to use the tool.</td>
</tr>
</tbody>
</table>

4. Discussion

One of the major gaps that SOK Corporation must deal with is about integrating their numerous data sources. This research with the specific research field focusing in data modeling for application integration was already a step to this direction. The data modeling emphasized same entities that the interviewees recognized important and problematic in the present information systems. For example both customer and product entity types are big challenges for the modeller, because the corporation operates with such a high number of different entities of these types.

In Salon Seudun Puhelin Ltd the main challenge is the integrity and the quality of the data. The personnel should be trained for proper use of the information systems. It should also be emphasized the value of the data as an organization’s valuable asset. Another issues that the research raised as challenges were integration and reporting. At least with reporting some plans already exists to overcome the capacity limits.

For Statistics Finland the major challenge is to rebuild the data storage solutions in the area of geographic data. In practise they have clear plans to exploit increasingly modern databases. The modernization relates also to the gaps that they have in integrating different sources of data for statistics production. They are for example studying and testing different spatial database management systems. Some emphasizes must be placed on data quality of geographic data as well to be able to provide accurate statistics also in the future.

The main challenge in State Provincial Office of Western Finland is to design an information system for the management of the yearly collected evaluation data. This research played here an initiative role since the goal was to design a first version of the necessary data model. With a new information system most of the reporting related gaps could be also solved. In addition, a appropriate database solution will also enable the management of spatial data together with other evaluation data. These solutions would offer good tools for versatile and flexible analysis and reporting. However, the key issue in the whole organization is still the integration of the existing information systems and the propaple new one.

Customer relationship management was the focus area in the case of TS-Group Ltd. The interviews confirmed the need for this movement to customer oriented way of doing business. There are also additional developments besides the CRM system. For example the old information system of printing house will be soon replaced and this will propaply solve the performance gaps as well. For reporting a data warehouse project is going on. Also in this case one central point is the integration of the information systems. In this sense TS-Group Ltd has prepared themselves with XML.

In Optiroc Ltd most gaps originated from the lack of the IT/IS-strategy. Maybe this was already recognized in the organization beforehand since the focus for this research was defined on maintenance and customization of information systems. The strategy would define the expected lifetimes of the information systems and thus speak out the maintenance and customization politics in the organization. The solution to overcome the gaps in reporting is simple: organize trainings for the users.

5. Conclusions

This paper wanted to describe common gaps in information systems of the case organizations. Data analysis produced seven different categories of gaps in these cases: 1) Logical structure of database, 2) Data integrity,
The research identified many IS-gaps in the organizations, but fortunately the organizations were aware of most them and corrective operations have already been launched. Different cases are focusing in different categories of gaps. SOK and STAT are focusing in data. SSP, WEST, TS and OPTI are focusing in infrastructure.

Figure 3: Final gap categories.

Logical structure of database and data integrity builds up the data gap category. This research confirms other researches (Brancheau et al. 1996; Christensen et al. 2000; CSC 2002) where data related issues have been ranked in top places when critical IS management issues have been listed.

Database management system, hardware and integration build up the infrastructure gap category. Infrastructure has been identified critical also in other studies like in CSC et al. (2003).

Information is a more descriptive name for the original name reporting. Basically, in this category the question is about turning data into information and presenting it. This result is not surprising since analysis and decision-making was identified as the most constraining issue because of lack of appropriate solutions in a study in 2003 (CSC et al. 2003). Thus the results confirm each other again.

Finally, humans refer to users and developers of the information systems.

The four abstracted categories of gaps can be abstracted even further to two categories of gaps in information systems: Information and Infrastructure. Information describes quite well the basic categories and actually they all lead finally to gaps information. Similarly Infrastructure describes broadly the basic categories except personnel. However, we could understand also personnel as basic part of the IS infrastructure.

References


Länsi-Suomen lääninhallituksen peruspalvelujen arviointiryhmä (2002).


Measuring the Quality of Electronic Journals

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Abstract: This paper presents the methodology developed to create a system to evaluate academic electronic journals. This methodology was developed in two stages. In the first stage, a system to evaluate electronic journals was created. The criteria framework and the indicators for assessment for academic electronic journals were selected and defined. According to this framework, several questions were designed to measure each indicator and, as a result, an instrument to evaluate academic electronic journals was built. In the second stage, this instrument was validated by 16 editors of electronic journals of different countries and different areas of knowledge that were considered as judges to evaluate clarity, importance, relevance and coverage of each question, indicator and criteria. This instrument was distributed by e-mail. The opinions given by the judges were processed and then used to help in the construction of a new instrument that is ready to be presented to the Mexican Council of Scientific Research in order to evaluate Mexican academic electronic journals.

Keywords: Key words: electronic journals, journals quality indicators, journals evaluation.

1. Evaluation of electronic journals

What we call the Gutenberg Era began in the Fifteenth Century with the invention of the printing press in 1463. By 1665 in Europe there appeared the first publications considered as systems of formal communication: Journal des Savants in Paris and Philosophical Transactions of the Royal Society in London (Guédon, 2000; Reyna, 2000).

Inaugurated more than three centuries ago, the formal publications (also known as primary, academic, scientific or research and development publications (Grunewald, 1982, in Rovalo, 1998) continue to be considered as basic links in academic communication, especially in the process of transferring and disseminating scientific information (Guédon, 2000; Rios, 2000; Barrueco, 2000).

Traditionally, the study of the evaluation of scientific publications dates from 1934, when Samuel Clement Bradford published Bradford's Law of Mathematics. The end of another three decades saw the birth of the science called bibliometrics, the brainchild of an Englishman named Alan Pritchard, who gave another name to "statistical bibliography." Garfield, toward the end of the fifties, expanded on the idea of indexing the sciences and the role of citations in creating a new concept for the evaluation of academic publications (Guédon, 2000).

The continuing advances in information and communications technology have transformed the production and dissemination of scientific knowledge. One of the fields in which this change has been most significant is that of publishing (Área, 1998), particularly in the publication of journals dealing with science and research.

The majority of authors tend to emphasize as advantages of online publication: the rapidity of publication; the ease with which illustrations, sound, animation, video, databases, hypertext links, and other characteristics of the electronic medium can be incorporated into the articles, and the low cost of reproduction and distribution.

In their fifteen short years of existence, electronic academic publications have shown rapid growth, but lamentable disorder because there are no quality standards by which to regulate them. The quest for excellence in this type of published material makes it necessary to define a set of criteria for its evaluation. Research on evaluative material for electronic publications is barely ten years old (Rohe, 1998). A look at the criteria for the evaluation of printed material (standardization, organization, clarity, indexing, etc.) shows that these are clearly identified and defined. In contrast, the criteria for evaluating online resources (access, navigation, design and speed, among others) are still in a state of confusion. Even among the authors themselves—those who deal with the subject—there is obviously little correlation in their way of defining and organizing the criteria (López and Cordero, 2001).

Some authors, such as Smith (1997), Alexander (2000), Brandt (1996), Beck (1997),...
Coutts (2001), Hinchliffe (1997), and Retting (1996), have dedicated themselves particularly to the evaluation of Internet publications. These authors have based their definition of criteria for the evaluation of electronic sources on those already established for evaluating traditional sources.

Some of those who specialize in the evaluation of digital journals are Cooke (1999), Bustos (2000), Codina (2001), Laerte (2001), Rodríguez (2001), Testa (2001), Lugo (2004) and Schulz (2001) who have proposed specific criteria for evaluating electronic academic journals as adaptable to user needs, access, content, navigation and site design. Although their work has been an important contribution to the field of electronic scientific publishing, they do not claim that their models of evaluation have been validated. These authors offer only a list of elements for consideration when evaluating academic journals.

As a contribution toward the resolution of this problem, the Autonomous University of Baja California’s Institute of Research and Educational Development organized a research project which had as its objective the development and validation of an evaluation system for electronic academic journals (López-Ornelas, 2003). The purpose of this paper is to present the methodology used and the results obtained, so as to consider these as a contribution to the evaluation of information technologies.

2. Method

The design for a system of criteria for the evaluation of electronic academic journals was structured in two stages. The first has to do with the design of the evaluation instrument, and the second, with the validation and restructuring of that instrument. Figure 1 shows the complete sequence of the work.

![Figure 1: Work process for the production of an instrument for evaluating electronic academic journals](image-url)
3. Design of the evaluation instrument

The purpose of this phase of the study was to propose a plan representing the best criteria for the evaluation of printed academic journals, as well as the most significant criteria for the evaluation of online publications. It was developed in three stages:

- Identification of criteria for the evaluation system;
- Identification of indicators for the evaluation system;
- Construction of an instrument for evaluating electronic academic journals.

In order to identify the criteria of the evaluation system, a search was made for the principal evaluation models of printed academic journals, and for the evaluation systems of online academic journals and resources. After reviewing the models, a comparative analysis was made to identify the criteria used most frequently. As a result of this analysis, it was found that the criteria used in the evaluation of printed academic journals are suggested by the consulted authors as an indispensable part of the evaluation of electronic academic publications as well. Thus, in order to evaluate an electronic resource, it is necessary to fall back on these traditional criteria.

There have also been identified the three criteria most frequently used for systems evaluation in academic journals and online resources: 1) timeliness and maintenance, 2) external recognition of the digital format of the publication and 3) navigation and graphic design.

Table I points out the criteria most frequently used in the evaluation of academic and electronic journals, as well as the seven criteria selected for the production of an instrument for the evaluation of electronic journals.

Table 1: Criteria selected for evaluating electronic academic journals

<table>
<thead>
<tr>
<th>Criteria selected for evaluating electronic academic journals</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Quality of content</td>
</tr>
<tr>
<td>- Standardization</td>
</tr>
<tr>
<td>- Purpose and coverage</td>
</tr>
<tr>
<td>- Periodicity and continuity</td>
</tr>
<tr>
<td>- Timeliness and maintenance</td>
</tr>
<tr>
<td>- Navigation and graphic design</td>
</tr>
<tr>
<td>- External recognition of the graphic design of the publication</td>
</tr>
</tbody>
</table>

Finally, the purpose of the third stage of the study's first phase was the production of an instrument for evaluating electronic academic journals by means of the criteria selected in the previous two stages, and by following the three following steps:

- Definition and integration of the system's seven criteria: Quality of Content, Standardization, Purpose and Coverage, Periodicity and Continuity, Timeliness and Maintenance, Navigation and Graphic Design, and External Recognition of the Digital Format of the Publication (See Table I).
- Definition and integration of the systems integrators (See Table 2).
- Formulation of questions for determining the presence or absence of each indicator.

Table 3 presents the definition and classification of the criteria and indicators of the system. First are shown the four
indispensable criteria for all academic journals; used in evaluating electronic academic journals.

Table 3: Definition and classification of the criteria and indicators of the system

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Quality of the content: Mechanisms used by the journal to ensure content quality</td>
<td>1.1 Authority: Presence of reviewers recognized by their academic community</td>
</tr>
<tr>
<td>2. Continuity and periodicity: Historical prestige of the journal and time of publication</td>
<td>2.1 Continuity: Historical prestige of a journal</td>
</tr>
<tr>
<td></td>
<td>2.2 Periodicity: Time established for its publication</td>
</tr>
<tr>
<td>3. Standardization: Inclusion and endorsement of the general aspects of a publication</td>
<td>3.1 Standardization: Inclusion and endorsement of the general aspects of a publication</td>
</tr>
<tr>
<td>4. Purpose and audience: Clarity with which the purpose of the site is stated, and the type of readers to whom it is directed</td>
<td>4.1 Purpose and audience: Purpose of the information in relation to the type of audience to whom the publication is directed</td>
</tr>
<tr>
<td>5. Timeliness and maintenance: Validity and preservation of the publication's internal and external links</td>
<td>5.1 Timeliness: Validity of the publication's internal and external links</td>
</tr>
<tr>
<td></td>
<td>5.2 Maintenance: Consistency preservation of the publication's internal and external links</td>
</tr>
<tr>
<td>6. Internal recognition of the publication's digital format: External recognition of the journal by its inclusion in libraries, incorporation in databases of relevant journals of the specialty which covers and finances the journal</td>
<td>6.1 Circulation and form of distribution: Various systems of circulation and dissemination used by a publication</td>
</tr>
<tr>
<td></td>
<td>6.2 Inclusion in databases: Indexing of the publication in databases and indices of national and international reach in its thematic area</td>
</tr>
<tr>
<td></td>
<td>6.3 Financing: Recognition which a journal may have by means of its financing</td>
</tr>
<tr>
<td>7. Navigation and graphic design: Use of factors which permit the effective use of the resources, such as images, color and graphic support, navigation, and structure of the information</td>
<td>7.1 Usability: Ease of access to the Internet publication</td>
</tr>
<tr>
<td></td>
<td>7.2 Navigation and organization: Organization which facilitates orientation and access to the information, as well as regular and ease of movement throughout the site</td>
</tr>
<tr>
<td></td>
<td>7.3 Design: Use of aesthetically pleasing graphic support in harmony with the context</td>
</tr>
<tr>
<td></td>
<td>7.4 Technical requirements: Characteristics of the hardware and software needed by the computer to access the resource</td>
</tr>
<tr>
<td></td>
<td>7.5 Interactivity: Ease of interaction between the user and the system</td>
</tr>
<tr>
<td></td>
<td>7.6 Connectivity: Time of access for consulting the resource</td>
</tr>
<tr>
<td></td>
<td>7.7 Search Capability: Presence of search systems which facilitate the access and recovery of information</td>
</tr>
</tbody>
</table>

As the final step of the third stage, questions were formulated for the determination of the presence or absence of the indicators in the journal evaluated.

4. Validation and restructuring of a system for evaluating electronic academic journals on the Internet

The purpose of the second phase of the work was to validate the system for evaluating electronic academic journals on the Internet. According to the Classical Theory of Measurement, content validity shows the level at which the items of an evaluation instrument are representative of the content of the domain that is tried to measure; that which is assured based on the opinion of experts, who determine whether this is, or is not, representative. The steps for validating the content are the following: definition of the universe of experts, selection of experts in the said universe, judgment of the experts regarding the relevance and representativeness, and analysis of the data (Backhoff, 2002).

What this means is that the study could not merely rely on an existing instrument by which to evaluate electronic academic journals, but rather, it was necessary to develop a new instrument in order to find out whether what had been considered important for evaluating a journal was, or was not valid, based on the verdict of the experts. There were three stages in the development of the phase:

- Production of a questionnaire for validating the instrument;
- Selection of the judges and delivery of the instrument to them for their validation;
- Restructuring of the instrument validated by the judges.
In making up the questionnaire, only three criteria were considered specific to the evaluation of electronic resources: timeliness and maintenance, external recognition of the publication’s digital format, and navigation and graphic design.

Three questionnaires were produced, one for each variable. For the validation of the instrument by the judges, four aspects were distinguished:

- **Clarity.** Evaluated legibility and clarity in the wording of the questions. This, for example, was one of the questions: “Is the indicator clearly defined?”

- **Importance.** Evaluated the questions’ level of relevance to the theme. For example: “What is considered the level of importance of the indicator timeliness in evaluating electronic journals?”

- **Coverage.** Evaluated whether or not the questions covered the theme in totality; that is, whether their content distinguished a particular theme, or was an indicator of another. One question, for instance, was: “Do you consider that new questions for evaluating this indicator should be included?”

- **Pertinence.** Evaluated whether the question was necessary, right and suitable for the theme; thus, evaluated whether or not the question belonged to the topic. For example, the questionnaire requested: “Mark the questions that are pertinent to the evaluation of the indicator financing”.

Table 4 shows the three criteria or variables reviewed by the judges, the indicators by variable and four aspects were distinguished.

<table>
<thead>
<tr>
<th>Criteria (Variables)</th>
<th>Indicators</th>
<th>Aspects that the judges evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeliness and maintenance</td>
<td>Timeliness, Maintenance</td>
<td>Clarity</td>
</tr>
<tr>
<td>External recognition of the publication’s digital format</td>
<td>Circulation and forms of distribution, Inclusion in databases, Financing</td>
<td>Importance</td>
</tr>
<tr>
<td>Navigation and graphic design</td>
<td>Navigation and organization, Design, Technical requirements, Interactivity, Connectivity, Search capability</td>
<td>Pertinence</td>
</tr>
</tbody>
</table>

Afterward, the judges were selected. It was first determined that the judges would be the editors of online electronic journals, refereed, published in Spanish, free access to complete text, at least two years old, and sponsored by recognized institutions, such as universities, educational organizations, governmental bodies, or societies.

Once the characteristics of the journals were identified, an Internet search was made to locate the journals and verify the length of their existence. After six months of checking, 36 electronic publications were found that met this criteria.

Finally, a letter of presentation and an invitation to participate in the study was designed and sent by electronic mail to the editors of the 36 journals selected. Of the 36 editors invited, 26 Emailed their acceptance, and the instrument designed was sent to them by the same means. Only 18 answered and Emailed back the questionnaires. Of these 18 questionnaires, two were eliminated because the questions were answered incorrectly. As a result, the evaluation sample was composed of 16 judges. The journals participating in the study had the following characteristics: all were from the area of social sciences; 15 were published by public universities, and one by a private university. As to their countries of origin, six were Mexican, six Spanish, one Canadian, one Northamerican, one Argentinean, and one Costa Rican.

### 5. Results

The validation of the instrument specifically considered four aspects of the criteria in each indicator and its questions: whether the questions were worded with sufficient clarity, whether their inclusion in the instrument were necessary (important), whether they adequately covered the theme and whether they were pertinent to the system.

Table 5 presents the results of the validation questionnaire. The results show the total points of all the questions which have to do with each indicator. It can be seen, for example, that in the case of the indicator circulation and forms of distribution, the judges considered that the questions were clear, but they thought there were too few, and suggested that further questions be added to the instrument.
As to the open questions, these were analyzed in qualitative terms; this was followed by the addition of the precise terms and techniques necessary for rejecting some questions of the instrument or for modifying the way these were worded.

The contributions of the judges were sufficient to make possible the restructuring of the original instrument, and for adding new questions. Table 6 shows in more detail the changes made in each of the criteria and indicators of the instrument for evaluating electronic journals.

### Table 6: Control of the restructuring of the instrument

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>INDICATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timeliness and maintainance</strong></td>
<td>1. The name and definition of the indicator were modified. 2. Questions 5.1.1, 5.1.2 and 5.1.4 were restructured, question 5.1.3 was eliminated.</td>
</tr>
<tr>
<td></td>
<td>1. The name and definition of the indicator were modified. 2. The construction of the five questions of the indicator was modified.</td>
</tr>
<tr>
<td><strong>External recognition of the publication's digital format</strong></td>
<td>1. The technical requirements were modified. 2. The definition of the variable was modified.</td>
</tr>
<tr>
<td></td>
<td>1. The technical requirements were modified. 2. The definition of the variable was modified.</td>
</tr>
<tr>
<td><strong>Navigation and graphic design</strong></td>
<td>1. The user friendliness was modified. 2. Questions 7.4.1 and 7.4.5 were eliminated.</td>
</tr>
<tr>
<td></td>
<td>1. The user friendliness was modified. 2. Questions 7.4.1 and 7.4.5 were eliminated.</td>
</tr>
</tbody>
</table>

The table 7 includes some examples of the questions that were finally selected by the judges giving their clarity, importance, and pertinence. It is not possible to include the complete instrument because of the space required.

---

**Table 5: Average percentages of each block of questions**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Indicators</th>
<th>Quest.</th>
<th>Clarity</th>
<th>Importance</th>
<th>Coverage</th>
<th>Pertinence</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeliness and maintainance</td>
<td>Timeliness</td>
<td>5.1.1</td>
<td>79%</td>
<td>81%</td>
<td>72%</td>
<td>72%</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>5.1.2</td>
<td>76%</td>
<td>75%</td>
<td>73%</td>
<td>71%</td>
<td>72%</td>
<td></td>
</tr>
<tr>
<td>5.1.4</td>
<td>75%</td>
<td>75%</td>
<td>72%</td>
<td>71%</td>
<td>71%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External recognition of the publication's digital format</td>
<td>Circulation and forms of distribution</td>
<td>6.1.1</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.1.2</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Inclusion in databases</td>
<td>6.2.1</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>6.2.2</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Navigation and graphic design</td>
<td>User friendliness</td>
<td>7.1.1</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.1.2</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Navigation and organization</td>
<td>7.2.1</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>7.2.2</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Technical requirements</td>
<td>7.3.1</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.3.2</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Interactivity</td>
<td>7.4.1</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Connectivty</td>
<td>7.4.2</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Search capacity</td>
<td>7.4.3</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td><strong>Average percentage</strong></td>
<td>5.1.1</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>7.1.2</td>
<td>88%</td>
<td>86%</td>
<td>83%</td>
<td>83%</td>
<td>83%</td>
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</tbody>
</table>

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6. Conclusions

The appearance of electronic publication has proved to be a phenomenon capable of transforming the traditional methods of circulation, publishing, dissemination, and transmission of scientific knowledge in a manner never before seen (Lafuente and Rosas, 1998).

The lack of methodological knowledge for the evaluation of electronic academic journals on the Internet has permitted the appearance of a great number of publications that neither adhere to traditional standards nor include quality criteria.

The evaluation system proposed in this work permits the designing of an instrument based on the exhaustive review of the check lists proposed by various authors, and also offers users the guarantee that this instrument has undergone a validation process, a process considered as basic in any evaluative process.

The validation of the instrument showed that the questions included were mainly clear and pertinent, but were not enough and there were still more important questions to include. This shows that from the time when the instrument was developed to the time in which it was answered by the judges, there were changes in the evolution of electronic academic journals.

This work contributes to the construction of the field of evaluation of technology in that it uses the principles of the Classical Theory of Measurement to evaluate a medium to which, until the present time, only general check lists have been applied.

7. Thesis contributions

This research proposal not only gives a methodology of criteria and indicators for the assessment of academic electronic journals, but it also supports the idea that those indicators and criteria should be used as "tools" of evaluation, which can be picked according to the users needs in each journal.

Likewise, because of the newness of this topic in Mexico, this study can be useful as:

- A basis for the development of new online academic journals design projects, or to develop web sites within a quality criteria framework. Understanding that the proposed criteria are not final.
- A check list to verify the quality of online data, selecting specifically the items to the kind of data one’s interested in.
- A guide to develop academic and non-academic electronic journals assessment models.
- A way for organisms to periodically assess the quality of their journals. In other words, to make an auto-assessment of their online periodicals.

Table 7: Examples of some questions included in each indicator

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Indicators</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>External recognition of publication's digital format</td>
<td>Circulation and access methods: o Does the journal have web distribution software? Yes ( ), No ( ) o If your answer is yes, do the readers have access to the repository? Yes ( ), No ( ) o Does the journal have a web-access form? Yes ( ), No ( )</td>
<td></td>
</tr>
<tr>
<td>Inclusion in databases</td>
<td>o If the journal is published in a database? Yes ( ), No ( ) o If your answer is yes, give the name of the database in which the journal is indexed? o Is the journal registered in any group, consortium or institution that registers academic electronic publications? Yes ( ), No ( )</td>
<td></td>
</tr>
<tr>
<td>Financing</td>
<td>o Does the journal receive financial support from any kind? Yes ( ), No ( ) o If your answer is yes, what kind of financial support does it receive? Please indicate the name of the organization: a) Donations b) Endowments c) Other income o Is the financial support dependent on any kind of evaluation? Yes ( ), No ( )</td>
<td></td>
</tr>
<tr>
<td>Navigation and graphic design</td>
<td>User friendliness</td>
<td>o Does the journal indicate any kind of help on the page? Yes ( ), No ( ) o Indicate the resolution required to use it better? Yes ( ), No ( ) o Is there any indication of the bibliography of the topics? Yes ( ), No ( )</td>
</tr>
<tr>
<td>Navigation and organization</td>
<td>o Does the journal have a table of contents? Yes ( ), No ( ) o Is the navigation the same in each number? Yes ( ), No ( ) o Is there any way for the reader to know whose site is on the page? Yes ( ), No ( )</td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>o Do the authors sign on the page under the writing? Yes ( ), No ( ) o Do the authors sign the introduction of the journal? Yes ( ), No ( )</td>
<td></td>
</tr>
<tr>
<td>Technical requirements</td>
<td>o Does the author of the journal only have a degree seven days a week? Yes ( ), No ( ) o Are the files in the body of the text that support the software required to have access to the journal? Yes ( ), No ( ) o If your answer is yes, specify what software is needed?</td>
<td></td>
</tr>
<tr>
<td>Search capacity</td>
<td>o Does the journal have a search tool? Yes ( ), No ( ) o If your answer is yes, specify the fields that it indexes? ( ) Title ( ) Authors ( ) Key words ( ) Other fields ( ) o Is there a search tool across the information from past numbers of the journal? Yes ( ), No ( )</td>
<td></td>
</tr>
</tbody>
</table>
As a validation scheme for further publication assessment models.

In our country in particular, the lack of recognition, standards and criteria for having electronic scientific journals assessed by evaluating agencies has caused the academic community to be uninterested in publishing in this type of journal. From this perspective, the application of the instrument will be useful not only for the Autonomous University of Baja California (UABC) and the National Council of Science and Technology (CONACYT) (a government bureau, dependent on the executive power of the federal government, which defines the scientific and technological policy of the country), but also for evaluative groups that need to use criteria for assuring the quality of information taken from the Internet.

References


