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Editorial

Information systems evaluation: past, present and future

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Introduction: past and present

The business environment of the new millennium is responsive, dynamic and competitive, and is in a constant state of customer-centred change. This change has been largely initiated by innovations in information and communication technologies, which have led to the creation of the *information-based economy*. Consequently, many organizations have become reliant upon Information Technology (IT) and Information Systems (IS) to support their business processes. Yet, research undertaken by Kempis and Ringbeck (1999) suggests that an alarming proportion of organisations are under-performing with regard to the efficiency and effectiveness of IT utilisation. Why is this the case? Well, the answer to this question is by no means straightforward, and is something that researchers, practitioners and the like, seek to explain. According to McKay and Marshall (2001), there appears to be a dichotomy with respect to the question of investment in IT/IS. On the one hand, the notion of an information-based economy and the arrival of an e-business domain have led to considerable faith being placed in IT to deliver performance improvements. On the other hand, there is concern that IT/IS is not delivering what it promises by vendors and project champions. Irani and Love (2001) attribute this lack of delivery to the difficulty in determining business value from IT/IS investments, and the considerable indirect costs associated with enterprise-wide systems. McKay and Marshall (2001) express concern that managers do not perceive that they are deriving value for money when it comes to IT investments. The measurement of business value of IT/IS investments has been the subject of considerable debate within the IS and business management literature (eg, Weill & Olson, 1989; Powell, 1992; Farbey *et al*, 1993; Willcocks & Lester, 1996; Serafeimidis & Smithson, 1996; Remenyi *et al,* 2000; Irani *et al,* 2001; Serafeimidis, 2001).

The difficulties in measuring benefits and costs are often the cause for uncertainty about the expected impact of IT/IS and thus, are major problems facing decision-makers. As a result, the IT/IS evaluation process is often ignored, or ineffectively or inefficiently carried out. The reason for this is that managers consider it takes too long, costs a significant amount of money with little visible return, and involves too many people with departmental or individual political agendas. The implementation and maintenance of IT/IS is invariably a costly exercise for organisations, so it is only natural for managers to assume that they should provide their organisation with a degree of economic value. Yet, organisations continue to report that the deployment of IT/IS within their organisation has resulted in the substitution of old problems with new ones (techno-based). In addition, the introduction of IT/IS can be a huge disappointment, since unexpected difficulties and failures are regularly encountered, with expected business benefits often not realised. Furthermore, the human cost of IT/IS failure (not realising stakeholder-expectations) can be quite considerable, and prevent the take-up of future technology, thus impacting the long-term survival and growth of the business.

To add to the complication of IT/IS evaluation, there remains a host of tools and techniques available to managers for the purpose of IT/IS investment appraisal (*ex-ante* evaluation). Yet, there has been a lack of consensus in defining and measuring IT/IS investments (Renkema & Berghout, 1997; Irani & Love, 2002). Yet as organisations continue to readily invest significant amounts of capital into IT/IS, research studies report

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contradictory findings on the relationship between IT/IS investments and organisational productivity and performance (eg, Brynjölfsson, 1993; Strassman, 1997; Grover *et al*, 1998; Bannister & Remenyi, 2000; Stratopoulos & Dehning, 2000). It is therefore not surprising to see that the *IT productivity paradox* is receiving increasing attention from researchers and practitioners in the new information-based economy. Considering the growing needs of businesses to gain a competitive advantage in their respective marketplaces, the evaluation of technological innovations (eg, E-Government, Enterprise Application Integration, E-Commerce, and Customer Relationship Management) will remain a necessity if the benefits of IT/IS are to be fully realised.

Despite the importance of IT/IS evaluation for organisations, the concept of evaluation has not been subjected to extensive empirical research. This point was made by Davenport (1993) who states that most of the research on IS evaluation is highly anecdotal or case-study-based, and the analysis is rarely rigorous with little having changed in recent years. In a similar vein, Strassman (1990) stated that if one read what experts have been saying about IT/IS investments, they would become severely discouraged. Needless to say, IT/IS evaluation is important for many reasons, with organisations needing to justify their investments in IT/IS before committing management's time and organisational resources to receive no doubt considerable *procedural pain* in return. The reason for this is that there are large amounts of organisational funding consumed by IT/IS, clearly suggesting the need to prioritise heterogeneous investment proposals competing for scarce organisational resources. Furthermore, managers need to have a better understanding of the impact of IS on the organisational infrastructure and performance. Such understanding can help an organisation better utilise resources and improve its position *vis-à-vis* its competitors. On the other hand, failure of such understanding may have disastrous consequences such as inappropriate resource allocation and result in a competitive disadvantage. Viewed in systems terms, evaluation provides the basic feedback function to managers as well as forming a fundamental component of the organisational learning process (Smithson & Hirschheim, 1998). Finally, evaluation provides the benchmarks of what is to be achieved by the IT/IS investment. These benchmarks can later be used to provide a measure of the actual implementation success of IT/IS projects. Notwithstanding the above, there is an increasing shift in the view that IT/IS should be seen less as an investment that should be compared with other projects that seek funding but instead, more as a matter of consumption. The view is that IT provides the vital infrastructure that makes an organisation work and is therefore a matter of necessity, thus questioning the need to compare with others seeking funding.

Information systems evaluation: the future

New problems that impact the investment evaluation process continue to evolve, and are largely motivated by changes in business practice together with technology-based innovations. Indeed, according to several researchers (Byrd & Marshall, 1997; Irani *et al,* 2001; Themistocleous & Irani, 2001a), IT/IS have always taken too long to develop, cost too much to implement and maintain, and are frequently not delivering the business benefits that were intended. In recent years, however, the changing role of IS in organisations has given new impetus to the problem of its evaluation. The high expenditure on IT/IS, growing usage that penetrates to the core of organisational functioning, together with disappointed expectations about IS impact, have all served to raise the profile of *how* IT/IS investments can and maybe more importantly *should* be evaluated during their life-cycle. Moreover, the life-cycle of an information system is becoming more and more blurred, as systems are being built on one another and integrated through enterprise application integration (Themistocleous & Irani, 2001a, b).

IT/IS evaluation remains under-developed and resourced by management, yet it is an important activity that managers can ill-afford to neglect if they wish to harness the full impact of the people, system and technology. However, the increased complexity of IT/IS due largely to the broad scope it is adopting from an enterprise perspective, combined with an uncertainty and unpredictability of benefits, point to reasons *why* management skips IT/IS evaluation. Therefore, emphasising the need for an improved evaluation process that might for example, lead to a process specific to application type, instead of an evaluation process that is generic to all IT/IS applications (Irani, 2001).

There appears to be consensus within the business community that the role and scope of investment decision-making is complicated and an ever-changing one. The reason for this is that there has been a continuous expansion of boundary surrounding the evaluation domain. The change in boundaries is in part attributed to new technology (eg, increased scope, functionality and flexibility) and its impact (in human and organisational terms) on developing a new *integrated* organisational IS infrastructure. In addition, there are many interacting socio-technical dimensions that support the organisation as an entity. Hence, investment decision-makers not only need to have the skill to evaluate the *nuts and bolts* of the technology sought, but need the foresight to assess its impact on the future of the organisation and the people who rely on and use the system. Such impact inevitably lies in terms of the integration links between legacy and future systems, benefit realisation, stakeholder exploitation, cost (direct and indirect) management and risk minimisation.

Hence, it appears that the crisis of understanding surrounding IT/IS evaluation remains and is set to continue far into the future.

EJIS special issue

The scope and purpose of the EJIS special issue is to help researchers and practitioners understand the evaluation processes associated with the adoption of IT/IS. The Guest Editors consider that this special issue will provide readers with a better understanding of the IT/IS evaluation process, and the constructs associated with investment decision-making. The prime objective has been to publish original theoretical works and interesting case studies and surveys that address concepts associated with IT/IS evaluation. In addition, a resource bank is provided (Appendix A), and seeks to signpost those with an interest in IT/IS evaluation to further resources. The special issue attracted 32 submissions that then resulted in four papers being selected following a rigorous review process, and presents a truly international flavour of the various research issues and views surrounding the evaluation area. The guest editors are delighted to present contributions from Jones and Hughes, Stefanou, Al-Mudimigh *et al,* and finally Shin.

Jones and Hughes: IS as a complex social process

The concept of IT/IS evaluation has become an increasingly important area of research because of the 'productivity paradox' and lack of benefits realisation. As noted above, there have been many studies that have examined the relationship between IT/IS investments and organisational performance, yet it would appear that there is considerable disagreement as to the direction of this relationship. However, it remains a general consensus that a rigorous IT/IS evaluation process must take place prior to IT/IS deployment and implementation (eg, Willcocks & Lester, 1999; Bannister & Remenyi, 2000; Irani & Love, 2001).

Methods that have been developed and used for the purposes of IT/IS evaluation have tended to be prescriptive, mechanistic and functional in nature and therefore have neglected the complex social processes that are associated with IT/IS decision-making. Jones and Hughes acknowledge this complexity and explore the IT/IS evaluation process in the UK public sector through an interpretative approach, as prevailing mechanistic paradigm appears not to work in practice.

Jones and Hughes revealed that by using a hermeneutic IT/IS evaluation method, a greater understanding of the benefits, value and suitability of IT/IS could be obtained and communicated to stakeholders. While such an approach is enriching and enfranchises stakeholders in the decision-making process, the guest editors add to this by suggesting that an organisation's culture, structure and strategy will largely influence the choice of evaluation method(s) used by managers. While Jones and Hughes argue for an informal situated hermeneutic evaluation process, we (guest editors) suggest that such an approach could have the opposite to the desired effect in practice. That is, by being too time consuming, confusing and costly to implement. Moreover, such an approach may not provide an IT/IS solution that is compatible with the organisation's strategy and financial capacity, which in turn may result in a productivity paradox being experienced.

There is no doubt that interpretative approaches to IT/IS evaluation are needed so that a manager can gain an insight into how IT/IS investments will influence employee behaviour and performance. Once an organisation has realised the importance of IT/IS evaluation and accepted it as an integral part of their business strategy, we suggest that an interpretative approach could be used to gauge the proposed benefits possible and value expected/experienced. The results of this exercise could then be integrated with a 'traditional prescriptive approach' so that the decision-making process of managers can be ameliorated. Jones and Hughes have presented some thoughtful and provoking non-traditional concepts, which we consider to be the seeds for future research in the area of IT/IS evaluation.

Stefanou: Ex-ante evaluation of ERP

Packaged information system applications such as Enterprise Resource Planning (ERP) have become widespread in deployment in various industries. The reason for this is that such systems are seen by practitioners as an integrated suite of software that links business processes together (Davenport, 1998). However, much of the focus associated with the adoption of ERP remains at an operation level, when viewed from a benefit realisation perspective. Yet, Stefanou considers this to be myopic. In emphasising this, Stefanou describes the need to consider the 'big picture' and the impact that ERP has on the organisation from a strategic perspective. However, authors such as Irani and Love (2001), Chen and Small (1994) and Money *et al* (1988) have all attempted to address this viewpoint. In doing so, proposing various taxonomies associated with information systems benefits but clearly leave the way open for an ERP focus.

Although information system benefits are positive and attract much attention from both industry and academia, their associated costs are neither positive nor widely researched. Stefanou highlights the need to consider such costs during ERP adoption and their integration within the *ex-ante* evaluation process. Indirect costs are particularly important, and considered as a substantial burden on the business because they are difficult to identify

before a project is initiated. They also often remain hidden during the adoption process thus, making it difficult to assign relevant cost centres. However, research by Irani and Love (2001), Irani *et al* (1997, 1998, 2001) and Hochstrasser (1992) does go some way to emphasising the need to *identify*, *measure* and *control* information system costs by offering and validating taxonomies.

In reading the work of Stefanou, it becomes apparent that there is a need to extend management's view of information system benefits and costs, which can be done through a formal feedback mechanism that completed the life-cycle evaluation process. However, research in the area of post-implementation evaluation remains limited, with Hamilton (1980), and Green and Kiem (1983) suggesting that post-implementation evaluation, when positioned as part of a life-cycle evaluation process may result in beneficial outcomes that include:

- Improvements in subsequent system development practice;
- Decisions to adopt, modify, or discard IS;
- Evaluation of personnel responsible for system development, implementation and operation;
- Ensured compliance with user objectives;
- Improvements in the effectiveness and productivity of the design; and
- Cost savings through modifying the system during implementation, before, rather than after, complete integration.

Interestingly, issues such as organisational learning and an assessment of benefit and cost realisation remain illusive from the charge of a post-implementation evaluation process. Clearly, there is a need to re-think the evaluation process, and make it more of a life-cycle process that seeks to provide decision-makers with an opportunity for reflective learning rather than a process that stigmatises failure.

Al-Mudimigh *et al*: ERP adoption

The authors of this paper describe the need to consider the adoption and integration of ERP at operational, tactical, and strategic levels. However, the concept of operational, tactical, and strategic level divisions is not new, although Anthony (1965) originally developed and applied such levels to strategic planning.

The authors of this paper identify through the literature those critical success factors that support the adoption of ERP. In doing so, identifying a range of issues that managers are advised to consider during the lifecycle evaluation process. The integration of such factors and categorisation into strategic, tactical and operational levels are then presented within a framework proposed for ERP system project implementation. One feature of the model proposed by Al-Mudimigh *et al* that is worthwhile pointing out, is that there is a dual process of planning and performing, which synchronizes the various activities of organisational systems, thus ensuring goal congruence and performance, and effective delivery outcomes.

Much of the rationale for this paper stems from technologies moving away from stand-alone, dedicated solutions with localised impact, to more integrated, flexible, enterprise-wide systems. However, care is needed as ERP is not the panacea claimed for process integration, indeed increases in ERP failures (to integrate) have led to the emergence of Enterprise Application Integration (Themistocleous & Irani, 2001a,b) as a solution to system integration.

Shin: IT/IS and firm performance

The benefits that organisations acquire through the deployment of IT/IS significantly vary due to each organisation's unique characteristics (Brynjölfsson & Hitt, 1998). However, the organisation-specific factors that influence performance and productivity have only received limited attention in the literature. Therefore, the question of whether IT/IS contributes to an organisation's performance, particularly in terms of a contribution to profit, is a difficult problem to address considering the intangible benefits that can be provided by IT/IS. Lin and Pervan (2001) suggest that the confusion about IT/IS benefits can be attributable to a number of factors, which include:

- the mismeasurements of outputs and inputs (inappropriate units of analysis);
- the difficulty of establishing the overall value IT/IS; the choice of inappropriate methods of evaluation;
- lags in learning; and
- adjustments and lack of effective IT/IS evaluation and benefits realisation management practice.

In addition to the above, there are changes in organisational structure and strategy that have arisen out of IT/IS deployment, such as the formation of alliances and the increased use of E-commerce. Such approaches have made it even more difficult to ascertain the tangible benefits of IT/IS, and in particular associated costs. In exploring the relationship between IT and net profit, Shin used an econometric model that examined the alignment of IT with vertical disintegration and product diversification using economy-wide US organisational data. Shin reveals that IT does not directly improve organisational performance but, when a firm introduces changes in structure and strategy through vertical disintegration and product diversification, then performance improvements can be achieved. During the 1990s, firms re-aligned their strategies and structures to take advantage of IT/IS. Yet, despite these changes the 'productivity paradox' still prevails. Rather than developing an econometric model, we suggest that a causal model that demonstrates the interrelationships between IT investment and constructs such as business strategy,

organisational structure and organisational performance and productivity may provide useful insights into where the benefits of IT are being leveraged within organisations. If more recent data were used by Shin, would the outcomes be different from what was reported? Bearing this mind, we suggest that this be replicated and alternative modelling techniques explored.

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Guest Editors

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Appendix A—IS Evaluation Research Bank

A number of conferences and journal special issues have been devoted to the topical subject of IS evaluation. Only looking back at the last few years one can find a number of literature sources that include:

- *Information Systems Journal*, Special Issue on Information Systems Evaluation (Guest Editors: Zahir Irani and Guy Fitzgerald)—to appear 2002.
- *Americas Conference on Information Systems (AMCIS-2001),* Mini-track on Information Systems Evaluation and Integration (Mini-track Chairs: Zahir Irani, Marinos Themistocleous, Angappa Gunasekaran, Peter ED Love and Ghassan Khalifa)—Boston Massachusetts USA, August 2001.
- *Americas Conference on Information Systems (AMCIS-2000),* Mini-track on Information Systems Evaluation (Mini-track Chairs: Zahir Irani, Peter ED Love and Mohamed Zairi)—Long Beach California, USA, August 2000.
- *Thirty-Third Annual Hawaiian International Conference on System Science,* Mini-track on Information Systems Performance and Evaluation (Mini-track Chairs: George Giaglis, Zahir Irani and Dan Amaruso), January 4th–7th, Island of Maui, Hawaii, USA, 2000.
- *European Journal of Information Systems*, Special issue on Information Systems Evaluation (Guest Editors: Barbara Farbey, Frank Land and David Targett), Vol 7, No. 3, 1998.
- *Logistics and Information Management,* Special issue on Investment Decision Making of Information Technology/Information Systems (Guest Editor: Zahir Irani), Vol 12, No. 1/2, 1999.
- *Eighth European Conference on the Evaluation of Information Technology,* Oxford University, UK, November 2001.
- *Seventh European Conference on the Evaluation of Information Technology,* Trinity College, Dublin, November 2000.
- *Sixth European Conference on the Evaluation of Information Technology,* Brunel University, UK, November 1999.
- *Fifth European Conference on the Evaluation of Information Technology,* Reading University, UK, November 1998.
- *Fourth European Conference on the Evaluation of Information Technology,* Delf University, Netherlands, November 1997.
- *Third European Conference on the Evaluation of Information Technology,* Bath University, UK, November 1996.
- *Second European Conference on the Evaluation of Information Technology,* City University, UK, November 1995.
- *First European Conference on the Evaluation of Information Technology,* Henley Management College, UK, November 1994.

Websites of interest

- A website dedicated to the Evaluation of Information Technology for Business Value can be found at: http://is.twi.tudelft.nl/iteva/iteva.html
- The Electronic Journal of Information Systems Evaluation: http://is.twi.tudelft.nl/ejise/