Editorial policy
The aim of the *Southern African Business Review* is to serve as a vehicle for the publication and dissemination of research in the field of business leadership, management and administration, with a special focus on Southern African business issues and concerns.

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SPECIAL ISSUE ON INFORMATION TECHNOLOGY

"The history of IT can be characterised as the overestimation of what can be accomplished immediately and the underestimation of long-term consequences."

Strassman (1984)

Change is around us. As business executives, practitioners and consultants, we know that the engines that expedite this are run on information and technology. Now, as never before, business should act as catalyst in embracing the powers of information technology and aligning these with the business strategies in order to compete in industries where the rules are being shattered by these emerging forces.

At the time of writing, *Time* magazine published an article on the major inventions of the year, most of them IT-related. To me, this reaffirms the appropriateness of our decision to devote an issue of our journal to developments in IT. It is thus not necessary for the Graduate School of Business Leadership to justify its decision to dedicate an entire issue of the *Southern African Business Review* to the force of IT, thus showcasing the nature of information and technology in changing our world, at the very moment that you may be reading this. Our commitment to and celebration of the strategic force of information technology in the global economy is without question. Moreover, in this issue, we articulate our support for an IT-centred society, particularly as regards the business landscape. This we accomplish by publishing manuscripts by well-known international and local authors and experts in this field.

It has been my pleasure to work with many distinguished IT academics in putting together the Special Issue: Marguerite Cronk (Harding University, Arkansas) develops a framework for IS understanding through holistic construal; Laurie McAulay (Loughborough University, Leicestershire) discusses determinism in IT evaluation; David O'Donnell (Intellectual Capital Research Institute, Ireland) and Philip O'Regan (University of Limerick) look at the structural dimensions of intellectual capital; Stephen Little (Open University Business School), Len Holmes (University of North London) and Margaret Grieco (Napier University, Edinburgh) focus on information communication technology and the new social practices and patterns this engenders. Harold Campbell (Directorate of Public Service Management, Botswana) and I propose a framework for business intelligence through knowledge management based on Harold's DBL research at the Graduate School of Business Leadership (SBL); Frank Bannister (Trinity College, Dublin) writes on the changing perception of the value of IT in public administration; Annemarie Quass (MBL student at the SBL) discusses the strategic nature of data warehousing; and J.D. Pieters (MBL student at the SBL) compares some marketing models in the light of high-technology products as well as the technological environment. Lastly, Bill Malik, vice-president and research area director of the Gartner Group, reviews Gartner's research methodologies (past and present) and provides some insights into the future of IT.

We are also privileged to publish an invited paper providing guidelines on the writing of academic papers, by Dan Remenyi (Trinity College, Dublin), Arthur Money and David Price (both from Henley Management College). The paper addresses the potential failure of research projects and provides guidelines on how to approach research, stressing the need to be critical from the '60s adage: 'It is a good morning exercise for a research scientist to discard a pet hypothesis every day before breakfast. It keeps him young.'

The field of IT would not be complete without focusing on the human issues involved. It was thus decided to include a limited number of general articles, subscribing to the vast and extensive nature of the business arena. K. Bhowan and J.D. MacDonald (University of Natal) expand on their research of general managers in the Greater Durban area with respect to competencies required in the 21st century, and, last but not least, Mahamed Rajah (Graduate School of Business Leadership) writes on employment equity and Act No. 55 of 1998.

I wish to congratulate everyone that contributed to this special issue. Moreover, I would like to express my gratitude to the members of the special advisory board that reviewed the manuscripts.

Enjoy reading.

René Pellissier
Guest editor

Midrand
December 2000

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Understanding information system evaluation through holistic construal

Marguerite Cronk*

Information system (IS) research has been called to demonstrate both relevance and rigour. With the desire of relevance and satisfaction of business questions in mind, much information system research has proceeded without due attention to rigour, resulting in simplistic and consequently conflicting findings, particularly in complex areas such as 'IS business value'. This paper employs the theoretical tool of holistic construal to model the IS business value construct and facilitate understanding of information system value creation.

Introduction

The IS research community has failed to reach consensus on the nature of many of its fundamental constructs, how they are defined, what they represent and consequently how they are measured (Zmud 1996a,b). Before more appropriate measurement instruments can be devised, a better understanding of just what is to be measured is required. That is, in order for IS research to make a contribution to the world of practice, a well-defined outcome measure, which reflects the true nature of the construct, is essential. It is proposed that tools such as holistic construal can aid in the development of such measures.

Science might be viewed as an attempt to make sense of the past, present and future. This is done by searching for meaning and theories. Holistic construal is a methodology based on the ways of ascertaining meaning in theory, being conceptual meaning, empirical meaning and spurious meaning. This approach provides the foundation for rigorous methodological thinking resulting in better models and definition of constructs (Bagozzi & Phillips 1982; Bogozzi 1984).

In discussion of theoretical models, Meuller (1997) suggests that models (for example, causal models) can be divided into two parts, the easy part and the hard part – the easy part being mathematical, and the hard part being the construction of models that are consistent with sound theory. He continues with the assertion that no matter how technically sophisticated the employed statistical technique, analyses can only be beneficial to the researcher if a strong substantive theory underlies the initially hypothesised model. "Based on correlation data, the statistical methods cannot, for example prove causal relations between variables. At most they can help in identifying some empirical evidence to either reject or retain hypothesised causal theories ... in the context of a specific model" (Mueller 1997: 355). The suggested answer lies in models carefully constructed from researchers' in-depth understanding of the substantive area and the constructs being modelled. Similarly, Parsons highlights the importance of theoretical and philosophical conceptualisation: "science is not common sense, and its most basic theoretical ideas and frames of reference require development through complex intellectual processes which involve not only interpretations of observations but also theoretical and partly philosophical conceptualisation" (in Bagozzi 1994).

As with much IS research, research into the value contributed by IS (information systems) to business has followed typical empirical research directions. According to researchers such as Zmud (1996a) and Ives & Olson (1984), its concern has mainly been with the testing of hypotheses about relationships between constructs specified in the theory, without first ensuring that the constructs themselves can be accurately and validly measured. Because of its inherent complexity and the paucity of psychometric research in this area, the 'IS business value' construct is still not well understood. Thus, it is not surprising that its measurement is problematic and provides conflicting research findings. To address this problem, the theoretical linguistic tool of 'holistic construal' is first described and then applied to the IS business value construct in an attempt to increase understanding of the construct and to ensure construct validity.

The following section provides a brief overview of the holistic construal methodology. Having introduced the methodology, the described methodology is then applied to the IS business value construct, resulting in the construction of a holistic model describing the construct.

Theoretical background

There are three types of meaning inherent in the representation of any theory, namely, conceptual, empirical, and spurious (Bagozzi 1994). The holistic construal method uses these three types of meaning to build a representation or model of a construct (Bagozzi 1994). As spurious applies more to measurement rather than initial conceptualisation, it will not be addressed in detail in this paper.

Conceptual meaning is derived firstly through examining what the construct is and what it is capable of becoming and doing, termed 'definitional meaning'. This includes notions of the construct's attributes, structure and capabilities (influence). This aspect of conceptual meaning is derived through attributional, structural and dispositional definition. Dispositional definition deals with the construct's ability to be influenced and to influence. The second element of conceptual meaning is designated 'relational meaning'. Relational meaning is concerned with the construct's relationship with other constructs in the larger theoretical framework examining antecedents, consequences and associative links. Investigation is done into how the construct is formed or where it has been. The meaning is supplied through the content of the hypothesis linking the antecedents to the construct. The rationale for the hypothesis is needed to complete the meaning of the construct provided by the antecedents.

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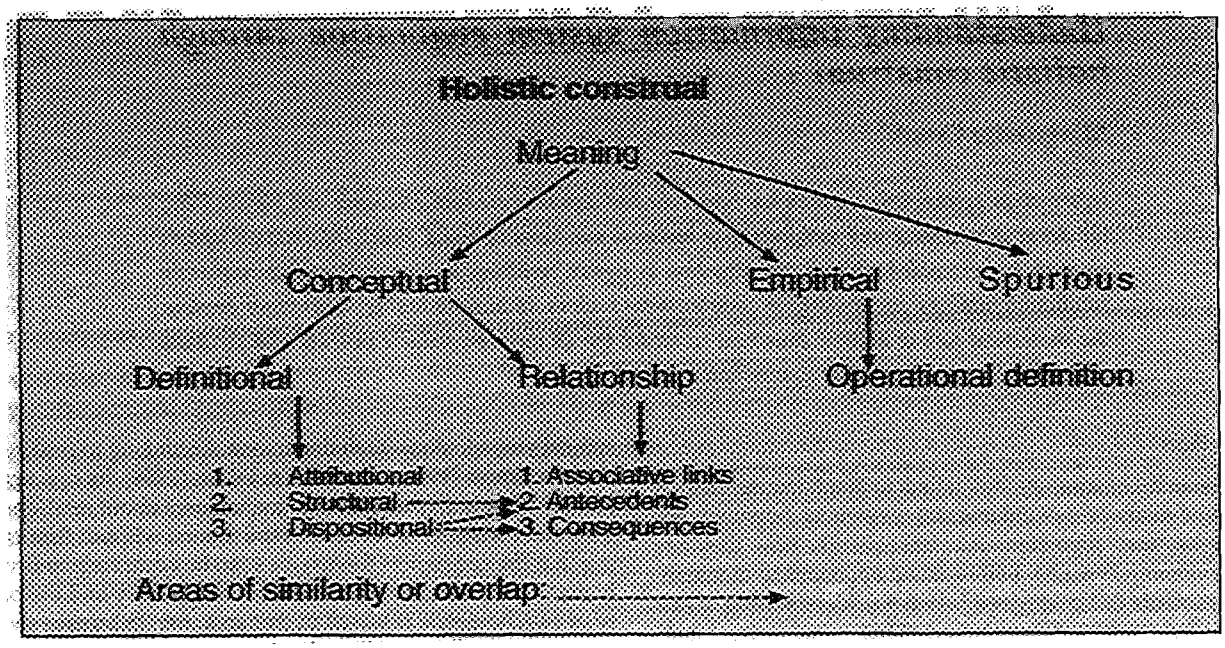

Figure 1. Holistic construal methology components

Relational and definitional meaning are slightly different ways of searching for meaning in a given construct and as such should demonstrate some degree of congruence. This congruence should be particularly clear, firstly in the area of dispositional definition, where ability to influence may be similar to the 'consequences' examined when considering relational definition. Secondly, the structure (structural definition), examined as part of definitional meaning, may be similar to the proposed antecedents examined as part of relational meaning.

The empirical meaning refers to the observational content associated with theoretical terms. Empirical meaning of a construct can occur simply through correlative links to other constructs. This is accomplished formally through correspondence rules that link theoretical terms with observations. There are three kinds of correspondence rules, operational definition, partial interpretation and causal indicator models. Operational definition is the correspondence rule chosen for this discussion.

Figure 1 depicts the relationship between components of conceptual and empirical definition.

Application of the holistic construal to IS business value

The holistic construal process, as outlined above, will now be exemplified by its application to the IS business value construct.

Conceptual

The conceptual meaning of a construct is obtained through a specification, firstly, of its definition (what it is) and, secondly, its relationship to other concepts in a larger theoretical framework. (The meaning of the construct depends in part on other concepts in the theory.)

Definitional

The definition of a concept is a linguistic operation that establishes a relationship between a concept and one or more other terms, which may be terms of refinement, expansion or partial specification (Bagozzi 1994). As mentioned earlier, three types of definitions can be seen to contribute to the conceptual meaning of a theoretical construct, namely, attributional, structural or dispositional (Bagozzi 1984). These definitions are similar, but each provides a slightly different aspect of meaning.

The attributional definition specifies the attributes, characteristics or properties of a concept. Each attribute is a necessary component of the definition, and all the attributes together sufficiently define the construct. A characteristic is that which is common in all or most occurrences of the construct. For example, all dogs have attributes such as four legs.

However, when considering the characteristics of IS business value, this process becomes more difficult, because value is seen differently by different organisations (Cronk & Fitzgerald 1999). This aspect in itself is a characteristic of IS business value, in other words, it is multifaceted and can be specified differently in different contexts. A common theme in all specifications, however, appears to be 'a contribution made by an information system to an organisation'. It can also be said that IS business value is an effect or outcome of prior actions.

The structural definition of a concept specifies a set of elements and relations among elements such that the concept is given meaning through these elemental relationships. To assist in this conceptualisation, consider the elements of an information system: the technical system (hardware/software), the user and the business. Each component of the system contributes to the final value contribution through its interaction with other components. Hence, it is proposed that IS business value structure consists of the value created by the qualities of the system, the value created by the qualities of the user and the value created by the qualities of the business. The IS business value effect is the result of the interaction of these three values. With these three elements in mind, IS business value may be considered loosely analogous to a four-sided prism, with each element contributing one face of the prism, and contextual factors (see dispositional definition below) representing the base of the prism. Each side (value contribution) is moulded by the shape of the sides with which it must interact. The interaction of each of the faces specifies the resultant form and magnitude of the prism (Figure 2). Similarly, the interaction of each of the IS business value elements (system, user, and business) creates the holistic form of IS business value.

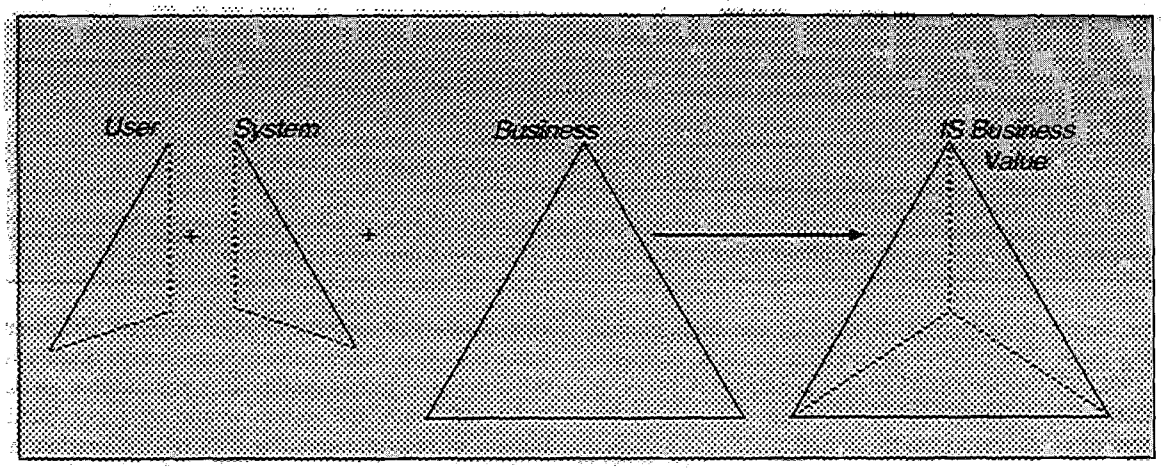

Figure 2. Faces of the prism – IS business value structural definition

This diagrammatic representation presents a relatively equal contribution by each element, but this may change depending on factors such as the system type and role in the organisation. This analogy can also help conceptualise the multifaceted and multi-perspective nature of IS business value. Various viewpoints will reveal more of some faces than others, depending on perspective. This does not change the shape of the form, just that which is seen. The purpose of holistic construal is to consider all faces of the construct.

The dispositional description describes the capabilities of a concept. An attempt is made to capture the intrinsic nature of the construct through specification of its characteristics or internal structure (as in attributional and structural definitions), together with its ability to influence or be influenced.

The characteristics and internal structure have been aptly defined by the application of attributional and structural definition. The remaining aspect of dispositional definition requiring attention is the ability to influence or be influenced. As mentioned above in the prism analogy, contextual factors influence or constrain the resultant IS business value form. Contextual factors that influence the formation of IS business value include organisational culture (in other words, the underlying set of norms that govern employee behaviour), power and political structures (Markus 1983), personnel factors (for example, whether there is a champion for the project) and 'conversion effectiveness' (in other words, quality of management and commitment to IS) (Weill 1989). Cronk & Fitzgerald (1997) discuss the role of contextual factors in greater detail. With respect to the ability to influence, the existence of the construct of IS business value influences the achievement of business goals facilitated by alignment strategies.

In summary, definitional meaning of the IS business value construct has suggested that:

- It is an effect that may exist in various forms (attributional)
- It is composed of value created by the interaction of the system, user and business (structural)
- It may be influenced by contextual factors and may influence business outcomes (dispositional).

Relational

In addition to its definition, the conceptual meaning of a construct is obtained through its relationship to other concepts in the larger theoretical framework, namely, specification of (i) the antecedents, determinants or cause, (ii) the consequences, implications, or results of the construct and (iii) the associative links (non-causal).

Some conceptual meaning of a construct arises through its antecedents. In contrast to definitional meaning (as above) which "specifies what a concept is", relational meaning is derived through, "its antecedents which supply information as to where it has been (i.e. its history and development) and/or how it is formed" (Bigozzi 1994). As mentioned above, the meaning is supplied through the content of the hypothesis linking the antecedents to the construct, and the rationale for the hypothesis is needed to complete the meaning of the construct provided by the antecedents. In a similar way, the meaning of the construct is also determined through its relations to consequences, in other words, where it can lead to or what influence it has.

In the light of the definitional meaning suggested above, antecedents of the IS business value construct would be the technical system, the user and the business – the rationale being that these three elements precede the formation of value and interact to produce the result or outcome, IS business value. The characteristics of each of the elements will have an impact on the resultant form of IS business value. The consequences (where it can lead or what influence it has) have been discussed under dispositional definition. IS business value may influence the fulfilment of business goals, such as business process enhancement, customer satisfaction or cost reduction, dependent on the nature of the system, users and business. This seemingly diverse list of business outcomes is to be expected considering the first attribute of value mentioned earlier, namely, that it may be specified differently in differing contexts.

Empirical

Finally, the meaning of a construct can occur simply through correlative links to other constructs. For the purpose of simplicity, we have considered a construct as a single entity. However, (as implied by attributional and structural definitions) central concepts in theory are often multidimensional (for instance, user satisfaction and perceptions of equity).

The empirical meaning refers to the observational content associated with theoretical terms. This is accomplished formally through correspondence rules that link theoretical terms with observations. There are three kinds of correspondence rules: operational definition, partial interpretation and causal indicator models. Operational definition is the focus of this discussion.

Operationalising, or operationally defining a concept so that it becomes measurable, is achieved by identifying the

Table 1. Dimensions of the IS business value construct

Aspect of value (How value is created)	Dimension
Value attributed as a result of the hypothesised characteristics of the system	System dependent dimension
Value attributed as a result of user characteristics	User dependent dimension
Value attributed as a result of the nature of the business (its strategy)	Business dependent dimension

dimensions, facets or properties denoted by the concept, and categorising these into observable and measurable elements (Sekaran 1992). Operationalisation of a construct reduces its level of abstraction to observable behaviours that enable the development of measures to tap the concept.

The first step – Dimensions of the construct

The first step in our operational definition reduces the level of abstraction by deriving the dimensions of the construct. These dimensions describe the nature of the construct. There are a number of avenues of investigation that may suggest the dimensions of the IS business value construct. The first is conceptual definition as above. The conceptual definition has suggested that the construct is made up of value contributed by the technical system, the user and the business. A second avenue is to examine the IS evaluation literature. This analysis produced three natural groupings of IS business value, partitioned on the basis of the focus of evaluation. These groupings reflect three different foci – that of the 'technical system', 'the user' and 'the business' (Table 1) – and are congruent with those suggested by conceptual meaning. Together with the findings of conceptual definition, it is proposed that these three natural groupings form the dimensions of IS business value in regard to operational definition. In this study, because the construct is a dependent variable, IS business value is seen as an outcome or result.

The second step - Elements of the dimensions

In the second step of the operational definition, each identified dimension is further broken down (reduced in abstraction) to observable or measurable elements (Sekaran 1992). As the focus of the following discussion is on measurable elements of the identified dimensions, it is appropriate to discuss evaluation methods. As mentioned earlier, the IS business value literature is swamped with evaluation methods. While not always delineated, some address value outcomes, others value cause, and yet others address moderators of the causal relationship. This should be borne in mind during decomposition from dimension to elements, as the distinction between measuring a cause or an effect becomes difficult at this elemental level. While the breaking down of dimensions into elements may be achieved conceptually, it is important to note at this stage that it may not always be possible to observe (in reality) each dimension in strict absence of its interaction with the other dimensions.

Elements of the system dependent dimension. Measures of the technical system include response time, down time, responsiveness, functional integrity, relevance of output, and semantic quality of the information (Bailey & Pearson 1983; Mahmood 1987; Srinivasan 1985). However, these are measures of technical quality, rather than the outcome of technical quality. (Conceptual definition stated that IS business value was an effect or outcome of prior actions). The dimension of IS business value that results from technical quality refers to the outcome of technical quality. It is posited that an outcome of a technically excellent system would be dependability and fulfilment of requirements. By way of explanation, a fast, accurate system, which is infrequently down and provides meaningful information, would be classed as dependable. However, as foreshadowed above, the outcome of a quality technical system can best be seen as it interacts with other dimensions, such as the user. It is difficult to identify which part of the outcome is due to system characteristics and which part is due to user characteristics.

Elements of the user dependent dimension. Very few (if any) IS evaluation methods focus solely on system user characteristics, possibly because it is thought that user characteristics represent too small a portion of the IS system to constitute a useful measure of value contribution. In relation to value contribution, user characteristics can be seen in at least two distinct ways: skill level and attitude towards the system. Testing, or the amount of training and experience in system usage, may measure skill level. Attitude is more difficult to measure, but may be described by user acceptance of the system in principle, or intention to use before actually seeing or using the system (and thus not influenced by the technical quality of the system) (Pasqualetto & Kumar 1990; Newcomer & Caudle 1991).

As was the case for system quality above, the measures discussed in this section are measures of user characteristics, rather than the outcome of user characteristics in a given information system (hardware/software, people and business). From an operational definition perspective, users and their characteristics will result in value being attributed to the organisation, and their role can therefore be legitimately considered as a dimension. An appropriate outcome measure may be the level of effective use of a given system. In other words, if a user is capable and willing, the system will be used correctly and effectively (within the limitations of the system). However, as was the case for the system dependent dimension, outcome measures for this dimension are difficult to isolate and are best considered when interacting with other dimensions.

Elements of the business dependent dimension. This dimension relates to the nature of the business and evaluation methods that address the business, such as the quality of the business plan/strategy in relation to the current business environment, and the alignment between the organisation's chosen strategy and goals, culture, structure, information systems and planned activities (Bennett, Fadil & Greenwood 1994; Tosti & Jackson 1994). Again, these will be the 'cause' of a particular type of IS business value contribution, but are not a measure of it. This dimension, in interaction with the other two dimensions (system dependent and user dependent), pro-

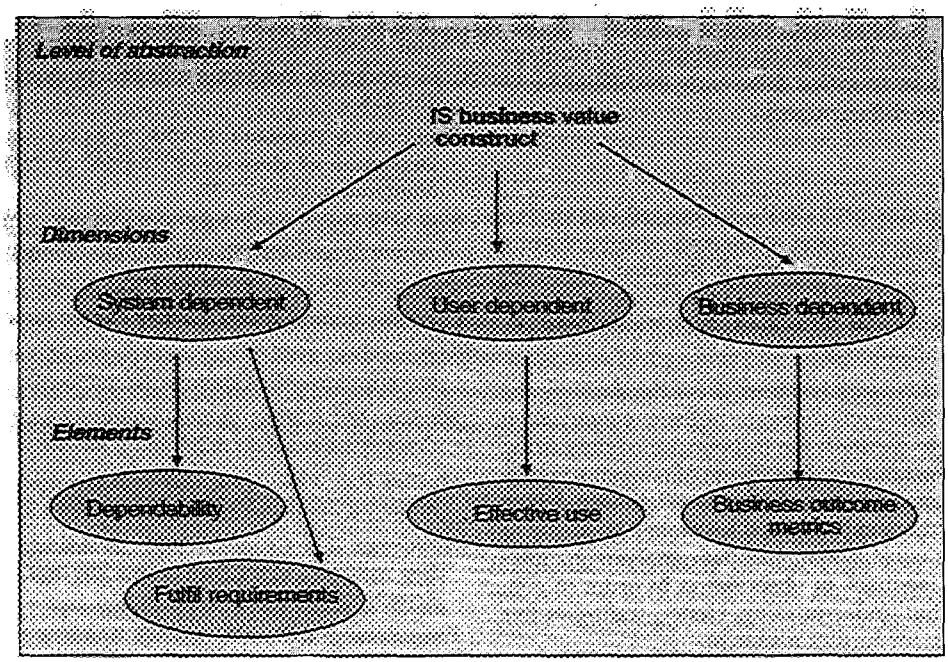

Figure 3. Operational decomposition of the IS business value construct

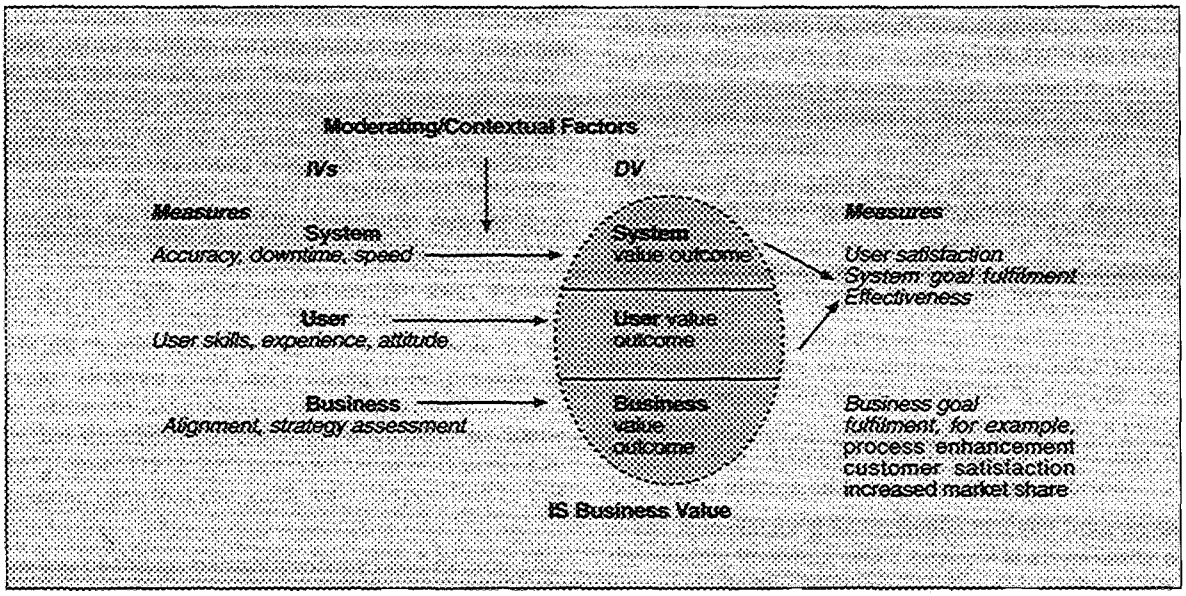

Figure 4. Holistic contrual model of IS business value

duces a value outcome that includes business outcomes or business goal fulfilment such as competitive advantage, increased market share or increased productivity.

The balanced scorecard technique (Kaplan & Norton 1996) suggests four major types of business outcomes that may be achieved by a particular investment: those pertaining to (i) the customer, (ii) the shareholder, (iii) internal business processes and (iv) learning and innovation. Evaluations of fulfilment of these types of business outcomes are suggested as metrics for the outcome of the business dimension in interaction with the system and user dimensions. In an attempt to predict the degree of contribution to these goals by a given system, each dimension and element should be evaluated.

Figure 3 is a diagrammatic representation of the operational definition process as it applies to IS business value. The first level of decomposition refers to dimensions, and the second level of decomposition refers to the elements (which may be observed) of the dimensions.

Model specification

Figure 4 is the holistic construal model for IS business value. The system, user and business are the antecedents and suggested causal factors for the creation of the construct IS business value. The section above on operational definitions suggests metrics that address these factors. The oval in the centre of the model represents the interaction of the various elements or dimensions of the construct, IS business value. IS business value as such is not tangible, just as value is not tangible, but the effect, outcome or consequences of the construct are measurable in the form of business goal fulfilment such as customer/user satisfaction, reduced cost, competitive advantage.

To represent this idea, the oval is in dotted line rather than solid. Just as predicted by the original attributional definition, IS business value can be specified differently in different contexts, reflected in these different goals.

Conclusion

The holistic construal has provided a framework for understanding the IS business value construct, differentiating between measures of factors that cause IS business value and measures of the construct itself. Questions of organisational strategy and alignment, and factors affecting value creation, are also placed in the framework.

While the focus of this work has been on understanding the IS business value construct through holistic construal, it would be amiss not to mention the importance of measuring and testing this understanding. The image of science suggested by the holistic construal is one of downward, theory-driven processes. However, there exists a need to create a greater synergy between theory construction and data analysis, by integrating the upward feedback of observation in order to confirm the validity of that understanding. Hence, testing of this model is a suggestion for further research.

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Of clouds and clocks: An approach to information technology evaluation and personal freedom

Laurie McAulay*

How can our knowledge of evaluation have more impact? If we believe that evaluation is a part of a deterministic system, then it is appropriate that we try to make our evaluation techniques more accurate. The alternative view is that information technology (IT) and its evaluation evolve over time, as new solutions are discovered, which in turn are rejected or accepted to provide new states of knowledge. This indeterministic view implies alternative ways of considering the impact of information technology evaluation. This paper presents a range of views so as to encourage readers to surface their assumptions about the impact of their own research.

Introduction

The title of this paper is taken from a lecture given by Karl Popper at Washington University in 1965. Ideas have no doubt progressed in the intervening 35 years, but the framework offered by his lecture is an intriguing one, and poses a challenging problem for researchers that are interested in the evaluation of information technology. Fundamentally, the framework invites us to position our research in relation to our underlying beliefs about the nature of information technology. The paper that follows poses fundamental questions about what we expect information technology in general to offer, and how evaluation might contribute to the evolution of information technology. No answers are provided, but the intention is to inspire readers to surface their own assumptions about the motivations behind their own research.

The clocks of the title refer to systems that are "regular, orderly, and highly predictable in their behaviour"; by contrast, clouds are "highly irregular, disorderly, and more or less unpredictable" (Popper 1972: 207). Might it be possible to position information technology evaluation in relation to a continuum that stretches from clocks at one extreme to clouds at the other? Popper (1972: 208) provides what he describes as a common-sense view that can guide us in responding to this question:

> There are lots of things, natural processes and natural phenomena, which we may place between these two extremes – the clouds on the left, and the clocks on the right. The changing seasons are somewhat unreliable clocks, and may therefore be put somewhere towards the right, though not too far. I suppose we shall easily agree to put animals not too far from the clouds on the left, and plants somewhat nearer to the clocks. Among the animals, a young puppy will have to be placed further to the left than an old dog. Motor cars, too, will find their place somewhere in our arrangement, according to their reliability: a Cadillac, I suppose, is pretty far over to the right, and even more so a Rolls Royce, which will be quite close to the best of the clocks. Perhaps furthest to the right should be placed the solar system.

Where might we position information technology evaluation according to this typology? Differences of opinion are possible. Walsham (1991: 93), for instance, concludes that "the organizational metaphors of machines and organisms underlie much of the current literature and practice of information systems". The machine metaphor positions information technology evaluation towards the right, to use Popper's imagery. However, the technical orientation that such a stance implies was under attack as early as the 1950s, particularly through the socio-technical approach associated with the Tavistock Institute (Trist 1982). This leads to the alternative interpretation: that information technology evaluation is organic in nature, and thus needs to be positioned towards the left of Popper's continuum.

However, this common-sense approach goes against the scientific advances of recent centuries, particularly the Newtonian revolution, in which, as Popper (1972: 210) expresses it, "all clouds are clocks". This deterministic view suggests that any attempt to position systems between the two extremes testifies not so much to the nature of systems *per se* but to our inability to model them adequately. The concept of adequate modelling implies that the seemingly most cloud-like systems behave with clockwork precision: a precision that it is the role of researchers to discover. It is this view that begins the discussion which is undertaken below.

The material for this discussion is taken from an analysis of the existing literature and a protocol analysis study of a small group of UK Top 500 financial directors as they responded to a short information technology evaluation case study (King & McAulay 1997; McAulay, Russell & Sims 1997). The method underpinning the paper is inspired by deconstruction (Kilduff 1993) and discursive psychology (Edwards 1997; Potter 1996). What follows is an excavation of alternative views about the nature of information technology evaluation.

Clocks and information technology evaluation

Introduction

If a clock implies regularity, order and predictability, what does this suggest for information technology evaluation? The answer that is to be found in the literature is superficially benign and stems from fundamental definitions of the nature of information technology evaluation. Just as clocks measure

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Of clouds and clocks: An approach to information technology evaluation and personal freedom

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time, so information technology evaluation measures the impact of information technology. For instance, a recent definition has suggested that information technology evaluation makes "explicit, quantitatively or qualitatively, all the impacts of an IT project and the programme and strategy of which it is a part" (Farbey, Land & Targett 1999: 190). Impact, in turn, relates to value and usefulness: "the assessment or appraisal of the value, worth or usefulness of an information system" (Smithson & Hirschheim 1998: 160).

How might we model the impact of information technology, and what assumptions are made about the relationship between evaluation and that impact? Central to thinking on these matters is the implication of Fitzgerald's (1998: 16) assertion that "organizations need to be much more careful about which IT/IS projects they implement". The implication of care in selection is surfaced through the proposition: "Although IS are integral to the operation and success of most organizations, organizations have limited resources and these resources should be invested in anticipation of future gains" (Serafeimidis & Smithson 2000: 93). In other words, information technology evaluation is a necessary guide to the selection of appropriate applications. Information technology evaluation is necessary to choice and justification, so that "if a consistent justification process is not followed, the more beneficial application may well be deferred, allowing those that are worth less to proceed" (Ward 1990: 222). This process is not a passive one: it is not sufficient to merely select the "more beneficial application"; "successful utilisation of information technology is by no means automatic. Appraisal of costs and benefits is necessary if value for money is to be obtained from existing information systems and plans made for future applications" (Symons 1991: 205). In other words, knowledge is necessary to constructive action; knowledge of costs and benefits is necessary to their realisation (Farbey et al. 1999).

The cognitive map in Figure 1 clarifies this analysis further and is drawn from Smithson & Hirschheim (1998: 160–162). This analysis suggests that information technology fulfils a number of purposes (see also Ballantine, Galliers & Stray 1996: 130) and that these lead to changes in the information system (IS) and thereby to impacts on performance, which can be realised either through improvements in decision making or in user productivity.

The diagram will be divided into two in order to pursue the discussion further: the first slice through the available literature will address the relationship between evaluation, the justification of new technology, and information systems implementation, while the second slice will address information systems implementation and business performance. The first is represented by a substantial literature that is central to evaluation and will be treated more comprehensively than the second, which has its own body of literature, most notably associated with the phrase, 'the productivity paradox'.

The evaluation–implementation transformation

Although absolute determinism is avoided in both the practitioner and academic rhetoric of the transformation of evaluation into implementation, different forms of determinism are nevertheless clearly evident. These take on different forms. Fitzgerald (1998), for instance, adopts a "hindsight determinism" that is typified by his account of a high street retailer's experience:

> A high street retailer ... implemented a system to link computers and tills in their stores to their head office via an X25 private network. The system polled the shops every 10 seconds and had a sophisticated system for locating and diagnosing faults. ... When burglars cut the telephone lines in raids on shops the system raised an alarm at head office

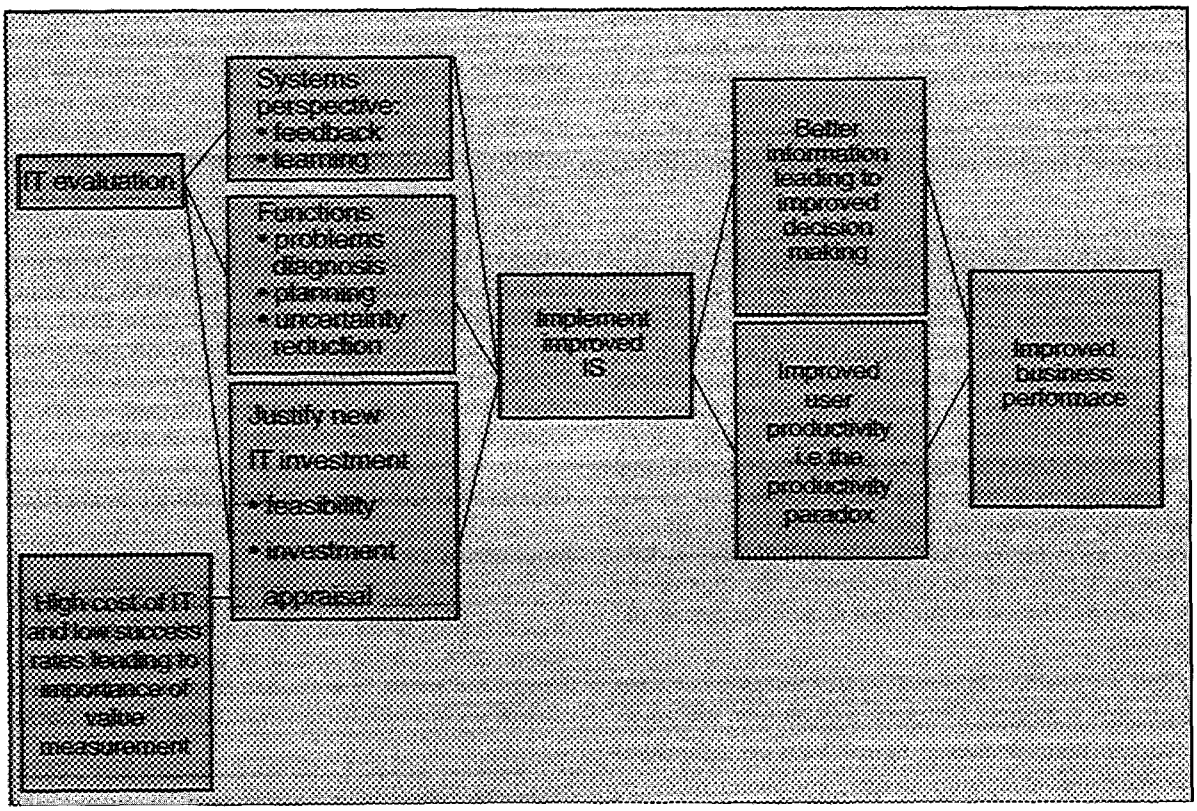

Figure 1. Cognitive map drawn from Smithson & Hirschheim (1998)

and the police were notified. In one weekend, out of 12 attempted break-ins at its branches, nine were foiled by the system. The security benefits of the system were unanticipated but substantial and *could easily have been used in the evaluation and justification process.*" (Fitzgerald 1998: 22, italics introduced by the author).

With the benefit of hindsight, the high street retailer's benefits were predictable. This is a point that Fitzgerald generalises throughout his analysis, including the statement, for instance, that "a large proportion of changes and enhancements made to existing systems were *predictable* at the development stage" (Fitzgerald 1998: 23, italics introduced by the author). In contrast, Smithson & Hirschheim (1998) adopt an idealised form of determinism that, consistent with Plato's concept of the ideal form, is both essential but difficult to attain in practice. They analyse the case study of a decision to outsource an IS department. An internal evaluation and an external benchmarking exercise both supported the decision to reject outsourcing, but, "although [the manager's] report was a realistic view of the problems than can occur with outsourcing, senior management had already made up its mind to outsource. ... In doing so, they pointedly ignored an independent benchmarking report which portrayed [the company's] IS function as close to 'best of breed' in their data capture operations and above average in systems development" (p. 171). The conclusion to be drawn from the case study is that "the failure to understand IS evaluation, and adopt appropriate evaluation practices, can lead to misconceived decisions with deleterious consequences for users and developers alike". A UK Top 500 financial director provides an account of how such an effective practice might be achieved. This adopts a form of imposed determinism that is redolent with the information technology evaluation literature in general:

> What is very important at the beginning of the project is that you agree a specification in detail: what's required, who's going to do it, what will come out at the end ... what are you trying to get out of this, how it will work, the costs and the benefits. You have benchmarks ... along the way to make sure that what you said you were going to achieve gets done. You don't allow the project to go awry. ... It has to be continually monitored, including the provisions in the original costing and the time-scale to train (McAulay et al. 1997: 20).

Irrespective of the form of determinism that is implied by these differing accounts, an underlying phenomenon is evident: dissatisfaction and the avoidance of dissatisfaction. Weill & Olson (1989) outline two themes in the dissatisfaction of practitioners and their attitudes to evaluation. The first theme is that organisations are dissatisfied with the available methods irrespective of the method chosen, although return-on-investment (ROI) methods dominate. Ward, Taylor & Bond (1996) found that only 36% of the respondents in their survey who had an investment appraisal process were satisfied with their processes. Common problems included the ability to account for the full range of benefits, but also that benefits might be overstated to gain approval for investment. The second theme is that many projects must be implemented irrespective of the findings of evaluation. "A threshold investment is often necessary to compete in the industry and is often not subject to ROI or any other type of return calculation" (p. 11). This is similar to the point made by Farbey et al. (1992) that projects might be implemented because of top-down strategy (including the putative acts of faith), top-down dictat, the need for incremental change or competitive imperative. This analysis therefore raises two questions: the adequacy of methods, particularly the quantification of costs and benefits (Powell 1992), and the relevance of methods – they might simply have no impact.

Farbey, Targett & Land (1995: 250) seek to overcome this dissatisfaction and the belief that "evaluation has too narrow an interpretation in many organizations, being taken to refer to the quantification of well-defined benefits with the sole objective of getting the project over the organizational fences" of investment appraisal. Their case study work suggests that evaluation produces new information about projects and helps to clarify stakeholder perspectives. This broadening provides a solution to the need for evaluation to do more than provide simple efficiency metrics (Smithson & Hirschheim, 1998). It serves to challenge managers to match evaluation with the purpose of the investment. A number of authors have contributed to the debate as to how evaluation characteristics and information technology might be matched. The key point is that "it is very important to use the appropriate basis for judgement of applications based on the role they are expected to fulfil in the business" (Ward 1990: 224). Ward (1990) matches three purposes for investment (substitutive – efficiency, complementary – effectiveness, and innovative – competitive) and five evaluation techniques (cost–benefit, value linking, value acceleration, value restructuring, and innovation evaluation). Farbey et al. (1992) alternatively suggest that the technique that is appropriate is determined by the timing and level of investment, the environment, the nature of the organisation, relation of the system to the organisation, organisational characteristics and cause-and-effect relationships. Their framework was later developed and presented as Farbey et al. (1994).

Cornford, Doukidis & Forster (1994) illustrate the size of the challenge posed by contingency frameworks such as these by showing that it is possible to create a substantial framework for the evaluation of a single investment, an expert system. Evaluation proceeds by means of a three-by-three framework, which considers structure–process–outcome on one dimension and systems functions–human perspectives–organisational context on a second dimension. The nine cells that result prompt a systematic questioning of the impact of the system. For instance, the structure–systems functions cell prompts questions such as, "What are the real hardware and software requirements; is the software architecture understandable and robust; does the full set of system components work together in a technical sense" (Cornford et al. 499), while the human perspective–structure cell adopts a stakeholder perspective to ask a range of questions, such as, from the point of view of the organisational administrator, "is the system a reasonable cost effective alternative to existing tools or materials in use" (p. 501), or, from a provider's perspective, "what are the changes to working conditions and practices, in terms of the physical environment and skill requirements?" (p. 500).

We know that, in practice, few investments are evaluated with such rigour. Farbey et al. (1992) and Ward et al. (1996) paint a consistent picture of formal procedures applying in roughly half of all cases. Recent evidence suggests that this informality may in itself be the source of practitioners' dissatisfaction with their information systems. Sabherwal (1999) shows a high positive correlation between IS planning sophistication and IS success. Nutt (1998) shows that analytical and

bargaining approaches to decision making outperformed individual judgement based on prior experience or knowledge of the situation.

These findings beg the question of the relationship between the tools provided by formal evaluation and the support that they give to the human decision maker (Powell 1992). Nixon (1995: 277), for instance, shows that "strategic decisions reflect the beliefs, assumptions and biases of top management" and that "decision making was driven by the need to reconcile apparent inconsistencies among different pieces of data or information, often from different sources: between financial and non-financial information, between quantitative and qualitative, between internal and external information, and between 'facts' and 'soft' data, including gossip, impressions, distilled experience and intuition" (p. 280). The recursive nature of the psychological process is modelled by Swan & Newell (1994). In their model, knowledge is socially recognised, coded and embedded in organisational systems, including evaluation, technical systems and information technology. Individuals use this information, but do so selectively, emphasising some elements rather than others. We can suspect from existing case study research that soft data may have greater psychological impact than hard facts, and this is supported by the communications literature that considers how agendas are set. The result of the sense-making process is that new solutions are adopted which, in turn, shape knowledge. Deterministic models must cope with this recursion and must model the psychology of the process; perhaps in ways similar to that illustrated by Swan & Newell's (1994) work.

The psychological difficulty of gaining acceptance for formal systems and hard facts is evident in the paradox of benefits recognition. We know that measuring benefits is considered by practitioners to be a significant problem (Galliers 1991; Ballantine et al. 1996), and yet no other topic has yielded as much in terms of consistency and comprehensiveness of findings as this area. Bacon (1992) summarises criteria of assessment under six financial benefits, six management benefits and three developmental benefits of IT implementation. Ward et al. (1996) list eight benefits: cost reduction, management information, process efficiency, enable change, competitive advantage, business necessity, communications and service quality. Lederer & Mirani (1995) draw upon the existing literature to create a survey that includes 33 benefits. These are factored to give nine benefits: improved information, strategic advantage, return on investment, reduced technology cost, better applications development, reduced travel costs, reduced workforce costs, business redesign and adherence to business redesign. Although the words differ between these papers, there is so much in common that it is not difficult to argue that we do understand the benefits of information technology, despite proclamations that we do not. The more interesting questions concern why our knowledge of these benefits is not adopted by practice and whether the benefits change over time. There is evidence from a study by Karahanna, Straub & Chervany (1999) that perceptions of the benefits of adoption do change as implementation proceeds, thus suggesting that deterministic models need to reflect different kinds of benefits analysis at the different stages of the project life cycle.

The preceding discussion problematises the neat cause–effect relationships of Figure 1. There are many challenges for those who wish to present a deterministic account of the transformation of evaluation into implementation. Among these challenges, dynamism has been highlighted as a central problem (Fitzgerald 1998; Smithson & Hirschheim 1998). The changing world imposes limitations on the ability to sustain hindsight, idealistic or imposed determinism, as explained by a financial director:

> The reason that you always have problems with things that don't show returns sort of five or ten years afterwards is that the world changes so rapidly that you can't be confident that it's going to look like that when it actually happens (McAulay et al. 1997: 27).

A second financial director takes a more radical position on the impossibility and unreliability of prediction (Singer 1994: 223–224):

> The challenge in all these things is that the real world doesn't usually work out the way in which you put it into the projections. If it does, you ask, you worry. It sounds very odd to say, but ... things that come in exactly as they were supposed to ... you tend to think that someone's manipulating the numbers ... because the world isn't like that. Things change so often (McAulay et al. 1997: 39).

The implementation–performance transformation

An obvious benefit of information technology implementation is improved performance, and a growing literature is producing insights into the relationships between implementation and business performance. This literature centres on the well-known productivity paradox and is extensive. This section will restrict its attention to a small number of recent works that have shown positive results.

The available analysis has proceeded at both the national and firm level. Dewan & Kraemer (2000) show that IT investment gives positive returns for developed countries, using IT investment per gross domestic product (GDP) and GDP per worker as the basis for measurement. They include technology, social and human capital, infrastructure and policies as necessary preconditions to the achievement of the potential of IT. Less developed countries do not show the same returns because these preconditions are not always met. The theme of the presence of additional variables to explain the IT investment–business performance transformation is repeated in Rai, Patnayakuni & Patnayakuni (1996) at the level of the firm. They test the model shown in Figure 2 and show that the IS budget is not related to financial performance as they define it, but is positively related to sales performance.

Within a deterministic perspective on evaluation, it is incumbent on us to show the relationships between the benefits that we build into evaluation and business performance: the relationships between the kinds of benefits represented by Rai et al. (1996) as intermediate performance and performance at the aggregate level. In this respect, knowledge is beginning to grow, but there continues to be scope for important future research. Current knowledge drawn from outside the information technology evaluation literature is surprisingly supportive of the very evaluative measures that have always been dismissed: those based on discounted cash flow (DCF). Brush, Bromley & Margaretha (2000) show that free cash flow (the undistributed cash flow in excess of that needed to create a positive net present value as shown by DCF calculations) leads to increases in sales growth, which in turn leads to performance improvements for certain kinds of firms, dependent

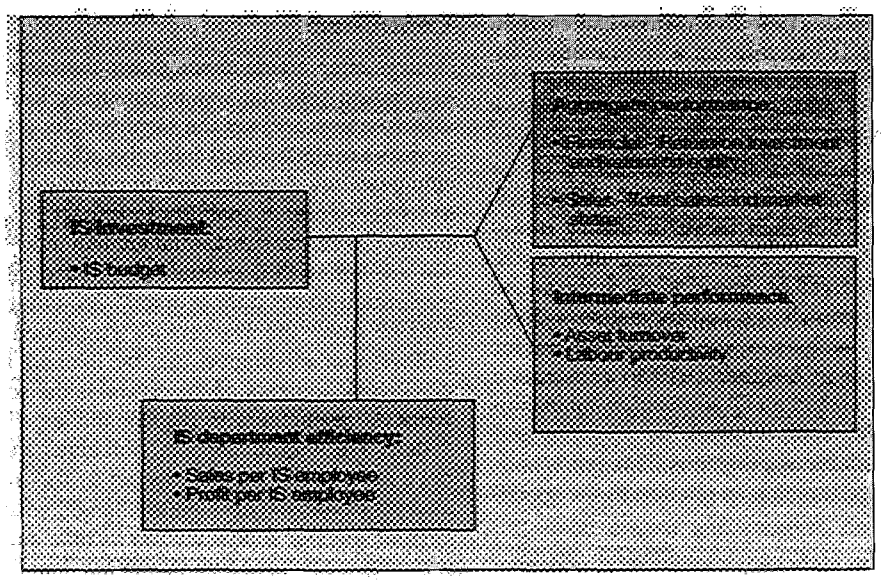

Figure 2. The model tested by Rai et al. (1996)

upon their governance structures. The argument is similar to that provided by Dewan & Kraemer (2000): that there are preconditions for the transformation of investment into performance. Likewise, Simerly & Li (2000) show that debt can introduce a short-term orientation that can limit strategic choices so that capital structure impacts performance differently under stable and dynamic environments. The overall conclusion that results from this literature, and which is well expressed by Kivijärvi & Saarinen (1995: 156), is that positive performance results can be demonstrated but that the demonstration is complex: "Investment in information systems pays back, but only in the long term, probably as a result of the long development and learning time required to take advantage of them." The literature has come a long way in the five years since Lubbe, Parker & Hoard (1995) could simply show that the most profitable companies are likely to spend a significantly higher proportion of the non-interest operating costs on information technology. However, there is an opportunity to develop our understanding further through improved models of the ways in which information technology investment can be translated into improved business performance.

Clouds and information technology evaluation

Popper (1972) somewhat surprisingly dismisses the determinism implied by the metaphor of the clock and favours the cloud metaphor as a way of understanding a range of systems, including those involving computers. The reason for this is that determinism opposes personal freedom: if determinism is taken to its extremes, human beings are subject to laws that are determinable and that leave no room for freewill, something that Popper regarded highly at both personal and social levels. He would therefore have been opposed to the kind of de-centring of the human being that is endemic to the analysis provided by the previous section. However, he also dismissed the absolute uncertainty implied by an extreme view of clouds, and he constructed his analysis on the basis of the development of human beings, a process he likened to "clouds controlling clouds". The basic argument is that the evolution of humankind has proceeded exosomatically: by "developing new organs *outside our bodies or persons*" (p. 238, italics introduced by the author). These "organs" include both information technology and its evaluation. Evolution proceeds by creating a "mulitiplicity of the tentative solutions" and a "multiplicity of the trials", so that development is a continual process of generating new possibilities, and evaluating their appropriateness, so that knowledge is continuously recreated and technologies are redefined. This is partly a process of re-description: each successive trial may lead to new types of utilisation, just as the telephone came to be used as a means by which one person can speak to another, although its designer originally intended it to be used to broadcast music (Markus 1994: 509).

There is no shortage of evaluation techniques that hold the potential for re-description. Powell (1992) divides these into objective and subjective and reviews the substantial literature that deals with these. More recently, Van der Zee & de Jong (1999) suggest that the Balanced Business Scorecard holds potential. Based on two case studies, the Scorecard helped to improve integration, the speed of strategy processes, team building motivations and awareness of the ability of IT to solve business problems. This provides an example of a success story in applying evaluation to information technology, and, moreover, presenting further examples of success provides a challenging research agenda for the future. However, belief in the efficacy of the Balanced Scorecard might testify to nothing more than a further deepening of the layers of clouds that interact in the implementation of information technology. A literature that begins by offering information technology evaluation as a solution to the problems of effective implementation of information technology might be guilty of establishing the Balanced Scorecard as a means of solving the problems of information technology evaluation itself. Rather than an absolute solution to our problems, an indeterminate view might see the Balanced Scorecard as yet another source of potential success or dissatisfaction.

The number of clouds that may be relevant to information technology evaluation continues to grow. Farbey et al. (1995), for instance, suggest that five factors contribute to IT success: a comprehensive search for benefits, post-implementation evaluation, understanding management processes, good communication among stakeholders and a champion to manage

the acceptability of the project. These five factors can each be considered as separate clouds that interact with one other. By 1999, the analysis of Farbey et al. came to suggest some new clouds to be added to their previous list: evaluation theory, stakeholder theory, decision-making theory, project dynamics and learning theory. Each factor or theory provides a set of knowledge that helps to advance our knowledge of information technology evaluation, but each factor or theory represents a body of knowledge which is itself being developed. The interactions can themselves be tested both through the attempt to systematise the knowledge and by testing against other forms of knowledge, such as expert knowledge. So, for instance, Kathuria, Anadarajan & Igbaria (1999) construct a knowledge-based system to select an IT application for manufacturing based on matching both competitive priorities and process structure to the available applications. This fulfils both an evaluative and a selective function in relation to the specific application.

If the aim of information technology evaluation is exosomatic development, and the many techniques and influences that impact upon information technology are seen in relation to a free agent, we might seek ways in which evaluation can gain credibility, not solely in its own right, but through the development of credibility in those who advocate evaluation. Human beings and their tools develop interactively. Sabherwal (1999: 139) expresses the point in relation to IS planning, of which evaluation is a part, as follows: "Instead of focusing their attention on trying to convince top management to take the actions necessary to increase IS planning sophistication, IS managers should take the actions necessary to build successful systems and thereby build a good track record and credibility for the IS group." Clouds control clouds, but clouds also impact upon other clouds.

Centring the individual in this kind of way provides alternative views on the constructive development of information technology evaluation. Singer (1994), for instance, proposes a radical way of breaking out of the cycle of dissatisfaction with existing approaches, not through the deployment of new techniques and an expansion of our views about the many factors that might be relevant, but by re-describing existing techniques with an emphasis on human capabilities. Singer begins by establishing the inadequacy of existing accounting approaches to evaluation as bluntly as any author in the information technology evaluation field: "Whilst many consider DCF to be almost useless, or even counter productive, it is nonetheless very widely used." However, Singer differs from other writers by taking an affirmative stance and by asking how we might put DCF to constructive use. This relies on recognising limitations, that "scientific knowledge tells us not to believe these numbers", but by then asking "what are the strategic issues affecting or impacting upon them?" (p. 228). The process explores future scenarios through DCF techniques as an act of simulation. Decisions on information technology implementation follow, not directly from the calculation, but because "a particular re-description has compelling psychological force, causing the suppression of other considerations" (p. 225). Evaluation impacts not at the level of accurate descriptions of the future world, which are likely to lead to dissatisfaction as events unfold in ways that were not predicted, but at the level of re-descriptions: the new knowledge that evaluation is known to be successful in generating.

Conclusion

Article after article throughout the nineties established that evaluation was the key to ensuring information technology effectiveness, and yet the same articles established that practitioners are dissatisfied with the effectiveness of their evaluation practices. A literature that promises to deliver impact fails at its very core: its inability to impact practitioners in positive terms. Given the substantial growth in knowledge in this area, we are left with one question: "How can our knowledge of evaluation have more impact?" So, what can we learn about impact from the framework suggested by Popper? If we believe that evaluation can be likened to a clock, then the clockwork accuracy of the crystal is the solution, and we must work as researchers to resolve the gaps in our deterministic vision. We should console ourselves that pendulums were once seen as the state of the art in the measurement of time, and yet dissatisfaction led to change, which in turn led to our current level of sophistication in time measurement. If, alternatively, we believe that evaluation can be likened to a cloud, our knowledge of information technology and its evaluation must evolve over time as a process of generating new solutions, which in turn are rejected or accepted to provide new states of knowledge. We should be open to the multiple ways in which human beings and their technologies and evaluations interact. We may learn not only from the dissatisfaction that is expressed with regard to evaluation that falls short of the ideal, but may also learn to understand the ways in which evaluation can come to be perceived as successful. Whether we are determinists or indeterminists, information technology evaluation continues to provide a fecund research agenda.

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The structural dimensions of intellectual capital: Emerging challenges for management and accounting

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In this paper [see note 1], we present some preliminary evidence in support of an emergent base-line structural intellectual capital model. This is based on interviews with the chief executive officers of Irish software companies. The overall Irish software and telecommunications sector has established itself as the largest software exporter in the world in an economy that has experienced real growth of almost 40% in 5 years, a rate unparalleled in the developed world. Basic empirical results are presented, and some implications for management and, particularly, accounting are discussed.

Introduction

As we move rapidly from the industrial to the intellectual age, a consensus is emerging that intellectual capital (IC) – a complex, dynamic and fuzzy activity set embracing language, experiences, culture, processes, data, information and knowledge – is becoming the primary source of organisational value. The growing book-to-market ratio in knowing-intensive business sectors is strongly indicative of the fact that this intangible has now overtaken the more traditional (and tangible) triad of land, labour and capital as the dominant source of economic value. Little is known, however, about this evolving and accelerating knowledge and communications dynamic, or how intellectual capital should be defined, theorised, measured, managed or valued (see Bontis & Choo 2001). At a very general level, intellectual capital creation is visualised here as a dynamic process of collective knowing that is capable of being leveraged into market value (O'Donnell et al. 2000a).

First, we outline the basic contours of an emerging structural model of intellectual capital. The challenge for management in general, and accounting in particular, posed by this emerging model is then briefly discussed. The results of a test of an emergent base-line structural model of intellectual capital, based on interviews with chief executive officers (CEOs) within the indigenous Irish software sector, are then presented. We conclude with a discussion of the results, and tease out some implications for both management and accounting practice of this approach to an understanding of knowing-intensive and IT-driven business.

The structural model

In the emergent intellectual capital discourse, company value is viewed as a combination of financial capital – hard, objectivist, tangible, universal – and intellectual capital – complex, fuzzy, intangible, particular (O'Donnell et al. 2000a,b). These dimensions can be represented by the following simple equation, on which we will present perceptual data for each term of the equation.

Total Value = Financial Capital * Intellectual Capital [People* Internal* External]

or

V=f$*P*I*E

A broad consensus is now emerging where most IC models assume this three-way distinction between people, internal, and external dimensions (Bontis 1998; Bontis, Keow & Richardson 2000; Edvinsson & Sullivan 1996; IFOA 1998; Kaplan & Norton 1997; Roos, Roos, Edvinsson & Dragonetti 1997; Stewart, 1997; Sveiby, 1997; Von Krogh & Roos 1995, 1996), although there is substantial variation on how each dimension is conceptualised, theorised or measured, as well as a glaring dearth of good empirical studies. In fact, drawing on complex adaptive systems theory (Arthur, 1994a,b; Kelly 1994) and Habermasian social theory (Habermas 1984; 1987a,b), it is possible to argue that intellectual capital can never be completely measured, but perhaps estimated, because of its intangible, tacit and socially unconscious and distributed nature. The intangible may never, in fact, be completely accessible; the tacit may never be made completely explicit; and some of the background 'know-how' in a community of practice, while somehow available to the members within it, will always remain, to a certain extent, inaccessible to non-participating observers (O'Donnell 2001; O'Donnell, O'Regan; & Coates 2000a; O'Donnell, O'Regan, Coates, Turner & McCurtain 2000b). Notwithstanding such difficulties, intellectual capital is viewed pragmatically here as existing in the complex interactional dynamics within and between these three dimensions.

'People' refers to people competencies – knowledge, know-how and experience; the traditional human resource. 'Internal' refers to the set of inner organisational structures, routines, processes, management systems and so on. 'External', often referred to as 'customer capital' or 'relational capital', refers to external constituencies and structures such as links to customers, suppliers, competitors, strategic alliance partners, research institutes and various other external networks linked into the value chain.

In the absence of any generally accepted accounting-specific methods to recognise and measure the intellectual capital element of this equation, various templates and indicators have been developed to facilitate both its identification and possible management (Table 1). Karl-Erik Sveiby's Intangible Assets Monitor (1997), Kaplan & Norton's (1997) Balanced Scorecard and the Scandia system developed by Leif Edvinsson are some of the best known examples here (See Brennan & Connell (2000) and Petty & Guthrie (2000) for pragmatic reviews.) Significantly, several of these are already produced by accounting-based internal management and information systems operating within knowing-intensive sectors.

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The structural dimensions of intellectual capital: Emerging challenges for management and accounting

Table 1. Intellectual capital indicators: A selection

People	Internal	External
Employee satisfaction	Number of patents	Sales per customer
Value added per employee	Number of multi-functional teams	Satisfied customers index
Rookie ratio	Database consult frequency	Frequency of repeat orders
Education levels	Investment in IT	Brand loyalty
Training and education costs	Proportion of support staff	Customer complaints
Years of experience	Research and development expenditure	Customer satisfaction
Reputation with head-hunters	Age of organisation	Profitability per customer

Sources: Selected from Dzinkowski (2000); IFOA (1998); Sveiby (1997)

Such intellectual capital 'accounts' constitute an evolving set of tools and metrics to represent an organisation's intellectual capital (Danish Trade and Industry Development 1998; IFOA 1998). Through such accounts, an organisation communicates its value, both internally and externally, as being highly influenced by its intellectual capital, that is, the dynamic processes related to employee knowledge and expertise, the level of customer confidence in the organisation and its outputs, the organisational infrastructure, such as the form of its IT systems and administrative procedures, and the general efficiency of its business processes. The concept of intellectual capital helps us to more adequately conceptualise and explain the difference between an organisation's market value and its book value – for the very simple reason that intellectual capital is not included in financial accounts! This applies particularly to innovative, knowing-intensive organisations where the market–book ratios are much greater than in traditional industries. Our main focus in this paper is on the private sector; but it is important to note that many of the issues discussed are also directly relevant to the public sector where the nature of value is also undergoing significant change (see Bannister 2000).

These approaches are supplemented by various measurement approaches that enable inter-firm comparison. Among the more common accounting approaches facilitating this relative assessment of the existence and valuation of intellectual capital are:

1. Market-to-book ratios, the simplest of the calculations, takes the difference between the book value of a company, as represented by its balance sheet, and the market value, whether from stock exchange or internal market, to be equal to the level of intellectual capital in the business.
2. Tobin's '*q*', developed by the Irish-American Nobel laureate, James Tobin, is the ratio of market value to the replacement cost of a company's assets and can be used as a comparative benchmark between firms.
3. The Calculated Intangible Value (CIV) measure, using industry norms to establish rates of return for tangible assets, calculates the level of intellectual capital by attributing to it any return in excess of the industry norm (see IFOA 1998).
4. The 'colorised' reporting approach, proposed by Securities and Exchange Commissioner Steven Wallman, emphasises additional narrative reports, which can supplement the more traditional financial statements, with information that assists in identifying and classifying intellectual capital in a relative context (IFOA 1998).

While all of these can be faulted on a number of grounds, their primary usefulness is that they provide common measures that allow organisational performance to be benchmarked, thus enabling comparative estimates of intellectual capital to be established, however tentatively.

The role of accounting

Drucker's (1994) claim that knowledge is becoming the *only* meaningful economic resource is complemented by Quinn's (1992) assertion that the ability to manage this resource is the critical skill in the modern era. Those concerned with the financial management of these resources echo such sentiments. The International Federation of Accountants (IFOA 1998) notes that knowledge is the primary competitive factor in business; that it is a non-traditional intangible resource; and that the accumulation, transformation, creation and valuation of this resource lies at the heart of intellectual capital management. The result is that knowledge, and how it should be measured and managed, is increasingly becoming a central strategic managerial concern (Leavy 1999), with consequent demands upon management information systems. Accounting has traditionally fulfilled the role of information provider, enabling users to make informed and timely decisions. The advent of the new economy, and the centrality of knowledge, offers, therefore, both opportunities and challenges for the accounting profession with regard to its internal management, external reporting, financial management and auditing functions (Danish Trade and Industry Development 1998; Dzinkowski 2000; IFOA 1998; O'Regan & O'Donnell 2000).

Accounting has traditionally focused its attention on capturing and representing items that can be fully objectified. Thus, generally accepted accounting practices (GAAP) have been designed with the intention of fulfilling accounting's fundamental stewardship role, that is, of accounting for and informing company management and its various stakeholders of the existence and progress of its resources, activities and investments. The recognition and measurement of these have been facilitated by a historical cost valuation basis that has allowed 'value' to be attributed to places, products, customers and commercial activities. This has resulted in an accounting model that is focused primarily on items to which a tangible existence can be ascribed and that views with suspicion, or even disdain, elements that do not conform to this objectivist model (O'Regan & O'Donnell 2000).

In recent years, however, accounting's capacity to adequately perform its function as a supplier of relevant information has diminished as it has struggled to come to terms with items to which its limited conceptual framework can assign neither value nor tangible existence. In an environment in which international trade in the knowledge sector is growing five times faster than in natural resource-intensive industries, where the costs of information long ago surpassed the costs of equity, and where tangible assets often represent less than one third of corporate value, an accounting system designed to satisfy the needs of objectivist financial capital is proving increasingly incapable of embracing the measurement and reporting needs of knowing-intensive organisations. According to Thomas Stewart (1997), accounting systems do a 'lousy job' of accounting for the value of knowing-intensive organisations, with the result that managers are not getting the information that they need in order to be able to manage. Van Buren's (1999) argument that "the compass of the industrial and information eras – the financial balance sheet" is now insufficient is surely a correct one. This is reiterated by Baruch Lev (1997: 36) in a comment on what has become known as 'the lost relevance' debate:

> In recent decades the usefulness of financial reports of public companies has steadily declined, despite their increased gloss and girth. One indicator: In the 1960s and 1970s, about 25 per cent of the differences in stock price changes could be attributed to differences in reported earnings. But by the 1980s and early 1990s, this figure had dropped to less than 10 per cent. That's a lot of *lost relevance*. Everybody in this economy ought to be concerned. Reliable financial reporting guides capital to the most promising investments. But bad or outdated information can lead to an inefficient allocation. This leads to volatile markets and investors who demand higher-risk premiums to cover the increased uncertainty. That's why, for capital markets to function best, financial statements need to be as informative as possible. Conventional accounting performs poorly with internally generated intangibles such as R&D, brands, and employee talent—the very items considered the engines of modern economic growth. (Italics introduced by the authors)

There have been some attempts to redress this deficiency. Accounting standard setters, for example, have begun to reconsider the conceptual scaffolding that has seemed to preclude the discipline from addressing issues of relevance in the new economy. The work of Hermannson and Flamholtz sought to advance the recognition and measurement of human resource costs under the term Human Resource Accounting (Flamholtz 1985; Roslender & Dyson 1992). But, the accounting profession has largely ignored human resources accounting (HRA), insisting on classifying human resources as a cost and citing the traditional objections associated with accounting for intangibles. Significantly, however, the European Union (EU), OECD (Organisation for Economic Cooperation and Development) and World Bank have recently resurrected HRA as a means of accounting for the competitive advantage of knowing-intensive firms and regions. There have also been attempts to deal with some of the more troublesome intangible assets, albeit on a piecemeal basis. Nevertheless, early responses such as those embodied in various accounting standards dealing with the questions of recognition and measurement of these resources have been disappointing. Thus, while accounting treatments have been devised which have embraced some elements of traditional bugbears, such as goodwill and brands, the opportunity to critically reconsider the nature and role of accounting in this context has been largely eschewed (Grojer & Johanson 1997; O'Regan & O'Donnell 2000). Thankfully, there are exceptions.

The ten ground-breaking companies investigated in a report compiled by the Danish Department of Trade and Industry (1998) all work actively to develop their intellectual capital 'accounts' to complement the traditional balance sheet. These companies provide the following reasons for doing so:

1. Intellectual capital accounts can be used to support organisational growth.
2. Internal and external attention can be focused on how the organisation functions. This brings the organisation's management system and its development over time into strategic discourse.
3. It becomes possible to illustrate, even in approximate terms, how investments in intangible capital are reflected in organisational outputs over time.
4. The intended implementation of core strategies can be demonstrated. Since developing a vision is often a lengthy process, intellectual capital accounts can illustrate how and at what rate an organisation is moving towards meeting its strategic intent.
5. By publishing intellectual capital accounts, an organisation provides proof of the existence of a long-term perspective to interested parties.
6. With respect to its employees, intellectual capital accounts can be used to stress the importance of developing human, technological and customer resources over time.
7. Disclosure of costs and assets within the area of human resources becomes possible. This is of particular importance to knowing-intensive firms and regions, where the people competence dimension is becoming critical.

Both the idea and the realisation of such intellectual capital accounts assists in framing future strategy for each of these organisations. Consequently, the intellectual capital indicators chosen are closely related to particular business strategies. These two cannot be separated. Communicating how these accounts or indicators inform corporate strategies and future visions are imperatives of these ground-breaking organisations. They are, however, very much the exceptions to the norm at this point in time.

Research

One of the persistent obstacles confronting managers, accountants, researchers and consultants as we struggle to develop measurement and management techniques appropriate to the dynamics of the knowing-intensive economy is the lack of empirical data. Thus, while considerable work has been done by individual companies such as Buckman, Celemi, Dow Chemicals, Scandia and the companies cited in the Danish study, for example, to develop indicators of intellectual capital, little is known about the changing internal dynamics within firms and, indeed, economies, that parallel the knowledge era. A joint research programme undertaken by the University of Limerick and the Irish Management Institute, in association with the University of Maryland in the United States – involving the collection of detailed and extensive data from CEOs, top management team members and core employees in know-

ing-intensive firms – is, however, yielding considerable insights into these dynamics [2]. Supplemented by internal and external data on the financial performance of these firms, this research provides some early indications of the extent of the challenges posed for managers, accountants and national policy makers by the new economy.

The Irish software/telecommunications sector provides an ideal research framework for this investigation. In recent years, it has established itself as the largest software exporter in the world. This sector has been one of the primary engines of growth in an economy that has experienced real growth of almost 40% in 5 years, a rate unparalleled in the EU. It also provides a new economy environment in which the scope to investigate and develop innovative managerial practices and conceptual strategies is greater than in traditional industries. Within this sector, indigenous Irish firms play an increasingly significant role, employing over 20 000 people in more than 900 firms.

Specifically, the perceptual data derived to date from interviews with CEOs of 30 of these indigenous Irish firms provides empirical evidence of the significance of intellectual capital in terms of company value and the principal drivers of that value. This highlights the extent of the difficulties confronting both management and accounting as we attempt to grapple with the recognition and measurement issues associated with emerging concepts of value. As one part of the interview process, CEOs were asked to provide perceptual data as to the extent of intellectual capital as a source of corporate wealth. This involved indicating the percentage of company value deemed to derive from intellectual capital. In line with the typologies outlined above, and mainly influenced by Bontis (1998), intellectual capital was posited as consisting of people, internal and external dimensions, and CEOs were asked to indicate the degree to which the drivers of this wealth could be traced to these dimensions by distributing 100 points between them. Finally, they were asked to estimate any increase or decrease in company value over the course of the preceding twelve months. All measures, including performance, are perceptual. Bontis (1998; Bontis et al. 2000) notes, however, that perceived measures of business performance can be a reasonable substitute for objective measures of performance (Dess & Robinson 1984) and have a significant correlation with objective measures of financial performance (Hansen & Wernerfelt 1989). Most of the companies in this data-set remain privately owned at this point in time, but the main capitalisation strategy for the majority is an eventual listing on the NASDAQ. The relevant interview questions are shown in Table 2, and Table 3 provides a basic interim summary of this feedback.

The key finding is that these CEOs believe that, on average, almost two-thirds of organisational value is composed of intellectual capital and that almost half of this intangible value stems directly from the 'people' dimension. Average reported growth rates of over 150% are suggestive of increasing returns to resource utilisation at this stage in the life cycle of this particular sector.

Discussion

Kenneth Arrow, in a foreword to Brian Arthur's (1994a) volume on the economics of increasing returns, notes that an outstanding characteristic of Arthur's viewpoint is its emphatically dynamic nature. Learning by using or doing plays an essential role, as opposed to static examples of returns to scale. These people, at this point in time in the emergence of an indigenous Irish software sector, are idea and revenue generators, not mere reified linear cost factors of production as in the industrial-era accounting model. As a recent Irish government report notes:

> It is people, through their collaboration and interaction who innovate – in universities, colleges, institutions, enterprises. Science, technology, systems, software, money are merely the 'things' that people use. The complexity of the innovation process has a lot to do with inattention to the intangibles and people. (Irish Government 1995: 10)

Traditional industrial-era paradigms, based on the tangible sources of value (land, labour and financial-capital), the equilibrium norm in economics, the individualist bias in psychology, the cognitivist-representationist view of positivist science, and the predict-direct-exploit-control-reward bureaucratic machine-metaphor, running from Saint-Simon and Comte through Weber to today, are proving increasingly incapable of conceptualising or understanding the complexities of visualising, creating or leveraging this dynamic intellectual capital phenomenon (O'Donnell et al. 2000b). Attempts to find new theoretical ways of conceptualising these issues are, however,

Table 2. Items from the CEO interview

Intellectual capital, and intangible assets in general, are often viewed as a function of the interactions between internal systems and structures, external constituencies, networks and structures, and human competencies. Please distribute 100 points among these three categories that reflects your perception of how your organisation creates intellectual capital
• External Constituencies, Networks and Structures (Links to customers, suppliers, and various external networks)
• Internal Systems and Structures
• Human Competencies (Knowledge, Know-How and Experience)
• In your estimation, what percentage of the market value of this firm is composed of intellectual capital? • How much do you think this company is worth right now? • ... and how much do you think it was worth a year ago?

Source:

Irish Management Institute/University of Limerick [2] project

Table 3. Perception of some Irish CEOs on an intellectual capital equation

N = 30	Intellectual capital attributable to People	Intellectual capital attributable to Internal Structures	Intellectual capital attributable to External Structures	Firm value attributable to intellectual capital	Increase in firm value over previous year
Average	50 %	19 %	31 %	66 %	153 %

Source: O'Donnell (2001)

now emerging: activity theory (Blackler 1993); autopoietic and social systems theory (Von Krogh & Roos 1995, 1996; Roos et al. 1997); complex adaptive systems theory (Arthur 1994a; Kelly 1994) and complexity theory (Kauffmann 1995); and our preferred approach, Habermasian (Habermas 1984, 1987a,b) action theory (O'Donnell, 1999a,b, 2001; O'Donnell et al. 2000a,b; O'Regan & O'Donnell 2000). Detailed examination of these theoretical approaches, however, goes beyond the scope of the present paper. Arthur (1994b) sums up the challenges facing us well:

> The story of the sciences in the 20th Century is one of a steady loss of certainty. Much of what was real and machine-like and objective and determinate at the start of the century, by mid-century was a phantom, unpredictable, subjective and indeterminate. What had *defined* science at the start of the century – its power to predict, its clear subject / object distinction – no longer defines it at the end. Science after science has lost its innocence. Science after science has grown up.

The results of this exploratory research crystallise the extent of the challenge for both management and accounting in that currently this corporate value not only commonly remains off the balance sheet, but is also absent from most internal management reporting processes that are supposed to facilitate managerial decision making. It is imperative, therefore, if it is to retain its traditional information-supplying role, that accounting develops new and broader internal and external measurement concepts and reporting methodologies that recognise the central role of knowing-intensive activity as a primary creator of value. These will need to be supplemented by new financial management techniques that incorporate information resources and know-how into investment appraisal techniques. This can only be achieved initially by focusing on relative, indicative disclosures rather than on the development of objective recognition criteria and measurement techniques. Such an approach allows the possibility of building upon existing techniques and methodologies such as those management accounting approaches that already recognise quality, strategic management and customer relationship issues, or reporting practices that appreciate the usefulness of softer disclosures in narrative form.

These interviews are highly significant in confirming that the greater part of intellectual capital can be traced to the 'people' dimension in this sector. CEOs perceive that almost half of this intangible value links directly to the people employed in these knowing-intensive firms. This provides a fundamental challenge to the traditional accounting model that classifies labour as an expense, and to the hierarchical, power-driven bureaucratic model of employee relations management (O'Regan & O'Donnell 2000). The knowledge economy views employees as dynamic beings whose primary function is to generate revenue by creating and converting knowledge and ideas into marketable forms. The extent to which people are perceived as dynamic beings rather than costs suggests that one way in which intellectual capital may be better accommodated is by revisiting the whole concept of HRA and developing new templates and conceptual approaches that will result in the recognition of people as the principal drivers of growth. It should also lead to the development of new tools to better assist in the management or facilitation of, and investment in, people.

This links to another related consequence of the new dynamics of the knowledge economy – the changes being induced in corporate governance models (O'Regan & O'Donnell 2000). The existing corporate model strongly favours the providers of financial capital. However, in an environment in which the primary resource is seen as processes of knowing embedded in people, together with their relationships both to one another and to knowledge and ways of knowing, the existing governance model will be challenged to embrace a stakeholder approach which recognises the claims of employees to a share of ownership that reflects the basic fact that they provide the primary value-creating processes. Nor is this likely to be satisfied by stock option schemes that are predicated upon notions of reward. A governance model that has traditionally linked ownership to provision of financial capital may be forced to recognise the consequences of this paradigm in an economy in which intellectual capital is provided by other than the matrix of financial capital. It is also likely that, as part of this process, the attempts by the stewards of financial capital to capture and establish ownership of knowledge by means of patents, or its physical expression in the form of recipes and manuals, will be resisted by employees in the digital 'desert of the real'. The nature of relationships internally will also be affected, with power and influence correlating more closely to knowing-intensive heterarchic networks than to the traditional static, hierarchical and mechanistic view of organisation structure (O'Donnell 2001). Kevin Kelly (1994) and Gerry McGovern (1999), two leading thinkers and doers of the digital economy, both stress the centrality of the thinking 'network'; network economics is decidedly non linear and difficult to predict and cannot be controlled by a central bureaucratic steering unit.

Furthermore, in an economy in which the importance of teams, knowledge flows, processes and collegiality are commonly seen as facilitators of value creation, the traditional predict-direct-exploit-reward-control paradigm, which underpins the agency theory view of organisation, will be increasingly challenged by models that emphasise notions of trust, empowerment, alliance, transformation and imagination. These will require the development of internal management techniques that recognise and encourage the accommodation of these concepts, as well as reporting methodologies that distinguish between entities in which these traits and dynamic processes are increasing and those in which they are decreasing. These techniques will need to recognise the often chaotic, intuitive and inductive processes of creativity and idea generation. The customer relation in knowing-intensive business, both internally and externally, is no longer one-way market driven, but takes the form of partnerships in which dynamic stocks and processes of knowing flow both ways (Sveiby 1997). Processes of knowing grow when they are shared, and such flows, whether face-to-face or IT-mediated, are probably becoming more important than financial flows in knowing-intensive business sectors (Bontis 1998; Chase 1997; Choo 1998; Nonaka

1994; Pellissier 2000; Von Krogh & Roos 1996; Spender 1996; St. Onge 1996; Sveiby 1997). As Arthur (1994b) notes, science may have grown up, but accounting and management science appear to have a lot of catching up to do!

Conclusions

As confirmed by this research, intellectual capital is playing a decisive role in the wealth-creating dynamic of the knowing-intensive economy. If it is to be properly facilitated, however, information systems appropriate to intangible resources and to the needs of an increasing range of users and stakeholders will need to be satisfied. Accounting has traditionally been the principal supplier of such information, gathering and presenting it in a manner such as to allow timely and informed decision making by management and stakeholders. But accounting's capacity to continue to function as a primary information provider has been compromised by its seeming inability to respond more rapidly to the demands of a new economy in which the dynamic intangible has emerged as the principal catalyst for growth, with consequent radical changes in organisational structure, power distribution, knowledge flows and remuneration practices.

This revolution, therefore, offers a number of challenges for management science and accounting, and this research project is being extended to investigate ways in which existing accounting methodologies and paradigms are being adapted by firms operating in this new economy [3]. Significantly, these challenges may be best met by those who learn to apply traditional collection, valuation, reporting and auditing skills in developing new ways of facilitating the creation, integration and facilitation of knowing-intensive activity in a transparent manner. This will involve the development of new accounting and management concepts and approaches which not only identify, evaluate and classify, but which are sensitive to the novel stakeholding and knowledge-creating dynamics of the new economy. Welcome to the digital desert of the real!

Notes

1. An earlier version of this paper was presented at the Seventh European Conference on Information Technology Evaluation, ECITE 2000, Trinity College, Dublin, 28–29 September (Brown & Remenyi 2000).
2. This project on knowing-intensive business is directed by Professor Patrick C. Flood of the University of Limerick, Tony Dromgoole of the Irish Management Institute (IMI) in Ireland and Professor Ken G. Smith of the University of Maryland. An IMI-sponsored research fellowship at the University of Limerick is gratefully acknowledged by the first author here.
3. Sponsored by CIMA (Chartered Institute of Management Accountants), this project focuses on the nature of intellectual capital and the role of accounting in knowing-intensive business. This project is directed by Dr Philip O'Regan, University of Limerick, in partnership with Professor Tom Kennedy of the University of Limerick, David O'Donnell of the Intellectual Capital Research Institute in Ireland, and Professor Nick Bontis, director of the Institute for Intellectual Capital Research, Canada.

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Island histories, open cultures? The electronic transformation of adjacency

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Technology transforms the historical character of enclaves, making the remote readily accessible to the centre, and the centre equally accessible to the remote, and placing remote locations in reach of one another. The physical boundaries that produced information enclaves no longer have the power to effect cohesive social separation. Information communication technology introduces new social practices and social patterns. At the same time, the political geography of islands and small states enables readier decision making. The combination of ready access to external structures through new technology and the potential for more rapid implementation of new technologies in smaller, and thus less complex, structures renders small states and island sites key beneficiaries of, and pioneers in, the adoption of information communication technologies (ICT). Singapore stands testimony to the trend. Networking by small states and islands through a combination of new technology and face-to-face meetings can generate new economic and social structures within global functioning. The voice of the small social and political unit can now gain volume through cooperation and communication within the institutional capabilities of the new ICT. Sponsoring and monitoring technology developers to ensure that scale technologies appropriate for small and remote locations do indeed develop must be a priority of the new electronic advocacy networks proliferating in the cooperation between public and private society, both in the developing and developed world. This paper sketches these dynamics and provides instances and examples of new developments in the field of community empowerment. These are relevant for island sites, small states and peripheral regions and present challenges and opportunities for both commerce and governance.

No space an island, no space unconnected: Electronic adjacency and ICT

Historically, the physical boundaries of islands had very real consequences for social relationships and the construction of identities: they broke the easy flow of traffic and people into distinct and scheduled channels of contact and communication. The present 'insularity' of the United Kingdom in respect of its European neighbours stands testimony to the impact of the ocean in shaping social discontinuity and thus generating distinct identities, languages and agendas. In the same way that the sea formed the physical boundaries and borders of social identity for islands, so too did mountain ranges, moorlands and marshes shape the contours of remoteness on mainlands, with resulting 'social islands' or enclaves that frequently share the social and communication characteristics of their geographic counterparts. Japanese notions of national uniqueness reflect an island status as much as language (Tale of Genji 2000). More surprisingly, low income urban spaces often experience such severe accessibility problems as a consequence of poorly organised transport services and inadequate income-generating opportunities that they too have distinct social enclave characteristics (Grieco 1990, 1994, 1995). Similarly, the lower income countries have experienced severe disadvantages consequent upon their poor access to information and technology resources in a history of power where transport distance was equivalent to information distance, and poor access to information negatively impacted upon bargaining capabilities. Uniquely, South Africa must deal with its own form of each of the above physical, economic and cultural discontinuities while overcoming the particular insularity resulting from apartheid and its consequences.

No island was ever perfectly separated from the external world; no remote community ever socially intact; no low income urban dweller ever completely sealed into the deprived inner city; no low income country ever completely without information or power resources. However, the degree of seal and separateness from interaction with other individuals, agencies and societies in such circumstances have been significant for economic, social and political forms and institutions.

Developing new practices and new knowledge, indeed developing any form of practice or knowledge, requires proximity or adjacency to others who compose the relevant 'team'. Historically, physical adjacency provided the framework in which new practices and knowledge were developed – the monastery or university not only pulled together relevant players for the knowledge team, but also placed boundaries around such teams that outsiders were not permitted to cross. Gates and doors serve both as points of access and as barriers developed by humans to limit the scale and character of the team in play. Placing players in the knowledge team close to one another allows a very high level of iteration – experiments can be developed and repeated, run and rerun until the winning solution emerges. As the knowledge team plays together in the monastery or university, the high levels of iteration provide the space for the fine-tuning and finessing of the performance before it is exposed to the light of the external world

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(Holmes 1998). Adjacency provides the ground for rehearsal, and rehearsal provides the performance that legitimates the label of 'expert'. Similarly, work teams and labourers the world over are aware of the importance of developing teams to undertake dangerous, difficult or skilled tasks – boundaries are based on social membership, and those inside the membership interact and shape one another in the collective development of skill. Or so the game used to be played, but change is abroad, and the rules are changing.

In 1988, Bruce Sterling produced a 'cyberpunk' novel entitled *Islands in the Net*. Based on a near-future scenario of offshore information economies, it portrays the Caribbean and Singapore as contrasting forms of 'data haven'. Since then, the continuing development of new ICT has created a new form of adjacency, which is critical to the development of new global practices and global knowledge. The new technology creates the opportunity for individuals and agencies that are physically distant from one another to be in real-time public contact with one another: it is a new collective form of social contact. Electronic adjacency permits instantaneous interaction between distant individuals: new forms of knowledge are generated in this new interactive practice, though social and political theory have been slow to document and analyse this new social state (Carter & Grieco 2000). The speed and ease of new communication over distance enables the collecting together of views and opinions that were historically fragmented and disparate. Similarly, the transparency of this discourse permits the opportunity for those that were historically excluded from decision making to enter core domains. The present programmes of the development agencies, most particularly the World Bank (Global Knowledge Partnership 2000), to make use of the new technologies in extending participation is paralleled, and was foreshadowed, by the use of consumer organisations and senior advocacy groups (American Association of Retired Persons 2000) in utilising the technology to make clear their case for social change.

Not only are the real-time capabilities of the new technology critical in creating public and transparent discourse, but the asynchronous capabilities of the new technology have important consequences for redressing inequities in gendered access to information. Women typically are time poor and are often unable to schedule visits to physical information facilities in the course of their complex working and caring routine day. The asynchronous capabilities of the new technology enable women to log on when children and husband are in bed: women have become major users of the new technology in the USA in their search for information and education and in the booking of services and ordering of goods. Electronic adjacency educates, enables and empowers those with constrained time and restricted mobility.

For small states and island sites, for inner city communities and for remote regions of Africa, the electronic adjacency offered by the new technology provides a new and viable path into the decision-taking centres of world technology and resource allocation. In cooperation and in complaint, the collective voice of the previously marginalised can be articulated through the new information communication technology with sufficient iterative possibilities for the polished and rehearsed political claim to emerge and succeed. The voices of large numbers of disparate interests can be recorded and acted upon without systems grinding to a halt: direct democracy is now possible, and community information networks are set to play their part in developing a world where collective complaint brings appropriate social change and action (Communities Online 2000).

Scale and flexible decision making: The implementation benefits of smaller structures

It has long been recognised that smaller-scale units can reach decisions more quickly than complex structures, but the advantages of this speed of action have been accompanied by traditional disadvantages, such as the weaker capabilities of small structures in the accessing of external information. However, the advent of the new information communication technology has seen the advent of a new community technology. Ccommunity nets (Onde 2000) have begun to flourish in small cities, small states, islands and other remote locations, and these community nets enable the members of communities to access not only their regional neighbours, but also the global range of learning and knowledge resources.

A good example of the speed with which the world of technology is moving in directions that extend the reach and influence of small communities is that of the Onde project. "Onde is one of several trial community networks in Europe with each citizen having free access to the civic network. To claim your email address you get the town hall to verify your identity and you can attend open forums on topical issues or ask advice of other users and officials. If you don't have a personal computer at home, computers are free to use at the Mediateca, the public library, old people's homes, schools and the town hall" (Turnbull 1999).

Interestingly, Desenzano (where the Onde project operates) is a relatively rural location, and the article that the *Guardian* newspaper carried on this project (Turnbull 1999) suggests that the take up of new technology might indeed be greater and faster in rural locations because of the benefits of connection it creates for communities that are comparatively isolated: "A poll of community networks showed a greater percentage take up in rural Desenzano (a town of 23,000 inhabitants of which 1,300 have registered on line) than in urban Amsterdam. The organisers say one reason for this is the community's desire to survive. As more people travel outside the town for work and only see their neighbours at weekends, they can only too easily lose track of life in the town on a civic and personal level. Local people see the network as a way of keeping the community vibrant and together, supplementing physical contact with a virtual one."

New information technologies may have been developed primarily in large urban locations, but there is clear evidence from the Onde project that small, remote locations provide the new community technologies with obvious and large markets. The small snippet in the *Guardian* (Turnbull 1999) on the Onde project also provides some other insights on the relevance of the new information technologies to small, remote locations, which are often subject to the never-ending loss of population through outmigration. The emotions and despairs of exile are well documented in world literature and in the reproduction of features of the home community in the new locations in which migrants take up residence: the little Italies, Chinatowns and little Polands of the United States and Canada stand testimony to the desire to retain contact with the culturally familiar. The development of virtual community

nets enables the migrant to enter once again the discourse and social being of his or her original community of identity. In the case of Africa, the level of activity of Ghanaians on the Internet, shaping cultural and commercial sites that retain the contact with mother Africa and generate the goods for the continuing support of that identity in the USA and America, is remarkable (Ghana Computer Literacy and Distance Education 2000; Grieco 1998). The benefits to a migrant of linking up to the community net of the place of origin are many: with the establishment of an efficient microbanking system linked to a community net, funds can readily be transferred from migrants in the wealthier location back to their places of origin for development purposes. Electronic discussions around the possibility and profitability of setting up such links have recently been hosted by community web sites in El Salvador (Conectandonos al Futuro de al Salvador 2000)

Small communities can take fast decisions about appropriate implementation locations. (Should the telecentre facilities be in the library or in the town hall, in the school or in the old people's home, in kiosks in the shopping centre or in all of these locations?) Larger societies have bigger bureaucracies and more competing interests to resolve. The benefits for small states and island sites in making rapid resolutions in favour of the new technology are many, not least because it extends their range of trade, finance and influence. No island need be isolated if it is sufficiently open to experimenting with the new community technologies and community nets.

Contemporary options and winning combinations: Off-the-shelf electro-policy with in-house implementation cyber-capabilities

There is a new market for ICT. Whereas historically the market for the technologies was in the public sphere of education and commerce, and subsequently in the private domestic consumption of individuals, information communication technology is rapidly becoming the technology of collective civic empowerment. Within the developed world, wealthy countries with sparse populations have led the social movement in the adoption of this technology. A leading state in this sphere has been Canada, where community nets are used to help individuals living in sparsely populated areas to communicate with one another and to coordinate their social activities. Community nets enable the pooling and sharing of transport, with great benefits both for the individual's transport costs and for the environment. In Australia, the limiting case of an island continent, local and national government are directing resources to remote communities in support of commercial, administrative, educational and cultural activities (*Technology Review* 1996).

At the other end of the spectrum from the vast expanses of Canada and Australia, with large land masses and small populations, is Singapore, with its small land mass and great population. Singapore has unashamedly pursued the vision of the intelligent city, where new information communication technology is used to pursue efficiency. Social efficiency requires that inhabitants be able to coordinate with one another to reduce the burden on the state in the provision of services.

Politicians and political entities, from Al Gore with his initiation of the 'smart' presidential campaign to Britain's Brent Council (Brent Council 2000), have realised that the 'smart' way to take the pulse of the electorate is cheap, direct, timely and efficient. Information communication technology provides the first-ever opportunity for direct democracy, and, indeed, the present significance of the instantaneous focus groups and their consequences for Clinton's survival show the imminence of such technology for future forms of governance. Linking with the electorate through various forms of online community, whether these be local community nets on an intranet model or open access Internet sites, creates pressure for the development of community technologies. In Africa, where the penetration of rural areas by motorised transport is particularly poor as a consequence of the history of extractive exploitation of that continent by colonial interests (roads and rail ran between mines or plantations and the port with little concern for the development of the surrounding hinterland), the prospect of information communication technology, organised around satellite communications and solar power, opens up a future for health and education servicing of the continent to a level that was previously inconceivable (Holmes, Turner, & Grieco 1998). The market for ICT in Africa is not for personal, home-based use, nor is it a market of large employers and enterprises. Rather, it is a market for technologies applied to community business with an export drive in the craft sector, as well as to small enterprises also in the export sector. There is also a market for the tele-servicing of the rural community in the areas of education, health and transport scheduling. It is likely to find its shape in the development of telecentres in rural areas, as well as in the mobile provision of information communication technology services – not unlike the mobile library, shop or dispensary of the past. Satellite and solar power permit such mobility (African Cellular 2000; Internationl Telecommunication Union 2000; Building Information Communities in Africa Conference 1998; World Bank Forum on Rural Communications in Africa 2000).

Information communication technology has already revealed itself as a key tool for small and medium-sized entrepreneurs in the developing world: e-commerce is already a normal part of advertising vocabulary. With these new markets, both hardware and software have been rapidly developing to satisfy the demand for the new electronic flexibility. The rural demand for electronic servicing is likely to call forth further developments in the technology – though rural access to technology is an obvious beneficiary of the demand for global-access, hand-held personal technologies used by the high-status international business and development professionals. Increasingly, small and remote sites have available to them off-the-shelf technologies that place them in contact with vast libraries and reservoirs of knowledge and policy information.

The logic of the level of decoupling and of simultaneous coordination available within the new technological paradigm is clear. The combination of ready access to external structures through new technology and the rapid implementation of new technologies in smaller, and thus less complex, structures render small states and island sites key beneficiaries of and pioneers in the adoption of ICT.

A union of small states and islands: Working the ICT mode to advantage

The consequence of the logic we have charted is that islands and small states as a category of technology consumers with special needs must cooperate and coordinate to identify their particular needs within the future pattern of technical development. Within the context of European integration, city governments have already begun to cooperate across national bor-

ders through fibre-optic technologies and other forms of electronic networking in the identification of municipal problems shared and solutions sought. Similarly, within the European Union, locations along particular lines of transport communication have begun to cooperate electronically in the management of traffic – so the models of networking are already present in the real world. The traditional geographical barriers that confront island sites and remote locations should not be permitted to conceal the potential for networking opportunities equivalent to, and as influential as, those networking forms that are developing among spatially adjacent, but politically distinct, institutional structures in the European heartland.

Indeed, the danger of the traditional barriers drowning out the new electronic opportunities for coordination between those who share problems but are spatially dispersed are shown by Britain's lack of integration into the new European arrangements in transport management and other vital areas of modern social life.

The fact that technology passed through the stage of servicing a large personal, domestic-based market has resulted in the proliferation of low-cost, easily housed technologies with global reach. Community technologies have, through this route, been developed as affordable at each and every level of society: even the lowest income household can be provided with networked terminal access, which has the lowest of possible costs. The consequence is that small states and islands can afford to select a range of off-the-shelf technologies that provide them with immediate networking capabilities. Instituting an appropriate framework is now an organisational or institutional issue, rather than a technical one.

New technology not only has consequences for the civic empowerment of the individual in relation to the state, but also for the capability of remote locations to have their influence on the world of global government and global commerce: there are now powerful electronic counterbalances to historical policy remoteness. Networking small states and islands through a combination of new technology and face-to-face meetings can generate new economic and social structures within global functioning. Every island can form a base.

Targeting technology: The promotion of scale ICT technology for small states and islands

Small states and islands have been fortunate in the path that ICT development has taken. Pricing, scale and technical capabilities of domestic electronic technologies have provided an off-the-shelf information capability with no need for substantial investment in the development of the technologies on the part of small governance structures. However, the future may not be as automatically benevolent: islands, small states and remote communities have to take an active part in determining the shape of new technologies, by influencing both technology developers and those agencies that represent the major public-sector market for ICT.

Institutions such as the World Bank and the United Nations Development Programme require active lobbying by civic-minded institutions to ensure the provision of adequate facilities for transparent and open government and trade. The potential for e-trade, e-commerce and e-banking, which would support remote communities experiencing migration loss to overcome the disadvantages historically imposed by remoteness, must be explored within an objective-driven framework.

Every island must act electronically to empower itself and its citizenry politically and economically. Malta, most interestingly, has already begun the process (Malta Network Resources 2000; Search Malta 2000; Drummond-Murray 2000; Look Communications 2000; Malta 2000; Maltese Community in Brazil 2000).

The task now is to shape the existing links and information into a cohesive citizen's site that furthers community empowerment.

Note

For a further selection of web resources on the new communication technologies, see Appendix.

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The role of organisational knowledge management strategies in the quest for business intelligence

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The topics of knowledge management and business intelligence have received much attention in the academic literature and the general media over the last few years. In this paper, knowledge management is explored from the perspective of the acquisition of business intelligence inside and outside the organisation. An attempt is made to discuss how information technology, or, more specifically, synchronous and asynchronous GroupWare, may be integrated with knowledge management in a drive to create business intelligence. The concept of business intelligence is studied with specific reference to the identification of business opportunities. In seeking to clarify the argument being made, a model of the transformation process from knowledge management to business intelligence is presented and discussed, along with the subsequent competitive advantage.

Introduction

Knowledge management (KM) is nothing new. The concept may be defined broadly as "the practice of adding actionable value to information by capturing, filtering, synthesising, summarising, storing, retrieving and disseminating tangible and intangible knowledge; developing customised profiles of knowledge for individuals so they can get at the kind of information they need when they need it; and creating an interactive learning environment where people transfer and share what they know and apply it to create new knowledge" (*Management Review* 1999). Understandably, the topics of knowledge, knowledge workers and KM are receiving increasing attention from a variety of disciplines and fields, including the life sciences, finance, manufacturing and management consulting. These issues are not new, however, because for hundreds of years, owners of family businesses have passed on their wisdom to their children, master craftsmen have taught their trades to apprentices, and workers have exchanged ideas and know-how on the job (Hansen, Nohria & Tierney 1999). There is an inevitable and incontrovertible movement from a post-industrial to a knowledge-based economy (Drucker 1993; Davenport & Prusak 1998; Tapscott & Caston 1993), while at the same time new technologies have emerged to better enable the management of knowledge (Lotus Development Corporation 1997; Ruggles 1997).

As KM has emerged as a management concept and tool, there have been many different interpretations as to what KM means and how to best address the emerging questions, such as how to effectively use its potential power (Davenport & Prusak 1998; Edvinsson & Malone 1997; Nonaka & Takeuchi 1995; Wiig 1995). These differing emerging points of view are influenced by a person's work experience, professional education and training.

It is arguable that anyone participating in the field of KM must understand that KM is an emerging discipline. As such, there is no agreed-upon industry-standard definition of KM, nor is there a framework as to what the correct focus should be – whether on the individual or the enterprise. Larry Prusak, the executive director of IBM's Institute for Knowledge Management, believes that the focus should be on neither, but rather on groupings of people who share, for example, some common context, stories or passion around a subject. He refers to a grouping of this nature as "a community" (Hildebrand 1999). It is important to understand that, like the management of knowledge, the facilitation of communities is not a new concept – just newly framed and enabled by new technologies, media, devices and techniques. It will take time for these new capabilities to fully evolve and for their opportunities and effects to be fully understood.

This paper explores the opportunities and constraints present in the attempt to integrate information technology (IT) with KM and suggests how organisations may manage their competitive business intelligence (BI) in the global, knowledge-based economy. Some of the reasons for the emerging interest in KM as a management practice will be discussed in the context that during the last decade, the basis for competition has started to shift towards how well knowledge and other intellectual assets are focused on reducing costs, increasing speed and meeting customer needs. Additionally, other factors and trends, such as the new age of the business-intelligence economy and the classification of information delivery systems, will be discussed in the context of their convergence to create an awareness of knowledge as an asset. These metrics will focus on the emerging virtual workplace and tele-computing practice as enablers for e-business.

In this regard, KM will be discussed within the context of the approach involved in capturing the knowledge, the wisdom and the added-value experiences of individuals within an organisation. The potential uses, features and benefits of the current incarnation of KM are still being defined as more people and organisations explore this new form of communication and organisational learning (Walton 1989; Wiig 1995).

Consequently, in this paper, we will also suggest how organisations may use KM as their primary business competitive tool, given its current status of evolution. In this context, there is cognisance of the fact that knowledge is very mobile and exists independently of space. According to

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Stephen Denning of the World Bank, we need to create space where innovation can flourish. If we get rid of all the space, we end up with a dead organisation (*Management Review* 1999). Notwithstanding this, however, many businesses are coming to recognise that knowledge is an invaluable asset, and not merely a fad, as were some 'foster children' of the management schools of the 1980s and mid-1990s, such as management by objectives (MBO), one minute management, total quality management (TQM) and business process reengineering (BPR). Each of these was thought at one time or another to provide the answer to organisational success.

Guidelines will be offered on how organisations should manage their knowledge, and some of the current obstacles to the implementation of knowledge-management practices in certain organisations will also be explored. The discussion will be on three strategic value propositions of the organisation, namely:

1. The need to manage staff members as assets, who add meaning to information
2. The need to set up structures that allow staff members to gather and distribute information, but most importantly to convert that information into bottom-line income
3. The need to be in touch with, and responsive to, the needs of the customers of the organisation; they are the best, and final, arbiters of an organisation's actions.

The argument will be supported by proposing a model (see Figure 1) for creating BI through KM. This model will aid the discussion of some key questions and challenges, which can lead to a better understanding and explanation of the current form of KM strategies being practised. The specific objectives and themes of this paper focus on four components of KM and BI, namely (Lotus Development Corporation 1997):

1. Innovation – finding and nurturing new ideas, bringing people together in 'virtual' development teams, creating forums for brainstorming and collaboration
2. Responsiveness – giving people access to the information they need, when they need it, so that they can solve customer problems more quickly, make better decisions faster, and respond more quickly to changing market conditions
3. Productivity – capturing and sharing best practices and other re-useable knowledge assets to shorten cycle times and minimise duplication of efforts
4. Competency – developing the skills and expertise of employees through on-the-job and online training, and distance learning.

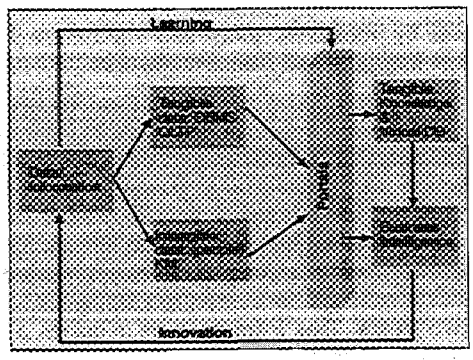


Figure 1. Proposed model for business intelligence through KM

The emerging trend of KM

As industry experience is gained, and academics and management practitioners continue to research this field, there will be increased understanding, and, in time, alignment with other areas of management studies and practice; however, today, this is not the case (Davis & Botkin 1994; Drucker et al. 1997). Anyone who consults in KM needs to be flexible and sensitive to different points of view, and must view KM as an exploratory journey rather than as a set destination. It is a frontier of great potential value, most of which is unrealised to date, and much of which is currently hard to measure. To use the terminology and perspective of the Gartner Group, it is also quite possible that KM is currently at the peak of inflated expectations and will soon plunge into the trough of disillusionment before rising again to provide sustained benefits (Gartner Group 1999).

An organisation's ability to function and prosper depends, in large part, on the knowledge and skills of its people, and on the knowledge base that it collectively develops and deploys. This knowledge base includes any information, however hard or soft, that contributes to the organisation's operations and success: ideas, know-how, personal creativity, problem-solving ability, customer information, technical expertise, competitor intelligence and so on. The agility and impact with which the knowledge base can be leveraged depends on the quality of the knowledge system in place.

Knowledge has become a commanding business issue for a number of reasons, including:

- The shift away from capital assets as the basis for market supremacy in favour of knowledge-based intangible assets (also called the shift to the 'knowledge economy' and likened in significance to the last major shift, from an agrarian to an industrial economy)
- The emergence and convergence of a number of technologies capable of capturing, managing and disseminating vast quantities of information
- The move towards the virtual organisation, where boundaries become blurred through the use of alliances, strategic partnerships and outsourcing relationships and in which the organisation's relationship with its people changes through new ways of working (such as remote and mobile working), making it imperative for organisations to manage and capture vital knowledge
- The realisation that knowledge can transform an organisation by moving it into new areas of activity. Examples include Federal Express, the courier service, which – apart from delivering parcels – now sells systems and advice to organisations with complicated distribution and logistics problems, and Schiphol Airport Amsterdam, which sells its expertise in airport design to other airports internationally.

As markets become more competitive, more fluid and less predictable, so organisations are realising that their core asset – the reason that they will be able to continue to prosper in an increasingly uncertain and risky environment – is what they know, along with their ability to deploy it quickly and effectively for competitive advantage. Leading organisations also realise that there are significant risks associated with not undertaking initiatives to manage their knowledge assets and processes now. These include:

- Productivity and opportunity loss – a lack of knowledge where and when it is needed in a useable format
- Information overload – too much unsorted and non-targeted information
- The 'knowledge is power' mentality – the misunderstanding that sharing knowledge will lead to a reduction of personal power
- Knowledge attrition – according to some estimates, the average organisation loses half its knowledge base every five to ten years through the turnover of employees, customers and investors
- 'Reinventing the wheel' – because there is a lack of standard processes for capturing best practices or lessons learned.

This is also true for nation states. Drucker argues that "the only comparative advantage of the developed countries is in the supply of knowledge workers ... [which is also the only] way for developed countries to maintain their competitive position in the world economy. This means continual, systematic work on the productivity of knowledge and the knowledge worker, which is still neglected and abysmally low" (Drucker, Dyson, Handy, Saffo & Senge 1997: 22). The implications are that knowledge needs to be understood and nurtured and requires a framework through which it may be enabled. Drucker goes on to caution that "knowledge constantly makes itself obsolete, with the result that today's advanced knowledge is tomorrow's ignorance" (Drucker et al. 1997: 22).

The fact that this is a likelihood, in the foreseeable future, has implications for organisations that operate in the knowledge-based economy of the twenty-first century. Hence, the overarching concern with knowledge and knowledge-workers dictates the strategic importance to an organisation of ensuring that the right knowledge is available, to the right person, at the right time, in order for that organisation to maintain its competitive advantage. This is the context in which an effective knowledge system is proposed (see Figure 1).

Ten questions arise from the foregoing, which, when answered, will inform the direction and objectives of future research in KM. There is nothing mythical about this, but epistemologically, managers and researchers must answer the following fundamental questions in terms of how an organisation maps its KM efforts – its knowledge strategy to key aspects of its business strategy:

1. What is knowledge?
2. How does it affect business intelligence?
3. What cognitive requirements and other limits are satisfied with the use of a global electronic KM network?
4. What media, devices and techniques have emerged in the KM systems, and what new capabilities do they allow?
5. What new ways of thinking will KM systems open up for us?
6. Are the traditional processes and methods of management adequate?
7. Which characteristics of KM networks support or limit different types of cognition?
8. Where can the new opportunities for dialogue within KM systems best be applied?
9. How might one determine when it would be better to use synchronous or asynchronous tools?
10. How can the knowledge-sharing dialogue best be enabled, supported, managed and rewarded?

Answers to such questions may be seen as enablers for managing the knowledge of organisations in the knowledge-based economy. Neef (1997) identifies six strategies and techniques that organisations may adopt in order to retain their competitive advantage, namely:

1. *Knowledge-based strategy*: Organisations must rethink global strategy, continuously reassessing the cost effectiveness of plant and labour locations, and organising their core competencies to take advantage of the opportunities of new markets. Additionally, they must focus on creating knowledge-based products, which complement the emerging electronic marketplace. This requires that they recast their value proposition to create corporate agility, responsiveness and competency, in order to take effective decisions aimed at improved productivity and business intelligence. The mission-critical decision here is that the organisation must develop a corporate strategy for competing in the 'New Age economy' of knowledge-based business.
2. *Knowledge-based process planning*: Organisations must structure their core processes around the logical sequence of what needs to be known at each step of the product life cycle, rather than around traditional tasks and outcomes. This approach will utilise the collective knowledge of the organisation's intellectual capital and create process efficiencies and knowledge-sharing opportunities. At the organisational level, knowledge process mapping techniques may be used with other business process improvement and group-based learning techniques to obtain significant cost savings and process efficiency. The competencies developed through such an approach can be replicated throughout the organisation and re-used in problem identification and problem solution. The heuristics of this epistemology are based on the business logic, which resides in the corporate portal (see Figure 1) and creates and distributes the business intelligence of the organisation.
3. *A knowledge-sharing culture*: This is perhaps one of the most important aspects of KM, as well as one of the most difficult. Notwithstanding this, however, organisations in the knowledge-based economy must strive to establish a knowledge-management framework (see Figure 1), based on their value proposition and strategic intent for knowledge transfer and collaboration. This approach will require the support of all levels of employees; communication of the organisation's knowledge-based action plans and strategies, shared values, visionary and strong leadership and dedicated resources. On an organisational scale, it will necessitate the establishment of communities of practice among knowledge workers, aimed at encouraging the sharing of productivity-enhancing practices, new techniques and lessons learnt from colleagues, by means of tools and mechanisms such as knowledge mapping and human networks.
4. *A technical support infrastructure*: Organisations need to take advantage of the new opportunities available in information and communication technologies in developing a technical infrastructure for transferring, creating and organising information and knowledge. It was suggested in a recent Forester study (Neef 1997) that almost 55% of all Fortune 500 companies were planning to develop knowledge webs capable of delivering information to employees worldwide within two years. This infrastructure requires a strategic position in investment, as well as the standardisation of IT components, such as hardware, GroupWare and communication equipment.

5. *Knowledge stewardship*: Organisations must develop techniques for organising and distributing corporate knowledge. Given the mission-critical nature of the task, as well as the opportunities for information transfer, the value propositions and tools that organisations use in KM for identifying, capturing, organising, formatting and distributing information on their knowledge webs must be carefully developed. Figure 2 attempts to explain that in developing the value chain for a knowledge web, there must be dedicated resources and clear methodologies for submitting, organising and retrieving information electronically. The approach can be described as a transformation process that takes the inputs (tangible and people data) and changes them into physical outputs and virtual databases.
6. *Content and corporate memory*: Neef (1997) explains that many firms are finding out that knowledge management entails more than just installing a knowledge web delivery system. Knowledge requirements must be identified, and properly defined and codified. Along with the development of taxonomies and delivery systems, information must be relevant and meaningful so that it can be placed in the right context for the enrichment of the corporate memory, thus allowing the personalisation and re-use of the organisation performance information, key lessons learned, and sources of internal skills and expertise needed.

This approach should be seen in the light of the continuing evolution of the digital computer, where revolutionary progress has been made in solving several distinct knowledge capture and distribution limitations. Continued business research and analysis will help to inform and explain the complexities of the global marketplace and the use of IT in developing the global knowledge-based economy. Some have argued that the effect will be equal to or greater than that of the printing press (Provenzo 1986); yet, at times, it has seemed that the computer, rather than solving the problem, has only made it worse. Within this milieu, the modern discipline of KM has begun to emerge. KM, in its most current sense, may generally be thought of as the effort to make the knowledge of an organisation available to those within the organisation who need it, where they need it, when they need it, and in the form in which they need it, in order to improve the quality of human and organisational performance (*Knowledge Management* 1999).

Organisations are now not only better able to distribute their best practices to everyone everywhere, but they can also better harvest improvements through these best practices from everyone everywhere. Two modern electronic technologies have merged to bring us the opportunities of KM systems of the present:

1. The strategic use of computer databases (which now have the capabilities to store enormous amounts of information about an organisation's customers, clients, services, products and even competitors' intelligence) aids the development of corporate business intelligence.
2. Networking technologies enable the movement of information, first within an office on a local area network (LAN), then across the world on a wide area network (WAN), and through the networks that link LANs and WANs together, including the virtually ubiquitous Internet.

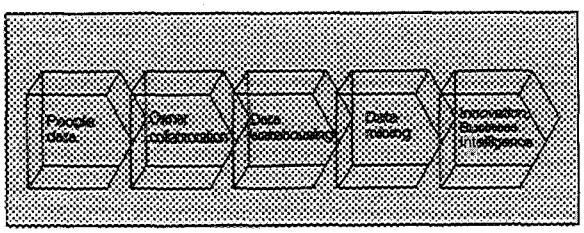


Figure 2. Value chain for KM

The first efforts along these lines included electronic data interchange (EDI) and electronic mail. These enabled little more than the exchange of data and information. As specialists began to recognise the possibilities, new and more sophisticated software systems were developed, leading to what became known as collaborative systems and GroupWare, the leading current example of which is Lotus Notes™. Knowledge capture and refinement capabilities, through electronic dialogue, are potentially greatly increased, along with the enhancements in knowledge distribution. Other important developments include the creation of hyper links and the development of the World Wide Web. Currently, the technologies that underlie KM systems usually consist of some sort of electronic network supporting GroupWare or Web technologies, or some combination thereof, along with e-mail (Lotus Development Corporation 1997).

There are two types of GroupWare tools. There are synchronous tools (for example, calendar and scheduling tools, electronic meeting systems, electronic whiteboards or data conferencing, and chat tools that allow two or more people to work together simultaneously, whether they are together in the same place or in different places). These tools enhance collaboration and make meetings more effective. There are also asynchronous tools that permit people to work together at different times (for example, e-mail, knowledge repositories, group writing and document editing tools, and workflow tools). In this case, it does not matter when or where a person is working. These tools replace meetings and make them unnecessary for certain types of collaboration. Each tool has its place (Lotus Development Corporation 1997).

These tools are the vehicles through which KM is used to empower the strategic decisions of organisations. In this regard, KM has two distinctive tasks, namely, to facilitate the creation of knowledge, and to manage the way people share and apply it. The manifestations of these tasks are found in the KM strategies that companies follow. The consulting business fraternity generally (Hansen et al. 1999) follow two very different KM strategies:

1. In some companies, the strategies are centred on the technology: knowledge is codified and stored in databases, where it can easily be accessed and used by everyone in the company. This is called the 'codification strategy'.
2. In other companies, the strategies are centred on the person – the knowledge worker – and knowledge is shared through direct person-to-person interactions. Computer and networking technologies are used to share and communicate knowledge, not to store it. This is called the 'personalisation strategy'.

The choice of strategy is reportedly not arbitrary, but relies on the way the company serves it clients, the economies of its business, and the staff who provide the service (Hansen et al. 1999).

Whatever the strategy, there seems to be much confusion about the definition of KM. A cursory survey of the literature offers four dimensions of KM:

- The process of cognition
- The type of knowledge (tacit or explicit)
- The level of activity (individual, group or organisational)
- The context in which knowledge is used.

The above are relevant where successful KM projects in organisations are achieved when information management and knowledge management are on the same continuum. The dividing line is the degree to which organisations manage their staff (people) resources and the information required by the organisation for competitive advantage.

In recognition of this fact, organisations may be advised that the above dimensions may be used to define a framework on which their various key processes can be charted for current and future states of strategic momentum. There is much debate that KM is not feasible because it is invisible (in other words, it resides in people's heads), whereas management deals with those factors that are tangible and measurable. Larry Prusak (Davenport & Prusak 1998) disagrees with this approach, believing instead that, in general, organisations can make KM visible, and virtually tangible, if they focus their strategic intent on knowledge processes, outcomes and investments. Knowledge processes include the collaboration of knowledge workers networked in virtual teams, policy directives and information sharing by executives, and the business logic that links the automation of the business processes in a seamless infrastructure. Figure 1 proposes a model for the acquisition of business intelligence through KM.

An application model for managing knowledge

Following from the discussion above, it is evident that an integrated approach ('syntrategy') is needed. The authors therefore propose a model for creating and sustaining BI through KM (see Figure 1), using the important concept of corporate portals to act as a medium for the tangible and intangible data/information to obtain the BI portal. The portal in this model becomes the engine that provides the heuristic – the business logic that creates intelligence or corporate memory.

The portal consists of the strategies, cultures, infrastructures, structures, values and beliefs, as well as the appropriate application software to harness knowledge, at all levels, both inside and outside the organisation. Within the portal are the enablers for creating, sustaining and applying knowledge. Specifically, culture could act as a barrier or an enabler for knowledge creation and use. In addition, there must be a sharing of values. Shared values must be established and communicated by the organisation. Thus, the portal becomes the engine that transfers knowledge throughout the organisation.

There is a very close relationship between knowledge processes and outcomes. Outcomes depend largely on the grand strategies adopted by the organisation – in other words, the organisation's value proposition. These are generally tangible and include components such as products and services, offerings, marketing campaigns, throughput, cost-reduction initiatives and contract outsourcing, as well as project cycle-time. Investments in KM, such a GroupWare and intranets, content management and integration of the various information workbenches (such as document and records management and workflow management), allow managers to automate their business processes with collaborative 'e-business' teams, in which people are linked together in a seamless manner. This strategic perspective empowers organisations to put e-business to work for them in rapidly accessing their business-critical information. On an organisational scale, the relationships between suppliers and customers are circumscribed by the degree to which these processes streamline the collaborative mechanisms of GroupWare (for example, e-mail) in cohesively managing their corporate epistemology. The epistemological issue of managing knowledge and intellectual capital can only be successful if the nature of knowledge creation and use are viewed with the following expectations: innovation, responsiveness, productivity and competency. These are performance criteria, which organisations may use to gauge how well their KM and intellectual capital projects are being managed in the new age of the business intelligence economy. From this follows a proposed value chain for KM (Figure 2) based on the authors' definition of KM: a transformation process that takes the inputs (tangible and people data) and changes these into a physical or virtual database.

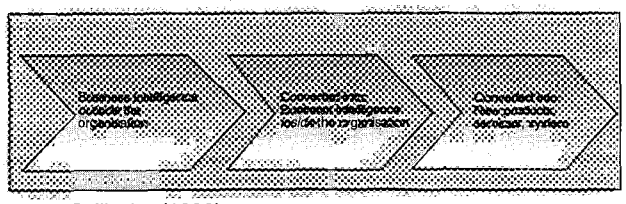
The new age of the business-intelligence economy

The study of human knowledge is as old as human history itself. It has been the central subject matter of philosophy and epistemology since the period of the Greek philosophers. Drucker and Toffler are two business theorists who call attention to the importance of knowledge as a business resource and a source of power. Using knowledge as the new competitive advantage calls for a fundamental shift in thinking about the business organisation. The focus is not only on the process of knowledge, but also on the creation of that knowledge.

As with most arenas in the business world, there is strong evidence to support the belief that Japanese companies' understanding and use of 'knowledge creating' companies is the most important reason for their successes. In other words, in the Japanese culture, the organisation acts as a medium for knowledge creation. In Western culture, however, the individual is the principal agent for possessing and processing knowledge. However, it is suggested that the individual interacts with the organisation through knowledge.

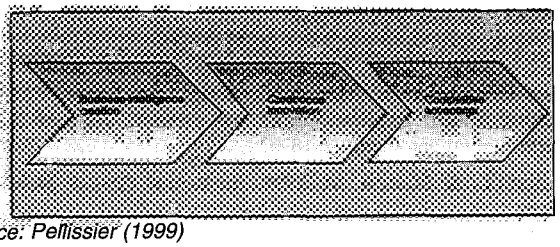
Thus, knowledge creation takes place at three distinct levels (Nonaka & Takeuchi 1995): individual, group and organisational.

The answer to the question, 'Why the focus on knowledge?', lies in the power of knowledge as a decision-making tool. An



Source: Pellissier (1999)

Figure 3. The transformation process of business intelligence



Source: Pellissier (1999)

Figure 4. Competitive advantage gained from business intelligence

organisation's BI base (accumulated outside and shared widely within) can be converted and used to develop new technologies and products (see Figure 3).

This dual external/internal role of business intelligence is the key to competitive advantage and is summarised in Figure 4.

Laudon & Laudon (1997) relate business intelligence to "the identification and understanding of problems occurring in the organisation – why the problem, where and with what effects" (Laudon & Laudon 1997), whereas Mallach (1994: 679) notes that intelligence is "the first of Simon's four phases of decision-making, which consists of finding, identifying and formulating the problem or situation that calls for a decision". Schultheis & Sumner (1992: G-8) agree that intelligence is "the first phase in the decision-making process in which the decision maker searches for conditions calling for a decision such as a problem or opportunity".

Thus, for the purposes of this paper, the term 'business intelligence' will denote the identification of business opportunities for change through appropriate information (technology and systems). This follows from the four stages of decision making described by Simon (in Mallach 1994).

Information-delivery systems

It is evident that IT has given organisations competitive parity. The history of IT has essentially been that of finding more efficient ways and means of getting data into systems to perform simple tasks (see Figure 5). Greater efficiency results in less waste, fewer resources and reduced costs. Moroever, standardising and integrating systems eliminate even further waste. One possible disadvantage of this approach is that organisations all perform at the same level. Thus, standard approaches to IT may deliver short-term competitive advantages, but, in the long term, may only ensure competitive parity. Moreover, standard approaches to IT may corrode differentiating strengths. In view of this, organisations should find ways to discover, develop and accentuate their strengths.

The focus of future organisations will not be on collecting data, but rather on acquiring information (and BI) to support and enhance innovation. Competitive advantage comes from matching internal strengths to profitable opportunities to create and sustain advantages that competitors cannot easily copy. For this, they need information about their own businesses, their customers and the external environment. The data that organisations collect over many years could act as the source of that information. This is the notion of 'information delivery'.

Definition

Information delivery may be defined as the end-to-end process of converting raw data, which large organisations

SYSTEM APPLICATIONS (OLTP, ESPECIALLY ERP) EXAMPLES: SAP, PEOPLESOFT, BAAN, JD EDWARDS, SSA, RUBICO	**BUSINESS INTELLIGENCE (INFORMATION WAREHOUSING AND MINING)** EXAMPLES: SAS, HYPERION, COGNOS, BUSINESS OBJECTS
DATABASE APPLICATIONS EXAMPLES: ORACLE, EXCEL, SYBASE, INFORMIX, MS ACCESS, LOTUS NOTES, DBASE, SOFTWARE AG	**OFFICE AUTOMATION** EXAMPLES: E-MAIL, DESKTOP PUBLISHING, WORD PROCESSING, FACSIMILE TRANSMISSIONS, VIDEO CONFERENCING

Source: Pellissier (2000)

Figure 5. Proposed classification of information delivery systems in terms of cost and ease of implementation

have in abundance, into meaningful information, which is required to support and enhance successful decision making (after SAS Institute 1999). Such software may be categorised according to the following four main categories:

- Personal productivity tools and utilities
- Transactional databases
- Standard operational applications
- Information delivery.

The first three of these categories are concerned primarily with data capturing, time saving and the achievement of day-to-day efficiencies. Personal productivity tools have automated the process of creating documents and organising personal information. Transactional databases provide an efficient means of storing substantial amounts of data that are continually changing. Standard applications enable an organisation to integrate its operational processes based on common software. The first three software categories are essential to the organisation's survival and provide an operational solution. However, the last category concerns more than survival. It is essential only for organisations that have set themselves more ambitious goals (such as market leadership, exceptional levels of customer satisfaction, above-average return on investment and sustainable competitive advantage); hence its more strategic focus.

Knowledge management – an oxymoron or value-adding business intelligence?

The expected outcomes of continued research in KM will hopefully bring about new perspectives on and understanding of what knowledge is, and how it facilitates BI. The challenge to companies will then be to develop the infrastructure of a knowledge-based system that will be capable of harnessing the full application of knowledge and will have features for the creation of knowledge. Understandably, on the one hand, tacit knowledge is rather difficult to record and explicate, but, on the other, is indispensable for translating knowledge into BI. The value of KM is at a crossroad. The question being asked is whether the term knowledge management is not an oxymoron.

Knowledge assets are very mobile and dynamic and cannot be controlled. However, knowledge management suggests the concept of control. The focus of effective business intelligence downplays the control element of KM and instead emphasises the value-adding characteristics of knowledge. There are three such value-adding characteristics, namely:

- Getting the right knowledge to the right place at the right time – this is associated with knowledge assets that are static in nature
- Providing conditions for the creation and improvement of knowledge – this is associated with the dynamic nature of knowledge assets and suggests the need for the 'learning organisation' from which business intelligence is born.
- Recognising the importance of tacit knowledge with regard to the creation and innovation potential of knowledge, as well as the effective storage and retrieval of that knowledge.

The key characteristics of the new economic framework – the knowledge-based business, new technologies, unbounded globalisation and the rise of the non-national organisation – have created the need for organisations to adopt KM techniques, which are beginning to emerge among leading international companies.

KM, therefore, is a logical and necessary response, at an organisational level, to the many fundamental changes occurring within the global economy. It requires a comprehensive and all-pervasive examination of every aspect of the way the organisation operates. Rather than being a programme, it is a way of looking at things. In fact, KM requires commitment and leadership if it is to be handled well, and it needs to be allied with other supportive initiatives.

Depending upon one's perspective, this transition can mean opportunity or Armageddon, but most economists agree that however difficult it may be to adjust to the new realities, it will be much more difficult to resist them. As comparative advantage (for nations, or, in the near future, for non-national organisations) becomes increasingly dependent upon access to ideas, human capital and the ability to create innovative new products and services, understanding and adjusting to these new parameters will become essential for survival in the global, knowledge-based economy (Neef 1997).

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Serving the citizen: A proposed model for IT value in public administration

Frank Bannister

While there is much common ground in the measurement of information technology (IT) value between the public sector and the commercial world, there are also significant differences. This is particularly so in the case of public administration, where evaluation of IT presents a number of specific theoretical and practical problems. Starting from an exploration of the meaning of information systems (IS) value, the differences between IT value in public administration and the commercial private sector are explored. A taxonomy of IT value in public administration is developed, and a model of IT value for public administration is proposed.

Introduction

A question of scale and perspective

By any measurement, government is big business. In many OECD (Organisation for Economic Cooperation and Development) countries, including Ireland, the state absorbs approximately 40% of gross national product. The government IT spend is correspondingly large. As Muid (1994) puts it, government is at the apogee of an information industry, a phenomenon also noted by Hood (1983) in his concept of the nodality of government, and by many others (Snellen 1992). Given the size of this outlay, research into IT value in the public sector has a relatively low profile. This is all the more surprising, given the general unease that IT in the public sector has not delivered the value expected (for example, Lenk 1990; Frokjaer & Korsbaek 1992; Pye 1992; Margetts & Willcocks 1993; Bellamy & Taylor 1994; Willcocks 1994; Margetts 1999).

This perception of poor value has not been helped by a number of high profile IT failures and overruns. Margetts & Willcocks (1993) suggest that there are several factors that make IT projects in the public sector inherently more risky, and thus more prone to failure and high cost. However, the question of whether public administration is receiving good value from its IT investment is much more complex and difficult to assess. One reason for this is that there is no agreed model of IT value in public administration. In this paper, it will be argued that an agreed model is needed if IT development in a given public administration is to be coherent. Such a model must be consistent with current thinking in public administration, while taking into account civil service culture, legacy infrastructure and technology developments. A model of IT value in public administration based on the concept of citizen centricity – the precept that the ultimate beneficiary of a civil service IT system must be the citizen in all his or her roles as customer, recipient, participant, taxpayer and so on – will be proposed.

IT in public administration

Developing a coherent theory of IT in public administration is difficult, given the current state of incoherence in public administration theory in general (Mainzer 1994). Indeed, Van de Donk & Snellen (1998) assert that not only has no such theory been developed, but that it is virtually impossible to develop anything other than a "more or less mature" theory. The most widely discussed conceptual framework is "informatization" (Frissen, Brussaard, Snellen & Wolters 1992). Another useful concept is the Information Polity (Taylor & Williams 1990; Bellamy & Taylor 1992 1998). More recently, Heeks & Bhatnagar (1999) proposed the concept-reality gap as a frame for considering how IT can contribute to the "reinvention of government".

The concept of informatization can be summarised as:

- The introduction of IT to shape or take care of the information retrieval process
- The arrangement of information flows and information relationships to facilitate administrative or management information process
- Changes in the organisational structure in which IT is introduced
- The development of information policies as a differentiated area of decision making in an organisation
- The use of specific expertise in the field of IT through functionaries or consultants with specific tasks in this field.

Informatization may be considered broadly equivalent to the term information management in the sense of managing the information needs of an organisation. Looking at informatization policies across a range of European countries, Snellen (1992) found that IT projects in the public sector during the period from 1970 to 1990 were dominated by the values of efficiency and effectiveness, controlled by the Ministry of Finance or its equivalent, and that "the interest of representation with informatization policies reinforces the internal orientation of those policies" (Snellen 1992: 21). Inasmuch as customer service was a consideration, it was viewed in terms of speed of delivery and absence of errors. Sometimes, even where projects were deemed to be successful, *ex post* research has shown the 'savings' realised to have been illusory (Henman 1996).

Informatization is positioned by Taylor (1998) as an alternative way of analysing what Heeks (1999b: 76) terms "the murky, messy world of information systems and public sector reform". In the literature on informatization and IT in public administration, a major focus is on public sector reform and reengineering (see, for example, Taylor & Williams 1990; Andersen 1999). Informatization should shift the emphasis from efficiency and effectiveness to reform – from automation to information and thence to transformation. The question is how all this relates to the value of IT in public administration.

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Serving the citizen: A proposed model for IT value in public administration

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There is a need to respond to the challenge posed by Wyatt (1991: 25): "Rarely has anyone explicitly addressed the question of why the public sector invests in IT, and of what it is hoping to achieve if not increased competitive advantage." Indeed, if one ignores self-funding and mandatory or survival investments, one might ask why a civil service would invest in IT at all.

In order to answer this question, a model of IT value in public administration is necessary. We now seek to formalise and develop such a model. This will be done in four steps:

1. A conceptual model of value will be developed to provide a framework for what follows.
2. The differences between public service and private commercial perceptions of IT value will be explored.
3. Using a number of existing taxonomies of IT value, a taxonomy of IT value in public administration will be distilled.
4. Consolidating all of these, a model of IT value in public administration will be put forward and discussed.

Defining IT value – A grounded approach

Values and value

The concept of value in economics goes back to Adam Smith's concepts of value in exchange and value in use (Samuelson 1976). Economics posits the rational man and proceeds to build various predictive models of behaviour on this assumption. In this model, the return on investment in IT is directly comparable with the return on investment in a new piece of machinery or in research and development (Engelbert 1991). Psychologists and decision theorists discuss value and decision making in quite different terms (for example, Tversky & Kahnehmen 1982; Plous 1993; March 1994). In practice, human and organisational decision making is often seemingly irrational when viewed from a strictly logical or economic perspective – a phenomenon Simon (1953) termed "bounded rationality".

To understand the nature of IT value as perceived by a civil service, we need a definition of value that will encompass the economic, psychological, cultural and political aspects of value. The multidimensional nature of IT value has been discussed, *inter alia*, by Symons (1994), who describes the need for multiple perspectives, and by Cronk & Fitzgerald (1999), who discuss the value perspectives of functional groups and dimensions of IS business value. To develop such a definition, we start by distinguishing the concepts of 'value' and 'Values' (for clarity spelled with a capital 'V'). Values may be described as normative characteristics or modes of behaviour that individuals, groups or organisations hold to be right, or at least better than other characteristics or modes of behaviour. Values have their visible manifestation in the ways that individuals or groups behave and interact with other individuals or groups. For example, beliefs in honesty, humility, self gratification, efficiency, social equality, duty, thrift, service to others, and so on, are all Values that, assuming they are applied, result in distinct forms of behaviour and choices. Values present as attitudes and beliefs that directly affect the way in which government departments apply IT.

Given this definition, 'value' is defined as a quality applied to a good, service or outcome that supports, meets or conforms with one or more of the Values of an individual or group. Thus, a person who holds strongly the Value that all humans should be treated with respect, is likely to place value on the work practice and ergonomic aspects of an IT system. An organisation whose primary corporate Value is economy in the form of keeping taxation levels or costs to a minimum will value an IT system that, say, reduces headcount. In extreme cases, Values become mindsets or ideology. An example of this effect was manifest in the United Kingdom during the 1980s, where the Values espoused by the Conservative government of the time had very dramatic impact on IT decisions during that period (Fallon 1993; Margetts 1999; Heeks 1999a). In such a climate, IT value can degenerate to financial efficiency and effectiveness, with the latter being ill-defined and of much less importance than the former (Bekkers & Frissen 1991).

The second distinction is between value and benefits. In assessing any information system, a government department will judge the value it receives on the ability of the system to meet a number of stated and unstated needs. These may include explicit external needs (such as implementing government policy) and/or stated or unstated internal corporate or even individual Values. Benefits can be thought of as an operationalisation of the value construct. Value is what we perceive; benefit is what we receive. The relationship is illustrated in Figure 1.

The impact of the objective needs – those values that are generally formally stated or specified – combines with Values that are implicit and that may or may not be recognised by the members of the organisation. Together, these substantially determine decisions about IT investment and use. Value perception is also affected by the information available to the actor. For example, civil servants will also be acutely aware of the general economic and political climate and will be work-

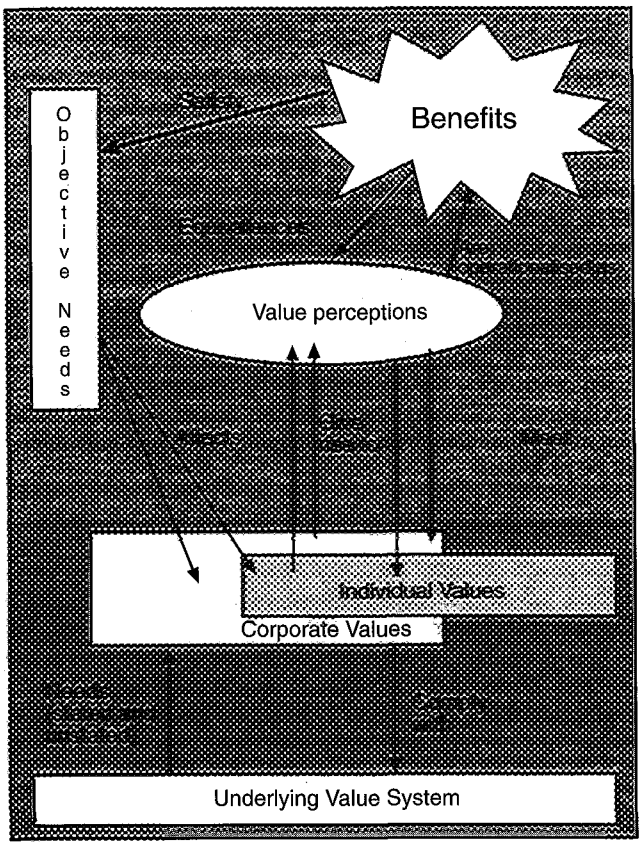

Figure 1. Relationship between Values, value and Benefits

ing within a broad framework set down by government, the Ministry of Finance/Treasury or other bodies. In times of economic cutbacks, there will be greater sensitivity to value for money than there might be in times of budget surplus.

In summary, all members of any organisation have Values, whether they acknowledge them or not. Values may be individual, group or organisational/corporate. They may be fundamental or transient and may be affected by current events. These Values lead individuals and organisations to seek goods or outcomes that deliver value – things that meet or comply with these Values. For IT investments and outcomes, we term this the *value set*. Benefits are the operationalisation of value. In order, therefore, to provide an appropriate basis for IT investment decisions in public administration, it is necessary to define the value set for public administration.

Public and private perceptions of IT value

A question of perception

An important issue is the difference between commercial and public administration perception of value and benefits. The perception of the role of IT in, and the value of IT to, a commercial organisation is inherently different from that of the civil service for a number of reasons, two of which are fundamental: motivation and complexity.

Motivation

Private sector commercial bodies are driven by some combination of a need to:

- Survive
- Grow
- Make profits
- Create wealth.

The combination of growth and wealth creation is the yardstick by which business performance is measured. League tables of added shareholder value are published indicating which companies are the most successful at achieving these ends (for example, by *The Sunday Times*). Reflecting this, the language of business management, particularly since the early 1980s, has been infused with the idea of competitive advantage (Porter & Millet 1985). While more sophisticated tools to measure company performance have been developed – such as the Balanced Scorecard (Kaplan & Norton 1992, 1993) – the fundamentals do not change. Investments of any sort are (or should be) primarily measured against how well they serve, directly or indirectly, the four criteria listed above. A variety of other rationales for IT investment may be invoked and filters used (for example, Boynton, Zmud & Jacobs 1994), but ultimately they must serve these commercial imperatives.

The above four criteria either have quite different meanings or no meaning at all in public administration.

Survival

Civil services, like most organisations, seek to survive; indeed, they are highly effective at so doing, but the threats to their survival are primarily political and social, rather than economic. A civil service department does not normally have competitors. In Ireland, as elsewhere, civil service departments constantly mutate, but the overall structure and staffing levels have remained broadly stable over the past 30 years (Dooney & O'Toole 1992). With constitutionally protected job security, most civil service managers do not concern themselves unduly with Grove's (1996) blunt assertion, "You have to be paranoid to survive."

Growth

A civil service may seek to expand, but the motivations for such growth are different from those of a private company. There are no shareholders or investment managers demanding year-on-year increases in earnings. Internally generated growth driven by civil servants (as opposed to growth driven by customer demand or government action) may be driven by a desire to provide better or additional services, or for less altruistic reasons such as power, promotion or control, but not by external pressures to add shareholder value. Furthermore, unlike private companies, any civil service has, in the central government Finance function, an internal control mechanism that deliberately tries to restrain growth.

Profitability

Civil service departments are not profit driven. Department management may be motivated by cost savings or cost avoidance, but this is a much more limited sphere than profit growth, in part because costs are only one side of profitability, but also because cost savings are bounded to a much greater extent than profits. The motivation in the civil service is still to come in on budget – in crude terms, to breakeven.

Wealth creation

While civil service departments seek to create wealth (a healthier population, better roads, a better educated workforce), such wealth creation is a vastly broader conception than that of financially enriching shareholders, management or the workforce. The value of such wealth is often difficult to measure by comparison with such metrics as increases in shareholders funds or earnings per share (Wholey 1979, 1983; Boyle 1993, 1996). The issue of such non-material wealth creation is, however, central to the mission of the civil service (Lalor 2000) and has a fundamental impact on the role and value placed on IT. This needs to be recognised.

Complexity

Business decisions can sometimes be very complex (Clemen 1996), but, in general, public decisions are much more so. There are several reasons why this is so, including:

- Public sector decisions tend to have many more stakeholders.
- The scale of expenditure by public bodies is, in general, far greater than that of private sector organisations.
- Many public sector decisions have the force of law and are not optional. They deal with citizens, not volunteer customers.
- Democratic and political considerations often add to the level of consultation required, and consequently to the timescale.

This last difference is often demonstrated when private sector decisions enter the public arena. For example, a decision as to whether a company should invest in a waste incinerator can be evaluated in a few weeks or, at most, months. Obtaining planning permission to build an incinerator may take several years, however.

Interpretation

Given the differences between private commercial and public administrative motivations, it follows that the rationale for investing in general, and in IT in particular, is frequently dif-

ferent. However, even where value perceptions are shared, they can take on a different connotation in a public administration context. For example, many commercial IT investment decisions would include several customer-related benefits or values including:

- Better customer service
- Enhancing customer value
- Customer retention
- Enhanced customer profitability.

There is, however, a fundamental difference between the customer/supplier relationship and the citizen (customer of the state)/state relationship. The commercial customer generally has the option of rejecting a supplier's product or service and buying elsewhere or, in many cases, not buying at all. The state is not only a monopoly supplier or provider of many services, but it often has the authority to compel the citizen to deal with it. For many of its services, there is no market imperative for the state to treat its customers well (although in a modern democracy, government departments which consistently fail to deliver service over a long period of time will normally be reformed, abolished or split up among other departments – there is a limit to public tolerance). Thus, in public administration, the above values translate as follows:

- Better customer service can, up to a point, be equated with better service to the citizen. Whereas a company may quickly suffer the costs of poor customer service, the same is not necessarily true of public services.
- Enhancing customer value may or may not be meaningful. In many instances, the 'customers' are at most paying for the services they receive indirectly or, in the case of social welfare benefits, for example, may not be paying for them at all.
- Customer retention is largely irrelevant. Customers can, of course, choose not to use state services, but if they want to travel abroad, drive a car or even eat, they may have no choice.
- Enhanced customer profitability has no direct equivalent meaning in the civil service. Lower cost per citizen served does have meaning, but this covers only half of the full scope of this value metric.
- Finally, there are also values and benefits which are either only found in a civil service context or which have a particular emphasis in the civil service which differentiates them. Examples of such values include:
  - Assuring equality of treatment
  - Social inclusion
  - Facilitating the democratic will.

None of these are commercial values. Many modern businesses deliberately set out not to treat their customers equally (for example, frequent flier schemes, private banking and so on). Social inclusion is not on the agenda of most businesses (witness the current closure of unprofitable bank branches in small rural communities) and facilitating the democratic will is not a Value that many businesses espouse in practice, even with their own shareholders.

In building the value set therefore, it is first necessary to differentiate those values that are purely commercial, those that are shared by all and those that have a different slant in public administration, and then to add values that are distinct to public administration.

A taxonomy of IT value in public administration

Values

To develop a taxonomy of IT value in public administration, we first define a core set of Values for public administration. The following list is proposed:

- Duty orientated
  - Responsibility to the citizen
  - Responsibility to the government
  - Proper use of public funds
  - Efficient and effective use of public funds
  - Facilitating the democratic will
- Service oriented
  - Service to the citizen
  - Respect for the individual
- Socially oriented
  - Respect for the citizen
  - Social inclusion
  - Justice
  - Fairness
  - Equality of treatment.

We term these 'core values'. The traditional themes in the study of public administration – accountability, responsibility, responsiveness, control, equity, justice and democracy – are implicit in the core values.

The citizen appears under each of the different headings, reflecting the fact that he or she has several possible roles. At any given time, the citizen may be some or all of the following:

Taxpayer:	The person who ultimately funds public administration and IT investment
Customer:	Someone who buys a service from the state
Client:	Someone on whose behalf the state acts
Claimant:	Someone who has entitlements from the state
Recipient:	A person who receives either treasure or authority from the government
Participant:	A member of the public participating in democratic decision making or policy formulation
Agent	Someone working for or on behalf of the state
Individual	A person in their own right.

The citizen *qua* citizen, as a member of the polity, is here termed 'participant' to avoid confusion. The above list is not exhaustive (a citizen could, for example, be a prisoner or a ward of the state), but it covers all the normal roles a citizen can take.

These two constructs will provide the basic structure underlying the model.

Value categorisation

A six-way framework categorisation of IT value is now proposed. IT value in public administration may be classified as:

Foundational

This relates to the legacy of cost efficiency, which has justified IT systems used in public administration. These values are close to the traditional three E's associated with value for money: efficiency, effectiveness and economy (National Audit Office (UK) 1996).

Policy formulation

This relates to the administration's role in developing policy and includes responsibility to government.

Democratic

This relates to the support for and enhancement of democracy and citizen involvement in the affairs of the state, including justice, fairness, equity and keeping the citizen informed.

Service

This relates to the provision of service to the citizen as customer, client, claimant or recipient and includes the criteria of timeliness, accuracy and convenience to the citizen.

Internal

This relates to values that affect employees and the internal operations of public administration, including staff motivation and working conditions.

External

This relates to the state's interactions with external organisations – some of which may be outside its jurisdiction – and may include many mandatory elements.

Towards a taxonomy of Values in public administration

In the middle tier of this structure are the IT values relevant to public administration. To derive a set of such values, we start from existing research. Several researchers have presented or suggested lists or taxonomies of 'IT benefits' (Parker & Benson 1988; Clince, Blennerhassett & Campbell 1992; Farbey, Land & Targett 1993; Coleman & Jamieson 1994; Bannister 1995; Remenyi, Money & Twite 1995; Remenyi & Sherwood Smith 1997). Most of these lists are not sector specific, although some of them are grouped in different ways. In converting these taxonomies/lists to a taxonomy of IT value in public administration, four issues must be addressed:

1. We need to distinguish between benefits and values. Benefits and values, though closely related, are not the same thing. This difference/relationship must first be made explicit.
2. Most of the lists are generic and/or business oriented. As has been shown, IT benefits and values that are important in the commercial sector may have no relevance in public administration.
3. Benefits and values in public administration may have little or no importance in business. A superset of such lists will not give a comprehensive list of IT public sector value metrics and will contain many irrelevant metrics.
4. Where benefits and values do overlap, they may have different meanings or interpretations in each sector.

The following steps were then taken:

- Following a wide literature search, an extensive list of benefits and values was compiled.
- This set was filtered to remove benefits and values that are not relevant or applicable to public administration.
- Where appropriate, benefits were restructured or reformulated as values.
- The resulting set was reviewed, and, where necessary, values were restructured and/or reformulated in public administration terms.
- The list was then augmented with a number of values that emerged from the background research into the Irish civil service and from the broader public administration literature.
- The identified values were categorised using the headings above.

The resulting taxonomy is shown in Table 1.

Citizen centricity – A new model of IT value in public administration

A citizen-centric model

Combining this taxonomy of IT values with the constructs previously discussed, a model can be developed. The model posits an IT value core which is made up of six major components delivering services directly and indirectly to the citizen. This model is shown in Figure 2.

The foundation on which this rests are the core values of public administration. The model is supported both by infrastructure and supporting constructs.

Supporting constructs

The core values and the operationalisation of value are supported by a number of supporting concepts including:

1. The whole person concept

The essence of this concept is that the civil service should view citizens as entities rather than as 'social slices' (Nora & Minc 1978). Traditionally, most civil service systems (and, by implication, departments and sub-units of departments) deal with only one aspect of a citizen's life. The whole person concept emerged during the development of systems for the UK DSS (Department of Social Security) Operational Strategy (Fallon 1993), but, as envisaged here, is much wider than the DSS's interpretation, which Adler & Sainsbury (1990) found to be more akin to a "whole claimant" concept.

2. The lifetime events concept

The lifetime events concept envisages the civil service being able to track citizens through those events in their life that bring them into contact with the state. This includes major events (birth, marriage, separation/divorce and death), many other milestones (reaching voting age, entry to the workforce, retirement, becoming a parent and buying a house), events which may affect only a subset of the population, as well as the issuing of various licences and authorisations by the state.

3. The one-stop shop

The one-stop shop is simple in concept, but its implications are profound. The essence of the concept is the notion that a citizen should, if he or she requires, be able to make contact with all the state services that are relevant to him or her at a single location. This might be a single office, a single counter in an office or (more questionably) a single web site.

4. Multiple modes of access

This principle states that there should be a variety of means whereby the citizen can transact his or her business with the

Table 1. Taxonomy of IT values in public administration

CATEGORY	VALUE	CORE VALUES SUPPORTED
Foundational	Positive cost benefit Cost savings/reduced headcount Avoided future costs Positive return on investment Positive net present value Risk reduction Greater staff efficiency Better control/reduction in fraud and waste Increase in capacity/throughput Mandatory	Efficient and effective use of public funds Proper use of public funds Responsibility to the citizen as taxpayer Responsibility to government
Policy formulation	Better management information Support for decisions	Responsibility to government Proper use of public funds Responsibility to the citizen as participant
Democratic	Citizen access to information Transparency Flexibility Policy alignment	Social inclusion Justice Fairness Facilitating the democratic will Responsibility to the citizen as participant
Service	Good service to the customer Good service to the citizen Meeting public demands	Service to the citizen as customer Service to the citizen as client Service to the citizen as recipient Service to the citizen as claimant Respect for the citizen as individual Social inclusion Justice Fairness Equality of treatment
Internal	Improved staff morale Improved internal communications Improved ability to attract staff Better staff retention More motivated staff Empowering staff Greater staff creativity	Responsibility to the citizen as agent Respect for the citizen as individual Efficient and effective use of public funds Proper use of public funds Responsibility to the citizen as taxpayer
External	Being abreast of the private sector Having a good public image Being abreast of other administrations Matching other external benchmarks	Reputation and image

state. With technological advance, the range of ways in which citizens can potentially undertake transactions with the state has increased. These methods now include:

- Direct face-to-face contact (in an office or in the home)
- Post
- E-mail
- Telephone (fixed and mobile)
- Fax
- Web (computer, television or WAP based)
- Teletext
- Courier
- Pager
- Automatic teller machine
- Kiosk.

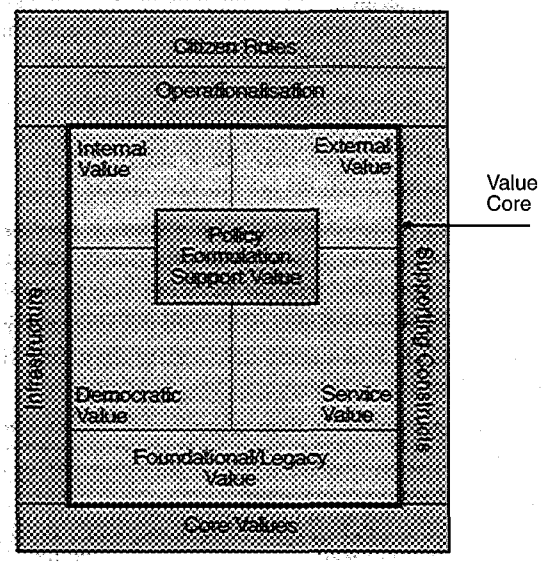

Figure 2. Relationships between Values, values and Benefits

Notwithstanding developments in the electronic delivery of public services, the need remains for a variety of other methods of delivery. Not all modes of delivery will be enabled by information and communication technologies.

Infrastructure

Finally, there is a need for a technical and organisational infrastructure to support the delivery of benefits. Briefly, this encompasses integration of systems, communications and privacy issues. This means, on the one hand, the ability to both access and combine information where necessary, but, on the other, the ability to separate and isolate information where the privacy or rights of the individual would otherwise be compromised. The design of such an infrastructure will be influenced by the Values held by departments and individual civil servants. There is much work in hand on this, but a discussion of it is outside of the scope of this paper.

Conclusion

It is important to stress that the model proposed in this paper is not a model of IT value in government, but a model of IT value in public administration. This paper has deliberately avoided what might be loosely termed wider political agendas, such as the reinvention of government through technology, e-government and the information society, as well as many of the wider and more complex issues surrounding IT in public administration. The objective has been to develop a model of core values – values which are independent of current government policies, dominant ideologies or political fashions. It is in this sense a politically neutral, but not value neutral, model. The responsibility of public administration is to both government and citizen. If government policy is to decentralise, to privatise state companies or to put a personal computer in every classroom, it is the function of civil servants to execute these policies and, where appropriate, to use IT as effectively as possible to achieve government aims. IT value in public administration is measured by its contribution to the good of the citizen. It is argued here that the primary aim of IT in public administration is to serve the citizen and the society in which he or she lives. In Irish society, the civil service has a long and honourable tradition of providing a politically neutral service – a service that can protect, and in the past has protected, the citizen from the government. These values will inform IT values and decisions made about IT acquisitions. An agreed model would provide a valuable reference for IT decision making in the civil service.

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Data warehousing principles for the strategic management of information: A synthesis of contemporary practices, theories and principles

Annemarie Quass*

The strategic importance of a data warehouse is unquestionable. This paper attemps to synthesise contemporary practices, theories and principles in data warehousing, concluding with some managerial guideline and principles for the implementation of a data warehouse.

Introduction

Bill Inmon, the recognised father of the data warehousing concept, defines a data warehouse as a subject-orientated, integrated, time variant, non-volatile collection of data in support of management's decision-making process (Lambert 1996). Another data warehousing pioneer, Richard Hackathorn, describes the data warehouse as a single image of the business reality (Lambert 1996).

Data warehouses are becoming an increasingly popular tool for the management of data. The most fundamental reason for this is, firstly, that executives need rapid, easy access to data for planning and control. Secondly, data have historically been stored in disparate systems, in multiple locations, which made a complete view of organisational data almost impossible (Laudon & Laudon 1996).

The problem is that the implementation of a data warehouse is usually left in the hands of the information technology (IT) department, without principles and guidelines set at a strategic level. Many companies pay too much attention to the selection of a data-retrieval tool at the expense of a sound strategy for populating the warehouse. Ultimately, the data warehouse is not a product to be purchased, but a strategy to be implemented. The definition of data architecture as the responsibility of management is much neglected currently.

Purpose

Data warehouses and other applications are generally regarded as the sole responsibility of information technology professionals, and some managers might feel intimidated by such concepts. However, organisational data are valuable resources to any firm, for which management should take responsibility. As data warehousing is a new field, this paper will attempt to provide a synthesis of the contemporary practices, theories and principles in data warehousing. The current literature will be reviewed to determine the architectures and principles that will facilitate business intelligence, as well as the key issues, challenges, goals and priorities for developing a data warehouse.

The paper will attempt to provide management with a concise overview of the current practices and key issues in the field of data warehousing. This information can be used by management to provide guidelines for the implementation of a data warehouse. This paper is positive in nature and motivates the involvement of top management in the implementation of a data warehouse.

Importance

It is important that managers take ownership of organisational information as a resource of the organisation. In order to do so, the data warehouse architecture needs to be defined at the highest managerial level. This will ensure that the management of data in the organisation is in line with, and supports, the management strategy.

Data warehousing is a popular topic, and much has been written about it. As it is a new field, the viewpoints are diverse, and there is not yet a generally accepted set of principles and practices. This paper will attempt to compile a set of principles and practices from the available literature to guide management in the definition of a data architecture.

Industry review

Historically, data were stored in such a scattered way that only IT specialists could gain access. Traditionally, managers would have to get organisational data from the IT department (Laudon & Laudon 1996). The problem is that in the fast-changing business arena, these data may no longer be applicable by the time they reach the manager or decision maker. In making data available to management, the IT department has to ensure that it does not interfere with transactional processing. The second challenge is to present data in different ways, as needed by different people in the organisation (Laudon & Laudon 1996). The answer is to implement a data warehouse that is application and platform independent (Laudon & Laudon 1996).

The data warehouse can provide a crucial point of leverage in terms of gaining an enterprise-wide perspective on data assets, if the challenges of implementing it are faced up front. The data warehouse is industry's primary decision-support tool, but it is difficult to implement, despite its popularity. IT departments are too often left in control of the implementation of data warehouses, without clear objectives and principles set by management. Executives are becoming more aware of the importance of providing the necessary principles and guidelines in setting up a data warehouse. These guidelines, provided by management, are needed to ensure that data will be of maximum benefit to management in decision making and control.

Data warehouses are receiving increasing attention from executives, and increasing numbers of companies are putting large efforts into data warehousing, according to Scott Kandel, partner at Deloitte and Touche's Information Risk Management

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branch in Los Angeles (Gallegos 1999). The Palo Alto Management Group conducted research in 1998, which showed the huge increase in the number of data warehouses maintained by the Fortune 500 companies. Palo Alto estimated that there would be a 70-fold increase in users. The president of the Palo Alto Management Group, Michael Burwin, has been quoted as stating (Gallegos 1999) that data warehouses are becoming ever more useful, and that companies are adding more data as they see the utility of data warehouses.

According to Marco (2000), a growing number of middle-tier and small-tier corporations are seeking to build data warehouses and decision-support systems. The early adopters of the data warehouse concept have grown to depend on them on a day-to-day basis and have proved that data warehouses can yield strong returns and competitive advantage (Marco 2000). It would seem that decision-support systems are becoming a commodity.

Literature review

The role of information in management

The global economy is increasingly dependent on the creation, management and distribution of information resources. Equally, most of the global workforce consists of knowledge workers who spend their time creating, using and distributing information (O'Brien 1999) to create business value.

In this information society, information is the key to performance in managerial roles. McLeod and Jones found that information was especially important in the handling of disturbances and entrepreneurial activities (Turban & Aronson 1988). Managerial success is measured by the decisions made by the manager. The quality of these decisions is heavily reliant on the availability of the correct organisational information. It should be borne in mind that decisionmakers operate at all levels of the organisation, and information is therefore needed at all levels. Managerial decision making is complicated by the fact that many more outcomes are possible in the rapidly changing business environment, and the result of each decision is far-reaching and complex (Turban & Aronson 1988).

The strategic importance of data management

Data constitute an organisational resource as much as do material or human resources. The range of uses of these resources is limited by the firm's knowledge and experience (Wiseman 1988). Like other resources, information can help the manager to make decisions, which can lead to competitive advantage (O'Brien 1999). A resource might not perform as it should because management has opted for a limited resource-use configuration (Wiseman 1988). Managerial end-users should view data as an important resource, which needs to be managed properly to ensure the success and survival of their organisation (O'Brien 1999).

According to Percy (1998), the collection, storage, interaction and importance of data in the organisation are strategic issues that are not well handled in most organisations. A strategic information base in an organisation can provide the information to support the strategy of a firm. Data are used not only for operational efficiency and effective management, but need to be recognised as a strategic resource (O'Brien 1999).

The issue of what makes the best sense for the organisation in terms of organisational data management is continuously clouded by different notions that influence the assessment by the enterprise architect (Percy 1998). It is the responsibility of management to define a data architecture that will govern the storage, configuration and accessibility of data to the maximum benefit of the organisation.

According to Cash, McFarlan & McKenney (1988), the development of a corporate database strategy includes the collection of files at a central location for reference by multiple users. They coin the phrase "long term information hygiene" to capture the spirit of the pressures on management to give strategic direction in the installation of information systems. The same principle applies to data, as the integrity of data grows in importance with time, while the full impact of a poor data strategy cannot be seen in the short term (Cash et al. 1988; O'Brien 1999).

The value of data to the modern enterprise is well documented, but the need to manage data as a corporate asset is still not widely recognised. A recent *Sloan Management Review* article stated the following: "Many managers are unaware of the quality of the data they use, and the issue of quality is largely ignored. ... Poor data quality and access can lead to direct or indirect damage to the firm. ... Poor data in management systems means that managers cannot effectively implement strategies. ... Inaccurate data make just-in-time manufacturing, self-managed teams and re-engineering unfeasible" (Lambert 1996).

Managers and knowledge workers cannot absorb all this knowledge for the sake of decision making and therefore need some support systems (O'Brien 1999).

Early decision-support systems

As can be seen, data management and decision support are not easy tasks. The problems are generally addressed by information systems, which can be defined as an organised combination of people, hardware, software and data resources that collect, transform and disseminate information in the organisation (O'Brien 1999). People have relied on information systems to communicate with one another using a variety of devices, information processing procedures and stored data for many years (O'Brien 1999).

Decision-support problems were thus originally addressed by implementing custom-built or off-the-shelf decision-support system (DSS) applications. The deficiencies of these systems are described by Moss & Adelman (1999a) and help to develop an understanding of the objectives and goals of data management and DSS applications. A shortcoming of the original DSS systems was that they were developed by different business units, resulting in disagreement between users on data definitions. Thus, no organisational view on data existed. These different data definitions also lead to inconsistent reports that cannot be used by management for decision making. In turn, the inconsistent reports cause users not to trust reports and organisational data. These problems were aggravated by the fact that data that went into the DSS systems were sometimes 'dirty' or inaccurate as there was no 'scrubbing' or cleansing process to ensure accurate data, presented in a uniform format. Lastly, data were shared reluctantly in business-unit-centric systems, and the data were not integrated, requiring complicated bridges to share data (Moss & Adelman 1999a). The shortcomings of DSS systems became profound as the users of these systems changed from administrators at a tactical level to analysts and managers at the strategic level.

Data warehousing as a strategic management tool

Management information systems and decision-support systems are rapidly changing areas as they move from an individual support system to a shared commodity across the organisation. Information is much more readily accessible, and the software used to access it is developed to the point where information is available from any desktop in the organisation (Turban & Aronson 1988). This trend increases the need for a well-defined data architecture, which will enable all users to understand how data are stored and can be accessed. According to Gallegos (1999), organisations create millions of pieces of information each day on, for example, their clients, products and operations, yet executives and decision makers still find it difficult to access such information.

This raises the need for a data warehouse, which is defined by Gallegos (1999) as a collection of integrated databases designed to support managerial decision making and problem solving. It contains detailed and summarised historical data, related to categories, subjects and areas (Gallegos 1999). It serves as a central source of data that has been screened, edited, standardised and integrated so that it can be used by managers and other business users to gain a common view of data from current and previous years, as created in operational data systems (O'Brien 1999). According to Laudon & Laudon (1996), a data warehouse is "the collection of current and historical operational data stored for use in Executive Support Systems (ESS) and Decision Support Systems (DSS)". The data are usually extracted from a number of sources, collected, integrated and then stored and managed in a relational database for quick and easy access, without affecting the data of the underlying transaction processing systems (Laudon & Laudon 1996). The data warehouse delivers data that can be viewed, queried, reported on and analysed to aid business decision making at all levels (Gallegos 1999).

Data warehouses are popular because of a growing demand for rapid access to operational data for management and decision-making purposes (Laudon & Laudon 1996). Management information at the strategic level is often complex, and data are needed from several sources, but presented uniformly. This can most effectively be achieved by a well-structured data warehouse that provides copies of actual data to the members of the organisation (Laudon & Laudon 1996).

The purpose of a data warehouse also needs to be viewed in the context of business intelligence. "The mission of a data warehouse is to provide consistent and reconciled business intelligence which is based on operational data, decision support data and external data to all business units in the organisation" (Moss & Adelman, 1999a).

Data warehouses and their analytical tools are dramatically enhancing access to information across organisational boundaries (Turban & Aronson 1988). Another important function is to provide nomadic users access to real-time data, any time and anywhere, as well as serve as a point of data access for external trading partners.

Introduction to enterprise architectures

An enterprise can be defined as a business association of a recognised set of interacting business functions. Business units can be defined as enterprises as long as they can operate as separate businesses (Finnerman 1999).

"Architecture provides the underlying framework, which defines and describes the platform required by the enterprise to attain its objectives and achieve a business vision" (Finnerman 1999). According to Finnerman, there is no single enterprise architecture (EA). The enterprise architecture can be divided into business architecture, information architecture and technical architecture, with supporting architectures as required by the individual organisation.

Information architecture can be seen as four interrelated architectural views, namely information architecture, business architecture, application architecture and technology architecture (Finnerman 1999). This view is based on the Zachman framework. An architectural approach provides operational definitions as a part of its common business terminology and therefore facilitates common business rules enforcement mechanisms (Finnerman 1999). Business architecture provides a start for business process redefinition and improvement, as it requires defined business process models. EA provides a method to relate architecture components to business goals and objectives, thus providing insight into business motivation of both data and business processes.

Establishing information architectures can yield important benefits to the organisation. An information architecture enables the capturing and storage of facts about the business, in an understandable manner, to improve decision making and communication at all levels (Blechar, Loureiro & Wallace, 1998). It also highlights opportunities for building greater flexibility into the business operations and processes without increasing cost (Blechar et al. 1998). The success of an information architecture relies on an organisational infrastructure to manage and coordinate information that is gathered from across the enterprise (Blechar et al. 1998).

The data architecture determines, at a very high level, the principles of design, accessibility and gathering of data. A well-defined data architecture is needed to curtail the negative impact that a data warehouse may have on the speed and ease of accessing data (Laudon & Laudon 1996).

There are several reasons why an architectural revolution is imminent for every enterprise that intends it to be a player in the information age (Zachman 2000). The first is that the new business culture is a game of information and not industry; power is therefore concentrated in the people controlling the information. The new challenge in the knowledge economy is to have formal conventions and mechanisms for describing and retaining knowledge, as companies are too complex to memorise how these enterprises work (Zachman 2000). Enterprise architectures will help organisations to deal with rapid change as well as complexity. This causes architectures to be essential for survival, as enterprises will not cope with change and complexity without it. Zachman argues that architecture is the new concept that will help organisations to view themselves holistically, to dynamically reshape and redefine themselves, given the environmental change and complexity.

Finally, enterprise architecture might become the admission price for firms to play in the information game (Zachman 2000). By the same token, a data warehouse architecture is needed for companies to view the organisational data as a whole and to utilise these data to support the organisation in adapting to high rates of environmental change and complexity.

Success principles

Determining the need for a data warehouse is important, as the implementation of a data warehouse is costly and a long-term decision. Gallegos (1999) has defined two questions that

can aid companies in determining whether a data warehouse is needed. Firstly, can legacy data be accessed instantly and efficiently? Secondly, when similar data from several legacy systems are compared, do they match? Gallegos suggests that a data warehouse is needed if the answers to these questions are negative. It is imperative, however, that the implementation of a data warehouse is motivated by true business concerns. True business concerns are evident from arguments such as the fact that all the data are available, but need to be accessed for better decisions, or that managers have difficulty in making decisions as they have to spend too much time gathering data, joining tables and drawing up reports (Onder & Nash 1998). Problems of this nature should drive the decision to implement a data warehouse. The decision can also be driven by parameters like improved efficiency, increased revenue, improved customer service and providing competitive advantage.

The data warehouse project has to be aligned to the business needs. Joshi & Curtis (1999) argue that the massive investment and effort which goes into the development of a data warehouse needs to be guided by a clear definition of the scope and goals of the project. A clear definition of the business needs that have to be satisfied is also detrimental. Joshi & Curtis (1999) suggest a design approach, which includes the development of business processes models to gain an overall understanding of the business.

Determine the objectives of the data warehouse

It is important to have a clear view of what the organisation wants to achieve in implementing a data warehouse. It is essential that the defined objectives be realistic and cost effective. The objectives also need to be prioritised, as it may not be possible to achieve them all within the specific project schedule.

One of the main project deliverables is to provide a consolidated picture of enterprise data by reconciling the different views that may exist on the same data (Moss & Adelman 1999b). All data in the data warehouse environment need to be accessible through a single point of entry. Furthermore, the data must be accessible through query and reporting tools that are capable of organising data in a format that is useful to the knowledge worker or decision maker. The data provided should be clean, consistent, integrated and reconcilable (Moss & Adelman 1999b).

Enable business intelligence

Business intelligence is a set of concepts, methods and processes that improve business decisions by using information from multiple sources and applying experience and assumptions in developing an understanding of the business. It includes the gathering and management of data to produce information that is used for strategic and tactical decisions. Business intelligence entails using the core information in conjunction with the relevant contextual information to monitor business trends, in order to adapt quickly.

There is little doubt that data warehouse technology can support business intelligence. The real issue is how to integrate and clean up disparate data so as to be truly useful to the decision maker. Business intelligence can be seen as a value chain that starts with the data resource (see Figure 1). When the data are put in context relevant to a certain object or instance, information is created. Information, in turn, supports the knowledge environment of the learning organisation. This knowledge is the raw material needed for business intelligence (English 1999).

Distinguish between operational systems and decision-support systems

Operational systems have different usage and performance characteristics from decision-support systems. Operational systems generally update a record of a business event or record on the basis of pre-defined transactions. Decision-support systems provide a unified picture of the whole organisation and the activities within it. By separating these distinctive processing patterns, the focus in both these types of systems is maintained on what they do best to optimise functionality and performance (Imhoff 2000).

Development principles

Organisational support and commitment are vital for the success of a data warehouse implementation. These have to come from the involvement of senior executives and top management in the analysis of the business model. The consideration of a data warehouse can provide the opportunity for management to review business plans, strategies and goals and to refine critical success factors to coordinate management efforts throughout the business (Joshi & Curtis 1999). Without commitment from top management, the data warehouse effort is doomed.

According to Onder & Nash (1998), there are four keys to a business-driven data warehouse, namely, organisational structure, change facilitation, expectation management and a proven methodology.

Organisational structure

In the data warehousing effort, two groups of people are of utmost importance, namely, senior management and 'working' management.

The first role in the project is that of project sponsor or owner. The sponsor needs the authority to lead the project, make decisions and be the internal marketer for the project (Onder & Nash 1998). A strong sponsor should have a vision for the potential impact of the data warehouse and should be an influential leader within the organisation (Kimbal, Reeves, Ross & Thorntwaite 1999).

The second component is a steering committee made up of senior business executives. This cross-functional team is responsible for project approval and funding and ultimately for project delivery (Onder & Nash 1998). The steering committee is also responsible for communicating the status and benefits of the project to the rest of the business.

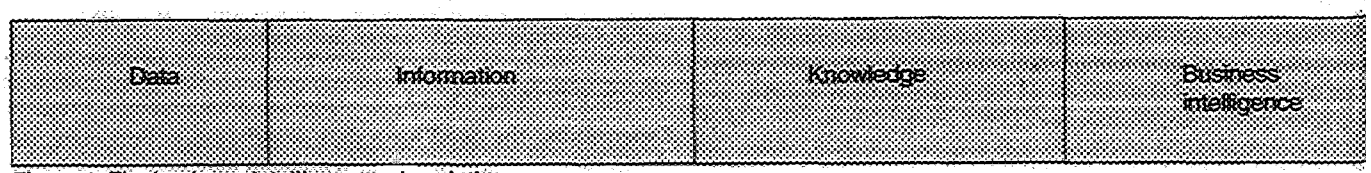


Figure 1. The business intelligence value chain

The third group that is needed is a user group of working management, who can be involved in requirements gathering and testing.

Other roles and responsibilities in the development and maintenance of a data warehouse also have to be defined and filled in the organisation if the data warehouse is to be successfully managed. The data administrator is a fairly obvious role needed in the management of a data warehouse. Data administration refers to the management of the quality of corporate data. Associated with data administration is the role of data proponent, who is responsible for the quality of a given collection of data elements (Lambert 1996). The data proponent will typically be a prominent person responsible for the processes that create the relevant data. Data administrators are responsible for identifying the different data proponents in the organisation, based on where the data originate.

Data administrators are also responsible for the definition of data management standards, policies and procedures. They establish the guidelines for the management of the corporate data resource (Lambert 1996). Policies governing data ownership and access are developed and enforced by data administrators. Organisational data resource requirements planning also forms part of this role (O'Brien 1999). Data administrators further need to approve data models based on the standards and guidelines as well as the data architecture developed by them (Lambert 1996; O'Brien 1999).

Gray (2000) recommends a "service management contract" between the administrators of the data warehouse and the users as a means of keeping performance levels at the desired level. Such a contract is similar to a service level agreement and addresses response time, targets, availability, data quality and data currency.

Change facilitation

The availability of a data warehouse is bound to change the way in which the organisation operates. The change needs to be managed, as users will be able to interact with data easily to create value for the organisation and clients. Without proper change management and the related change in processes and training, the true value of the data warehouse will not be realised.

Expectation management

Expectation management goes hand in hand with the change management discussed in the previous section. Management must guard against promoting the data warehouse as a solution to all organisational problems. Education is crucial in demonstrating the potential benefits of the data warehouse, as well as in introducing a sense of realism as to what the data warehouse will not be able to provide for the organisation. It is essential that the users understand which functions are better left to other technologies.

Methodology

It is important that all the stakeholders in the organisation understand the methodology and that the methodology directly supports the goals and objectives of the data warehouse. The most appropriate development process for a data warehouse is cyclic and iterative. The iterative approach allows for the delivery of the quick, three-to-six-month releases that most users need. An outline for the data warehouse approach will be discussed next.

Project management process

The project management approach is generic to all projects, but it plays such an important role in any implementation that it should not be neglected. Management must guard against ignoring the basics while focusing on a new concept like data warehousing.

The project management approach needs to be defined in terms of roles, project tracking, budgeting, change management, issue handling and milestone review points (Kachur 2000). The project plan may have to be revisited in terms of the level of detail and the flexibility of target dates. The second important thing to do is to train the whole project team in the methodology that will be used and the approach that will be followed. In addition, the communication mechanisms for the project need to be determined (Kachur 2000) and the project team needs to be set up properly before the project can start. This will ensure that these issues do not slow the project down once it has started.

Business case development

The business case specifies and supports the justification for a data warehouse. The business case will estimate the cost and identify the benefits of a data warehouse to the organisation. The business case will include a high-level work breakdown structure and milestones. Furthermore, a cost/benefit analysis needs to be done, and the critical success factors and risks associated with the project have to be identified. Project assumptions must also be documented in the business case document.

Requirements gathering

The first method to ensure that the project supports the goals and objectives of the data warehouse is requirements gathering. Business performance measures are derived from the organisational strategies and goals and are the key to the business success of the data warehouse (Onder & Nash 1998). Management and other decision makers need to be involved in this process of defining what information they need, at what times, and in what format. During this requirements gathering process, care should be taken not only to define the information that the data warehouse needs to contain 'all customer data' and 'data from financial systems', but users of the system have to define what information is needed from the system, as it is possible that supply-side objectives may not coincide with these demands (Lambert 1995). The requirements depend on the specific information needs of users and are as fluid as the changing needs of the decision maker. Lambert (1995) suggests that top executives be closely involved in the requirements gathering process, as they can help to identify organisational goals and priorities.

In gathering the requirements from the business, it might be useful to provide a simple pictorial representation of the business conceptual design (Onder & Nash 1998). This design will give a simple overview of the database design and technical architecture to help management understand how the pieces fit together and what their role in the project is.

The outputs of the requirements analysis should be the following:

- Understanding of the key strategic business initiatives
- Identification of the key performance measures for each of the strategic initiatives
- Determination of the core business processes and the impacts

- Determination of the impact on performance measures of the improved access to business information (Kimbal et al. 1999).

Scope management

The second requirement that is needed for successful implementation is scope management. The scope and justification for the initial implementation go hand in hand and will probably be defined concurrently (Kimbal et al. 1999). The scope of the data warehouse project needs to be limited for the initial effort. Many organisations have spent liberally in developing data warehouses without effective results. Focus areas should be identified to determine the priorities in developing the data warehouse, as the data warehouse can be designed to provide information relevant to any strategic or operational performance issues or trends (Joshi & Curtis 1999). The goal of storing all information in the data warehouse seems promising, but it might prove too costly. Careful consideration therefore needs to be given to what should be included in and excluded from the data warehouse. This analysis will provide the basis for the scoping of the data warehouse.

It is recommended that the implementation of the data warehouse be done in smaller iterations that are still meaningful (Kimbal et al. 1999). This allows the developers to focus on one or two strategic subject areas or data marts. The design needs to be governed by the data architecture to ensure that pieces that were developed separately will integrate (Joshi & Curtis 1999).

It must be recognised that the scope might change several times before implementation. This is usually due to a refinement of the scope and must be distinguished from scope creep. Scope creep can be defined as a steady increase in the size of the implementation as requirements are gathered. During scope refinement, the size of the implementation remains constant and is therefore not regarded as scope creep (Kimbal et al. 1999).

Tool selection

The next issue to consider in the development of a data warehouse is whether to use off-the-shelf applications, which can be implemented at lower cost and in a shorter time span, but which forfeit the flexibility and scalability that can be achieved by building a custom solution (Joshi & Curtis 1999). The specific circumstances of the organisation should be the deciding factor in selecting a development option. It should not be assumed, however, that either will have a lesser cost impact, as this could differ for every implementation.

A data warehouse development process might require several tools to do the job. The first step in the selection of a tool is to choose the evaluation criteria, which may include market reputation, scalability, compatibility with other tools in the business, and availability. All possible tools need to be evaluated against the criteria before a decision can be made.

Design principles

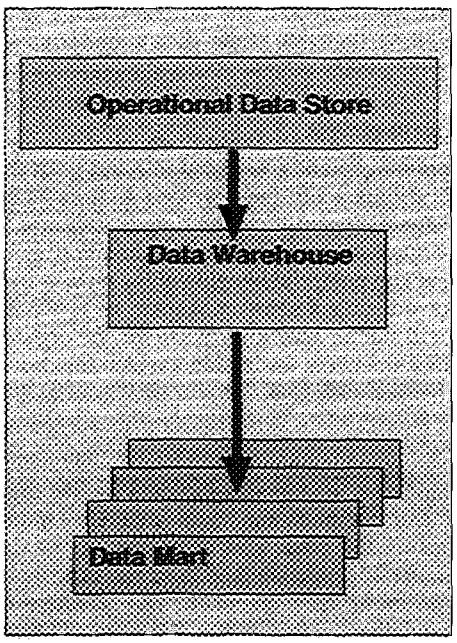
As mentioned before, the business processes and revised strategy and goals of the organisation play a major role in the design of a data warehouse. The high level architecture design defines the overall strategy by which the data warehouse is developed (Kimball et al. 1998). The detailed design maps out the implementation of those processes for the specific iteration. In this phase, the physical data warehouse model is developed, the source data inventoried, and the meta data requirements defined. Meta data will be discussed in more detail in a separate section.

The three-tiered architecture has proven to be one of the quickest to implement while remaining extendible across the business. The three tiers are the operational data store, the data warehouse and the data mart (see Figure 2). The three tiers refer to the three tiers of data, each designed to meet a specific set of end-user requirements. The three-tiered architecture involves data from operational data systems that are extracted, cleansed and moved to the data warehouse environment. The data warehouse can then be used to build several data marts to meet the specialised information needs of smaller user groups.

The first tier is the operational data store (ODS), which comprises the data created and maintained by the operational systems. These systems keep track on a transactional basis of events related to such matters as customers and products. The ODS is a current, integrated, volatile collection of data used to support tactical decision making or business management (Imhoff 2000). As the data warehouse becomes the central integration point for business intelligence, so the ODS becomes the central integration point for business management. The data in the ODS can come from internal or external sources and are usually detailed (Cooney 2000).

The second tier in the data warehouse to which the data are moved can consist of multiple data layers such as the operational data store (ODS) and the data warehouse. In this tier, data are cleansed and standardised to provide a single common set of data designed for all decision-support applications in the business. The data contained in the data warehouse can come from internal or external sources and can be detailed or summarised (Cooney 2000). The data warehouse is a non-volatile collection of data that supports business intelligence (Imhoff 2000).

The third tier comprised the data marts, which provide customised data for specific sets of users, such as departments in the organisation. A data mart can be defined as "a subset of the data resource, usually oriented to a specific purpose or major



Source: Adapted from Imhoff (2000)

Figure 2. The three-tiered data warehouse structure

data subject, which can be distributed to support business needs" (Brackett 1996). Data marts are known to meet end-user requirements effectively. The idea that the data warehouse needs to be fully complete before data marts can be developed is a misconception; these can be built incrementally and in parallel. The data mart contains data extracted from the data warehouse and presented in a tailored fashion to support the requirements of a specific user group (Imhoff 2000).

The three-tiered data warehouse structure is described by John Wiley as the Corporate Information Factory (CIF). The concept of a CIF developed as a result of the pressure from forces such as the economies of scale, limitations of technology and end-user demands. The CIF is a logical architecture that supports business intelligence and business management capabilities driven by data from business operations (Imhoff 2000).

Architecture principles

The role of architects in the business is to combine engineering principles and creative skills to develop systems which are too complex to be understood from one person's perspective (Lambert 1996). These characteristics apply to a data warehouse, as it requires the integration of several types of systems in different locations as well as different role-players.

A data warehouse must be developed with an architecture that is flexible enough to meet current and future requirements (Gallegos 1999). It may contain global data that are accessible by all users in the organisation, or specific clusters of data contained in data marts used by specific groups or departments.

An enterprise data warehouse needs to create a user-friendly environment for management to perform decision analysis, identify opportunities and make tactical and strategic decisions based on internal and external information (Joshi & Curtis 1999). The data warehouse also facilitates the use of data mining techniques to help uncover patterns in large data sets, thereby enhancing organisational knowledge and decision-making (Joshi & Curtis 1999).

The architecture needs to outline the following aspects of the deliverable:

- A description of the problem the system is meant to address.
- A description of the objectives, constraints and critical success factors for the system
- The project team and the roles of the participants
- A description of the major components, interfaces and connections as well as the communication paths between components
- The definition of the anticipated enhancements, migration paths and modifications for the future need
- The development and staffing schedule
- An account of the skills, tools and support required to develop and maintain the system (Lambert 1996).

All participants need to agree on the architecture. A well-defined architecture will provide a common level of understanding among managers and staff, both non-technical and technical (Lambert 1996).

Information quality principles and data integrity

Data integrity is a key issue in the development of the data warehouse. As data in the operational databases of most firms are not consistent, extreme caution should be taken in integrating the data from these separate locations. Data should be checked against the business rules (as defined in the meta data) before loading into the data warehouse (Joshi & Curtis 1999).

There is, however, a difference between data quality and information quality which must be borne in mind when implementing the data warehouse, as there may be information requirements that cannot be met by a data warehouse.

Information quality is needed in any organisation to serve customers and provide information about products, services and processes to serve the end customer and the internal knowledge worker and enable them to be effective in performing their work and meeting their goals.

Information quality is described by English (1999) as the quality of business communication in all forms, both spoken and written, including reports, the intranet, policies, manuals, catalogues and newsletters, as well as the data in databases and in the data warehouse. It is therefore important to bear in mind that information quality entails far more than the quality of the data in the data warehouse. English (1999) formulates his definition of information quality as "consistently meeting knowledge worker and end-customer expectations through information products and services".

Over and above this definition is the learning that is retained and shared. The knowledge that is created and shared represents to a large degree the essence of information quality principles.

An important notion underlying the definition of English (1999) is that information is a primary product, as opposed to a by-product, and that this product can be classified as quality or non-quality. With this in mind, top management can approach the management of the organisational information with similar quality principles to those stipulated by manufacturing organisations. This means that management should focus more on the output of the process and less on the system that produces the information.

Information quality can in reality only be defined in the context of the customers or workers that use the information. Information has value only when needed by knowledge workers to perform their tasks and meet their objectives (English 1999).

Data definition quality

The data definition is a specification of the name, meaning and business rules in the same way that a product specification controls the product (English 1999). The quality of all aspects of the data is controlled by the data definition and needs to be governed by standards that take into account the business terms used and the 'language' of the organisation.

Data content quality

The data content is more than the values in the data warehouse, and all communication content, intranet content and paper-based reports and documentation are included in the data content quality of the organisation. The data content of the data warehouse therefore needs to be closely aligned with all the other sources of data used in the organisation. Data accuracy means that the data correctly reflect the real-life events and facts that they represent (English 1999). Quality data can be combined to derive quality information.

Data presentation quality

Data have presentation quality when they are available when needed, easily understood and factually complete (English 1999), and thus fit for all the uses that may be required.

In spite of the previous description of what data quality entails, it needs to be considered that information quality entails far more and is a value system or habit that is created by the organisational culture and environment.

Meta data

Meta data is defined by Gallegos (1999) as data about the data that is stored in the data warehouse. Gallegos uses the analogy of cards in a library that provide a central point of reference and are used to guide users through the data in the data warehouse; Inmon (2000) also uses a metaphor, equating meta data with a road sign; and Sachdeva (1998) describes meta data as a road map and general tour guide to help you get around in an unknown city. The quality and availability of meta data are therefore key criteria for the success of a data warehouse (Gallegos 1999).

Despite its importance, meta data is still the most neglected part of many data warehouse projects, and the approach is usually to worry about it later (Sachdeva 1998). The metaphor of the road signs by Inmon (2000) illustrates another point. When people operate on known territory, they do not pay much attention to road signs, and people doing transaction processing and data administration thus do not need meta data from day to day. This is the reason why most users and administrators of systems do not see the use and importance of meta data, and is it easily disregarded when the implementation of the data warehouse is left to technical people alone. However, managers using the system for decision support need the meta data as a road map to access the data that they are interested in, as the system is unknown territory to them. It can be seen that management should take ownership of meta data and ensure that it is maintained and managed, as it enables analysis to a large extent.

A second reason why management should ensure the maintenance of meta data is to provide context to data (Inmon 2000). Contextual data should provide all the context information, including the data relationships at the time the data were created (Sachdeva 1998). Data on their own are just figures, whereas the meta data will clarify, for instance, what was regarded as revenue, or how the product was defined, at the time of data creation. With this context, management can satisfactorily interpret data and differences in data.

A last achievement of the involvement of management with meta data is that the meta data must have a business side, as required by management and the business community for decision support. When the data warehouse is left solely in the hands of the IT department, the meta data will have a technical slant, reflecting the needs of the technician and administrator.

It is not sufficient just to have meta data; it must be maintained as the business changes as a result of mergers, spin-offs and reorganisations. Management should ensure that the correct version of the meta data is used at all times (Sachdeva 1998).

Another issue that should receive managerial attention is the maintenance of meta data standards for the data warehouse. LeBaron & Adelman (1997) confirm that meta data standards are critical to data warehousing since it is so new to most organisations. Meta data standards provide a mechanism for ensuring alignment of the data warehousing effort, thus governing the data to be defined, named and stored, for instance. Ignoring meta data standards will result in an unhealthy infrastructure and often in the failure of the data warehouse implementation.

There are indications that a generally accepted meta data model might be established. The implication of a meta data standard is that decision-support systems will be able to share data across organisational boundaries (Marco 2000). There are currently two standards, namely that of the meta data coalition (backed by Microsoft, Computer Associates and others) and that of the Object Management Group (backed by Oracle, IBM, Hyperion and Unysis, among others) (Marco 2000).

User access

Data warehouse implementations can become very ambitious in terms of the amount of data to be stored. In the bigger implementations, access performance can become a real issue. The performance of the data warehouse is measured mainly in response time. These response time problems can be solved by several hardware solutions, such as parallel processors and distributed data warehouses (Joshi & Curtis 1999). Capacity problems can also be solved by software tools such as online analytical processing (OLAP), where the queries are tuned for multidimensional analysis along pre-planned dimensions (Joshi & Curtis 1999). An unpopular solution is to regulate the kinds and frequency of queries that users can put to the data warehouse. A well-designed set of indexes can provide an efficient solution to several data access problems in the data warehouse without specialised hardware and software.

The performance problem is complicated, however, by the different types of users, described by Gray (2000) as "farmers" and "explorers". The explorers are executives, concerned with the strategy of the firm, who seek intelligence from the data warehouse, while the farmers operate at a tactical level and monitor the impact of strategic decisions on the firm. Typically, the farmer is clerical while the explorer is managerial (Gray 2000). It is of the utmost importance that the user interface is designed to meet the needs of the different types of users. The user interface needs to be understandable and logical for the user when accessing the data warehouse.

The data warehouse design should provide the user with the maximum amount of flexibility. User interfaces can be designed by queries according to predefined requirements for tactical users or exploratory facilities for accessing data on an ad hoc basis by users at the strategic level (Joshi & Curtis 1999). In designing the user interface, ease of use and learning should take priority.

Another important consideration in developing user interfaces is to train the users in the access and analysis capabilities of the data warehouse, as well as the layout and structure of the data warehouse and the use of meta data. Training will play an important role in the adoption of the data warehouse in the organisation, and consequently in its success. Users that are comfortable using the data warehouse will also provide feedback for future refinement and development of the data warehouse. "The usefulness and quality of a data warehouse and its contribution in enhancing business performance will ultimately depend on the developers' ability to make the data warehouse environment user friendly" (Joshi & Curtis 1999).

Summary and conclusion

A data warehouse provides an opportunity for the organisation to utilise internal and external information sources for business intelligence. The concept of data warehousing has been current for almost ten years, and most information systems professionals are familiar with it. However, is it fairly new to most business users, and the topic thus often seems overwhelming. It is therefore important that managers are aware of what could cause the data warehouse to fail. The principles discussed for the implementation of a data warehouse included starting with management buy-in and support, as well as alignment of the data warehouse objectives with the strategies of the organisation. Other success factors include defining the appropriate architecture for the data warehouse and limiting the initial scope for the implementation. Other considerations are the span and extent of data to include in the data warehouse, proper definition of meta data, and data quality standards. The availability of data must match the business intelligence needs of the business.

User access needs to be flexible and user friendly in order to gain the support of the intended users. Data warehouse planners must bear in mind that user requirements will always be changing as the strategies and plans of the business develops. It has been shown in this article that it is important for managers to take ownership of the data and decision-support systems in an organisation, as well as for the management thereof. For this reason, managers need to define the conceptual architecture for the development of the data warehouse.

The success of any information systems tool or method requires an understanding of certain basic concepts. This article has touched on some of these concepts to serve the manager as a point of departure when considering the implementation of a data warehouse. The article has also attempted to provide a conceptual framework of the contemporary issues and practices in data warehousing.

Lastly, it is important to re-emphasise a few of the main factors to bear in mind when dealing with a data warehouse implementation.

The business as a whole, rather than the IT department, is responsible for the success of the project. Even a technically perfect system will not succeed if business needs are not met. Multidisciplinary teams are essential, and they should include members from top management as well as technical people.

The selected technology strategy should support the business strategy and harmonise with the culture and direction of the organisation.

There should not be an attempt to solve all the organisation's information and analysis needs in too large a project with unrealistic scope.

Operational data should not just be replicated without consideration of the true information requirements of decision makers in the organisation, as this could give rise to a data warehouse with limited use and benefits.

The importance of business involvement, understanding and education should never be underestimated.

The methodology of the top-down business approach to developing applications will help in developing a data warehouse that adds real value to the organisation and meets the needs of knowledge workers and decision makers.

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The marketing of high technology production in the technological environment

J.D. Pieters*

The article attempts to define some general principles that apply in a situation where a new technology product has to be marketed. The research found that the marketing of a new technology product differs in certain fundamental ways from the marketing of products that contain known and proven technologies. The following principles were defined:

- *It is important to get close to the customer. With new technology, there is an uncertainty, or risk, factor that influences the adoption of the product involved. The adoption of new technology is a social learning process in which the adoption characteristics of the customers must be considered and in which factors like reference and word of mouth play a significant role.*
- *Innovation is a paradox in the sense that it is not necessarily market driven or technology driven, but somewhere in between.*
- *The early market for a new technology can be broadly defined as a small group of 'early adopters', who are visionaries and seek the dramatic strategic changes that the new technology provides, and a large group called the 'early majority', who are more pragmatic and risk averse and want to have the reference of a trusted and respected market player before accepting the new technology.*
- *Companies marketing new technology products would do well to focus their full attention on a small but significant market segment initially. This provides entry into the market and reference for customers who like to follow rather than lead when it comes to new technology.*
- *From a purely marketing point of view, it is important to be market focused rather than sales focused. Speed is also important as product life cycles are shortening.*

Problem statement

We live in an era of technology. The pursuit of new technology has become an important way in which companies across a broad spectrum of industries are trying to secure a competitive edge over their rivals. The lure of high returns from a new proprietary technology has caused both companies and individuals to allocate valuable resources to the identification, procurement and development of new technologies. Companies that find themselves involved in the process of trying to commercialise a new technology product or service often find themselves in a dilemma with regard to the process of marketing the new product. This is especially true for companies that are not experienced in the process of bringing new technology to market. The dilemma manifests itself when the normal marketing functions have to be performed. Moore (1991) describes marketing as "taking actions to create, grow and maintain, or defend markets".

For novel products, there is no existing market to research with regard to user preferences, and projecting current market knowledge on to the new technology could be disastrous. Sales forecast are based on managerial wishful thinking and extrapolation, and the segmentation of the market is different from that of the current product portfolio of the company. There is uncertainty with regard to how the advertising and promotion budgets should be spent to be most effective. These are typically the symptoms of the management question that can be phrased as follows: 'How do we market a product that is novel to ourselves and our customers, to appropriate the highest possible value from the product?'

It is a question that deals with the, "generation and evaluation of solutions", as defined by Cooper & Schindler (1998).

Research objectives

The objective of the research is to define a global marketing strategy for novel, or new, technology products and services. A marketing strategy consists of defining a marketing mix and a target market. Perreault & McCarthy (1996) define the marketing mix as the four P's of marketing: product, place, promotion and price. Table 1 shows the details that comprise the four P's. The research will investigate the various marketing models suggested for use with new technology products and attempt to combine them into a single marketing strategy with reference to the details in Table 1, as these are the items that make up a marketing strategy.

Benefits and importance of the study

When a company has access to a proprietary new technology, even with a perfect appropriability regime, it is always of crucial importance to get the product into the mainstream market as soon and as efficiently as possible. This gives followers and imitators less chance of catching up and taking valuable market share from the innovating company. It also reduces the risk of a competitor's design becoming the dominant design in the industry. While the company is ahead of the competitors, it can charge premiums on the new technology product because of the monopolistic nature of the situation and also, from a cash-flow perspective, because it is important to start recouping the cost of implementation as soon as possible.

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Table 1. The four P's of marketing

Product	Place	Promotion	Price
• Physical goods • Service • Features • Quality level • Accessories • Installation • Instructions • Warranty • Product lines • Packaging • Branding	• Objectives • Channel type • Market exposure • Kinds of middlemen • Kinds and location of stores • How to handle transport and stores • Service levels • Recruiting middlemen • Managing channels	• Objectives • Promotion blend • Salespeople Kind Number Selection Training Motivation • Advertising Targets Kinds of advertisements Media type Copy thrust Prepared by whom • Sales promotion • Publicity	• Objectives • Flexibility • Level over product life cycle • Geographic terms • Discounts • Allowances

Source: Perreault & McCarthy (1996)

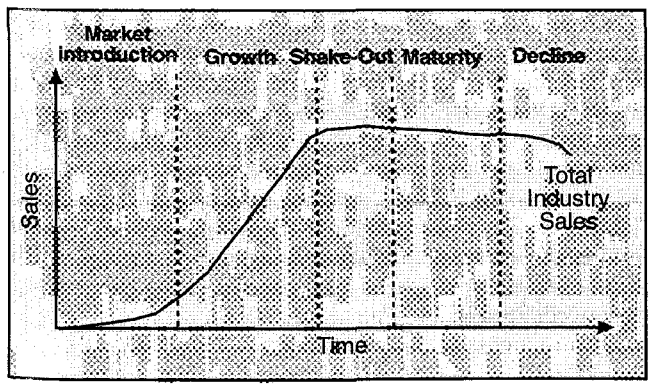
The only way that managers in this type of situation can get the product from the introduction phase into the mainstream market quickly and efficiently is if they know exactly how to approach the new technology marketing process and have a sound marketing strategy. As there are a number of suggested approaches to marketing strategies for new technology products, getting an objective overall view can be a daunting task. This research has the potential to consolidate the different models into one.

Industry review

This research is not industry bound. The marketing of new technology is required in most industries and can include new technology products, innovative services and new process technologies. While it is true that technology today is dominated by electronic, and especially computer, technology, this research will focus on new technology as a generic term for a novel or new way of solving problems in an industry.

Literature review

The literature review reveales a number of models, either dedicated entirely to the marketing of new technology or to parts of this marketing process.



Source: Perreault & McCarthy (1996)

Figure 1. The product life cycle

The product life cycle

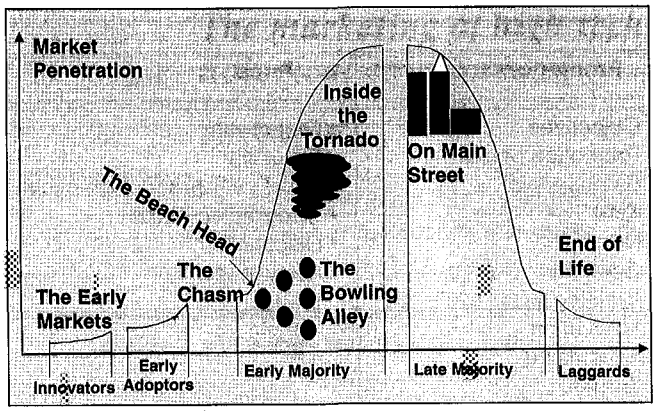
In their book, *Basic Marketing: A Global-Managerial Approach*, Perreault & McCarthy (1996) describe the product life cycle and the different marketing issues that are important during the various stages of the cycle. Figure 1 shows the basic product life cycle. Although new technology products are not explicitly addressed here, it is obvious that such a product would fall within the market introduction phase. The following points are made with regard to marketing strategy in this phase:

- Even if the product is unique, this does not mean that it will immediately be accepted.
- Distribution channels will have to be built up and incentives offered to players in the channel.
- Promotion must be aimed at building primary demand for the full product, and not just the particular brand. During this phase, the promotion must be of the pioneering or informing type.
- The correct marketing strategy depends on the adoption rate of the product, and if the rate is fast, a low initial price may build customer loyalty quickly. If the adoption rate is slow, the initial phase is good for skimming extra profits while the monopolistic situation is available.
- Because it is difficult to predict exactly how the life cycle of the new technology will advance, a company has to be flexible and change its strategy when required.

The book is dedicated to conventional marketing theory and does not cover the topic of new technology marketing well. It does, however, help to define the basic marketing principles.

Crossing the chasm

In his book, *Crossing the Chasm: Marketing and Selling Technology Products to Mainstream Customers*, Geoffrey Moore (1991) describes a marketing strategy to be used when selling new technology. He describes the high technology adoption life cycle, based on the product life cycle, categorising the type of customer that buys new technology at certain stages in the adoption life cycle. Figure 2 shows the technology adoption life cycle. The basic premise of the theory is that customers



Source: Moore (1991)

Figure 2. The high technology adoption cycle

have different risk profiles and will accept new technology under different circumstances. Where previously it was assumed that the transition between groups was a smooth one, the author points out that there are gaps between the groups, and that marketing strategies have to be adapted to "cross the chasm" between them.

The author advances a marketing strategy that has the purpose of making inroads into the mainstream market, where the real money is, as opposed to selling to customers that accept new technology easily. The main chasm that is addressed is the one between the early adopters, who want to be the first in their industry to implement the change, and the early majority, who want productivity improvements.

High technology marketing principles

In her book, *Warp Speed Branding*, Agnieszka Winkler (1999) describes the impact of the new high technology environment on branding. Although the book focuses on the high technology environment, rather than on new technology in general, some valuable points are made. The author points out that product life cycles, in general, are shortening, and that this impacts on branding. In the past, brands were established over periods of decades; these days, brands are established within months. The example of Amazon.com is mentioned. Furthermore, it is shown that the abundance of information on products and the vast array of choices in almost all consumer products have shifted the brand power away from manufacturers to the various groups of consumers. In order to assist companies in moving closer to consumers, the author suggests the following:

- Give customers exactly what they want in staggering time frames.
- Brand the company capability rather than a fleeting product or technology.
- Create a one-on-one relationship with the customer.
- Build partnerships to build the brand quickly.

The author also discusses six "myths of branding" to show how the environment has changed:

- A brand is built over a long time. Various new brands like Amazon.com and Apple are mentioned, showing that this is no longer the case.
- A brand is precisely crafted for a tightly defined target. Not only is does the brand have to address a much more splintered society, but it also has to accommodate a very complicated group of stakeholders caused by virtual organisations.
- A brand is created by advertising. Today brands are created by advertising, public relations, the enabling effect of new technologies like data warehouses, customer service and co-branding on an established name.
- The product has to be branded. It is better to brand the idea behind the product or technology, as either could be fleeting. Also, it is important to brand a group of technologies.
- The brand needs a manager. With the complex brand situation experienced today, the brand needs a guide rather than a manager.
- The brand is a marketing concept. The value of a strong brand is mainly a financial one that can be valued as an asset, valuated by the stock exchange and included in acquisitions.

The personnel requirements for the high technology marketing environment are described by Nino S. Levy (1998) in his book, *Managing High Technology and Innovation.* Although aimed specifically at the high technology market, these principles also apply to any new technology product. The author describes good qualities for a marketer in this type of environment as:

- Imaginative and creative, to cope with the undefined situation
- Good communicators, both with customers and technical people
- Strong engineering background, but not engineers – knowing 'why' but not necessarily 'how'
- Reliable, to instil confidence in a situation where there are many uncertainties
- Enthusiastic, devoted and have perseverance.

With high technology products, as with any new technology products, the customer needs strong support. The author suggests that this should be done by assembling a team based on the customer requirements. He further suggests that the company should not try to provide all the support itself, but that contracting is a realistic alternative. Also, the company should make use of local teams when expanding into foreign countries, because of their better knowledge of local culture.

In yet another book on the high-techology industry, *Silicone Gold Rush*, Karen Southwick (1999) compares the innovative rush for high technology products to the nineteenth century gold rush in California with innovators having to 'stake their claims' in an industry before they know if the business will pan out. The author identifies the two routes to entering a new market as (i) creating and exploiting a paradigm shift, and (ii) identifying a niche that is not being served well and becoming the market leader in it. Gary Hamel is credited with saying that to get to the future first, it is not as important to be the first player in the market as it is to be first to leadership. The author goes on to underline the importance of being close to the client and warns about having a technology focus, as opposed to a client focus. The point is made that any new technology must provide the client with a compelling reason to buy it. The counter stance, however, is that sometimes the client's paradigm needs to shift.

Lead users

In his article, 'Lead users: A source of novel product concepts', Von Hippel (1986) addresses the problem of conducting

research on customer preferences for new technology products. The dilemma is, of course, that current market research is not valid and that the new market does not really exist yet because of the the newness of the product. Von Hippel suggests the use of what he defines as "lead users" for market research purposes. Lead users are defined as "users whose present strong needs will become general in a market place months or years in the future".

These users can be utilised as need-forecasting laboratories. Furthermore, because these users often try to solve their needs, they can be a source of ideas for new technology products. The author identifies a four-step process for incorporating lead users into marketing research:

1. Identify an important market or technical trend.
2. Identify the lead users that lead that trend in terms of experience and intensity of need.
3. Analyse lead-user need data.
4. Project lead-user data on to the general market of interest.

The author discusses trend identification, but points out that there are currently no formal trend prediction methods. Only intuitive methods currently exist. Once a trend has been identified, the lead users must be identified. For industrial goods, the users with the biggest needs and the most experience are normally well known. The author suggests the use of appropriate surveys. Once the lead users have been identified, their needs can be analysed and projected on to the main market. As the needs of the lead users are typically not exactly the same as those of the users of the main market, some assessment of the results will still be necessary. The article provides some insight into the use of lead users, but lacks in practical useability.

The principles described by Von Hippel are further underlined in his book, *The Sources of Innovation* (1988), in which he shows the results of his research into 224 innovations. His research indicates that 56% of the innovations originated from the end users of the products and that companies should look to them as an important source of innovations.

Diffusion

In is book, *Diffusion of Innovations*, Rogers (1983) describes the variables that influence the rate of adoption of new technologies. As a high rate of adoption is desirable when taking new technology to market, this article provides valuable insight. The author describes the variables in the following way.

Perceived attributes of innovation

This refers to the perception of the target market with regard to the characteristics of the new technology. The relative advantage is the extent to which the new technology is perceived to be better than its predecessor. There is a positive correlation between the perceived relative advantage and the rate of adoption. The relative advantage is not only functional but consists of other aspects as well. Typically, there are perceived status effects in addition to the influence of incentives. A further issue that influences perceived attributes is compatibility, which includes sociocultural compatibility, compatibility with previously introduced ideas, and compatibility with the client's need for compatibility. In general, a higher perceived compatibility is positively related to the rate of adoption. Other aspects, such as the naming of the new innovation, market positioning, complexity, trialability and observability, are also discussed. The author stresses the point that it is the perception of the client that is important in all these cases, and not the perception of the marketer.

Type of innovation decision

Innovations requiring an individual-optional decision will be adopted more rapidly than an innovation requiring an organisational decision.

Communication channel

The attributes of the communication channel affect the rate of adoption. Interpersonal communication channels are typically associated with slower rates of adoption.

Nature of the social system

The norms of the social system, as well as the interconnectedness of the communication system, affect the rate of adoption.

Extent of the change agent's promotion efforts

The extent of the change agent's promotion efforts obviously plays a role in the rate of adoption, but a point is reached where the system reaches critical mass and the self-generated pressures towards adoption take over. This is known as the diffusion effect.

Information age principles (high-IQ organisations)

In their book, *Survival of the Smartest: Managing Information for Rapid Action and World-class Performance*, Mendelson & Ziegler (1999) describe the results of their research into two groups of companies, which they describe as high-IQ and low-IQ organisations. The difference between the two groups relates to the ability to disseminate information quickly and react intelligently. This is discussed on the basis of:

- Information awareness. This includes listening to the customer through the marketing side and paying attention to lead users, or "lighthouse", customers; being aware of competitors; benchmarking and researching best practises; and being aware of new technology developments.
- Decision architecture. This includes faster decision making through decentralisation; better decision making through informing the decision makers better; the fostering of ownership; getting the lower level employees involved in strategy formulation; and the shifting of power to people with knowledge rather than position.
- Internal knowledge dissemination. The internal distribution of information can be improved through the removal of cross-functional boundaries by creating teams; removing physical boundaries and implementing job rotation; showing lower level employees the bigger picture; showing managers the "sharp end" picture; and improving the process of learning for all involved.
- Organisational focus. Focus can be increased by realising that bigger is not necessarily better and that attention should be focussed on a few "hit" product lines, as well as by changing the focus as required through the product life cycle.
- Business networks. Networks allow companies to focus on their core competencies. The implication is that all the parties in the network, such as a distributor network, for instance, become part of the organisation and have to be included in the principles mentioned above.

Technology elasticity of demand

In the book, *Strategic Management of Technology and Innovation*, Burgelman, Maidique & Wheelright (1996) define the technol-

ogy elasticity of demand concept. The principle basically states that the change in demand for a new technology can be estimated by the extent of the improvement of the acceptability of the technology. For instance, the change in demand can be estimated when the functional performance, ease of use or service requirements have been improved. Two types of elasticity are discussed. Absolute elasticity represents the responsiveness of total market demand, and relative elasticity represents the tendency for shifts in market share.

Important principles

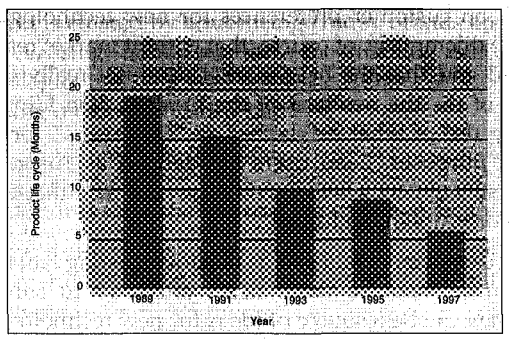
In the discussion of the relevant literature, certain themes and principles are raised by a number of authors, indicating that they are of universal importance in the new technology marketing environment. In this section, these common principles will be identified and discussed.

Getting close to the customer

Not surprisingly, a number of the authors recommend getting close to the customer in a situation where a new technology is being marketed. Winkler (1999) suggests that it is important to create a one-on-one relationship with the customer because of the fact that a brand has to address a much more splintered society. Because market segments are no longer clearly defined, it is important to get closer to customers to understand their needs. Levy (1998) suggests that, with new technology products, the customer needs strong support to incorporate the new technology. Von Hippel (1986) recommends getting closer to the potential customers, or lead users, because they are a source of innovation. From a high-IQ organisation point of view, Mendelson & Ziegler (1999) also suggest getting in contact with the lead users. Rogers (1983) differs with regard to diffusion. According to his research, interpersonal communication channels are associated with slower rates of adoption.

Innovation as a market/technology-driven paradox

In his article, 'Managing the S-curves of innovation', Rick Brown (1992) points out that marketing literature has traditionally portrayed new product development as essentially a market/customer-led process, but that innovation seems to be technologically driven in practice. Often, innovation can be regarded as a technology seeking a market application, rather than a market opportunity seeking a technology. He does, however, acknowledge that there needs to at least be an insight into how a new technology should be utilised. Southwick (1999) describes this utilisation as a "compelling reason to buy", implying that the technology has to solve a problem or it will not sell. This idea is probably taken from Moore (1991), who describes a value proposition as a combination of the customer, the product and the application, and rates the value propositions as "not useable", "useable", "nice to have", "should have" and "must have". He suggests focusing on a market segment with a "must have" value proposition. This principle has an impact on one of the main marketing functions, that of predicting sales. As Von Hippel (1986) points out, for a new technology product, the market research is often not valid, as the market does not exist yet. Brown (1992) supports this by pointing out that it could even be argued that market research stifles innovation, as all market research is based on current knowledge and history. He does concede, however, that this would be hard to prove.



Source: Mendelson & Ziegler (1999)

Figure 3. Average product life in the personal computer industry

Product cycles are shortening

Winkler (1999) points out that product life cycles in general, but specifically in the high technology industry, are shortening. She expands on this point by showing how certain companies in the high technology industry are branding, "what they do well", rather than specific products, due to the fact that products are fleeting and the branding investment is lost. The example used is Intel, which brands the "Intel inside" principle rather than every single type of chip that it produces.

Mendelson & Ziegler (1999) quote Andy Grove, chairman and former CEO of Intel, as saying, "Today, there are only two types of companies: The quick and the dead." They expand on this idea by discussing the average product life cycles in the personal computer industry as found in their research. Figure 3 shows the declining trend. It can be seen that there has been a 75% decline in product life cycles.

Aim small first

A number of the models refer to the fact that when a new technology is being marketed it is important to focus on a small, specific market segment first. Southwick (1999) suggests that a niche market should be identified that is not being served well and that this niche should be exploited. It is not important to be the first player in the niche but it is important to be the first segment leader. Brown (1992) shows that a product market rarely develops in one homogeneous unit; rather, it develops as a series of segments. These are generally increasingly larger segments that have a progressively declining perception of the utility value of the new technology. In other words, the first segment will probably be the smallest but will perceive the value of the new technology as the highest. The author points out that if a company wants to maintain its market leadership, it has to grow with the market and not just serve the initial segment. He warns, however, that a company can throw away its lead by trying to penetrate the largest segment first. In his D-day analogy, Moore (1991) suggests focusing the full company resources on a niche market in order to break into the mainstream market. He suggests two types of niches: an application niche focuses on a highly specific application function, and a thematic niche focuses on a highly specific theme critical to the broad mainstream market. In addition, the niche market has to have a 'must have' value proposition. He describes the niche market as the kindle used to light the fire and set alight the main logs of the broader market.

Flexibility

Flexibility is a requirement of the new high-speed, information-age environment and not necessarily of a new technology

environment. The need for flexibility is compounded, however, in a situation where a new technology is marketed, as a result of the ambiguity of the situation. There really is no way of knowing if you are on the right track initially, and adjustments have to be made as more market information becomes available. Perreault & McCarthy (1996) state that the product life cycle is difficult to predict and that the company therefore needs to be flexible. The principle of flexibility is also highlighted by Mendelson and Ziegler (1999). They suggest that high-IQ companies have decision-making architecture that allows for fast information dissemination and decision making. This is achieved through decentralisation of decision-making authority.

A universal new-technology marketing strategy

The person who coined the phrase, 'fools rush in where angels fear to tread', was clearly never responsible for bringing a new technology product to market in the current high-speed marketing environment. This is no place for the fainthearted. The stakes are high, the situation is ambiguous, success is not guaranteed and there are only two types of companies: 'The quick and the dead'. Yet there are companies that excel at doing exactly this. The following points show a generalised view of what current good practice in this type of situation seems to be, on the basis of a literature study.

The product

Traditionally, issues associated with the product focus on the physical product or service itself, as well as related issues (see Table 1). In the new technology environment, the following issues are important to consider in this regard:

- When looking for new innovations, or evaluations of new innovations, look to the lead users. The lead users are ahead, in time, of the main markets and will provide good estimates of the performance, service and quality levels required of the new technology product when it reaches the mainstream markets. If the new technology is to be applied in the high technology industry, the 'innovators' and technology enthusiasts could play the same role as lead users with regard to defining the technical performance of the new technology. It is important to ensure that the potential clients perceive the technology as new. For, as Brown (1992) states, "A marketing innovation does not necessarily need to be technically novel; the point in marketing terms being that the customer should perceive it to be novel."
- Guard against a 'shotgun' approach when it comes to product lines. It is better to focus on a small number of core product lines and adapt them quickly than it is to try and satisfy everyone.
- Remember that it will most probably be a better idea to focus any branding activity on what your organisation does well, and not on the product itself. The first product based on the new technology can, and probably will, soon be replaced by newer versions, but the role played by the organisation is more enduring.

Where to find the target market (place)

Traditionally, issues associated with place focus on the identification of the target market and methods of delivering the product to it (see Table 1). In the new technology environment, the following issues are important to consider in this regard:

- Be very careful to accept ideas about target markets based on current market research. The research is based on current and historical market knowledge and may not be accurate for a new technology.
- Lead users not only provide good information about future innovations and product but also provide a view of future mainstream market requirements. In short, the current needs of lead users are probably close to the needs that the mainstream market will experience in the future. How do you find lead users? According to Von Hippel (1986), lead users are customers who are at the leading edge with regard to the needs your product will satisfy and will obtain a relatively high net benefit from the new technology.
- Focus on a small market segment first. This market segment that should ideally be a niche that is not being served well or is experiencing a paradigm shift that can be exploited. The choice of market segment should be based on a sound value proposition. In other words, the new technology must provide the target customer with a 'must have' proposition. This proposition is described by Moore (1991) as, "benefits that are strategic to the sponsoring organisation and cannot be achieved by any other reasonably comparable means". It is important that the customer have a high perception of need and of the ability of the new technology to satisfy the need. Once these early adopters have accepted the new technology, attention can shift towards the early majority. Moore (1991) describes early adopters as visionaries who have the insight to match a new technology to a strategic opportunity. They are looking for a breakthrough, they are not price sensitive and they can serve as public references with regard to the new technology.
- Remember that the new technology product constitutes a risk for all other role players involved. This is particularly relevant to the stakeholders in the distribution channel. Incentives will have to be offered to secure their commitment. Also bear in mind that it is not a good idea to put too much channel distance between yourself and the customer. With the new technology, the customer will probably require special attention.

Conveying the message to the target market (promotion and price)

Traditionally, issues associated with promotion and price focus on type of promotions, the nature of the publicity, the type of marketer involved and how to determine the price to the various market segments (see Table 1). In the new technology environment, the following issues are important to consider in this regard:

- The adoption of a new technology is a social learning process. When this is taken into consideration, a number of diffusion issues can be identified that play important roles in promotion and advertising. Focus on the relative advantage of the new technology when compared to its predecessors. A principle that links closely to this issue is that of technology elasticity of demand: the greater the perceived improvement, the greater the demand will be. Play to the status effects generated by visionaries that are the first to utilise the technology. If possible, focus on clients where the decisions to buy are made by individuals. The early market is no time to get bogged down in red tape and bureaucracy.
- Pick the right people to do the marketing job. According to Levy (1998), new technology marketers should be imaginative and creative and able to cope with undefined situations and to communicate with technical people and customers.

They should be technically knowledgeable, instil confidence, be enthusiastic and have perseverance.

- Be careful of pricing too low. The first customers should be visionaries that are not price sensitive and attribute a high value to the new technology. These customers are not looking for small improvements, but for strategically enabling technologies, and they are generally willing to pay.
- For a new technology, pure advertising is not necessarily the best way to market. Even though interpersonal communication channels are associated with lower rates of adoption, these may be necessary to offset the uncertainty in the situation and reduce the perceived risk to the customer. Brown (1992) points out that the customer learns about the new technology from a variety of sources, of which supplier advertising is one of the least credible. Get close to the customer and use reference groups and opinion leaders.
- Be quick about it and be willing to adapt. As has been indicated previously, speed is important. It is not as important to be first into a market segment as it is to be the first leader of the segment.
- Lower sale expectations. As Brown (1992) points out, the new technology will probably appeal only to a small group of visionary customers at first. Acceptance of this fact allows for planning of lower initial promotional costs.

Growing the market

As has been suggested, the marketing of a new technology product should be aimed at a small market segment first. However, at some point the segment will have been penetrated sufficiently to start expanding the target market into other segments. Important issues to consider at this point are the following:

- Moore (1991) suggests that this process constitutes the transition between the early adopters and the early majority, or "crossing the chasm". He points out that the early majority has to be approached in a very different way from the early adopters because they have very different adoption characteristics. They are pragmatic, risk averse, bottom-line focused and not interested in dramatic changes but rather in incremental improvements. It is suggested that the best way of penetrating this group is by "focusing an overabundance of support into a confined market niche". Or in simpler terms, by convincing one pragmatic customer to accept the new technology, other pragmatic customers can be approached by using the first one as reference. So focus your organisation fully on one market niche. Do not be sales driven but market driven. Failure to satisfy the first customer completely removes him as a reference, thereby negating the strategy.
- To become, or remain, the market leader you have to grow with the market. The market will probably not grow in a smooth continuous fashion, but rather in a series of segments adopting the new technology. In general, these segments will increase in size and decline in the utility value of the technology. It is important to consider this from a pricing point of view.

Conclusion

From the literature study, it is clear that the marketing of a new technology product differs in certain fundamental ways from the marketing of products that contain known and proven technologies.

With new technology, there is an uncertainty, or risk, factor that influences the adoption of the product involved. This uncertainty affects not only customers but all stakeholders involved. The research has shown that the adoption of new technology is a social learning process in which the adoption characteristics of the customers must be considered and in which factors like reference and word of mouth play a significant role.

The early market for a new technology can be broadly categorised as a small group of early adopters, who are visionaries and seek the dramatic strategic changes that the new technology provides, and a large group, called the early majority, who are more pragmatic and risk averse and want to have the reference of a trusted and respected market player before accepting the new technology.

Companies marketing new technology products would do well to focus their full attention on a small but significant market segment initially. This provides entry into the market and reference for customers who like to follow rather than lead when it comes to new technology. It is important, however, to remember that early adopters do not provide good reference for the early majority.

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Overview: The Gartner Research Group

William Malik*

Who is Gartner?

Gartner provides unrivalled thought leadership for more than 10 000 organisations, helping clients to achieve their business objectives through the intelligent and efficient use of technology. Additionally, Gartner helps technology companies identify and maximise technology market opportunities. Gartner's technology content and strong brand reach information technology (IT) professionals globally through Gartner Research, its research and advisory unit; Gartner Services, its custom consulting unit; Gartner Events, including Gartner's renowned Symposia; and www.gartner.com. Gartner's subsidiary, TechRepublic, Inc. (www.techrepublic.com), is the leading online destination developed exclusively for IT professionals by IT professionals. Gartner, founded in 1979, with its headquarters in Stamford, Connecticut, achieved fiscal 1999 revenues of $734 million. Gartner's 3600 associates, including 1200 research analysts and consultants, operate in more than 80 locations worldwide. Additional information on Gartner's industry-leading products and services may be found on the Web at www.gartner.com.

What is the methodology?

Gartner's original form of futurology had three major elements. Firstly, a 'key issue', a particular form of question, characterised each area of inquiry. A key issue would ideally be future-oriented, complex, and fundamental. For instance: 'How will enterprises[1] effectively incorporate Internet-based technologies into their business processes?'

This particular key issue is particularly relevant at the time of writing because many vendors advocate using Internet-based technologies, which transform a business into an e-business. Gartner has witnessed the following apparent platform shifts over its history: mainframe batch-processing, online transaction processing, distributed or LAN-based computing and client-server business transformation. Any enterprise that chose to adopt each new fad would have undergone near-continuous transformations from the early 1960s until the present. (Of course, each transformation would have introduced a new layer of platforms and programming styles, requiring reinvestment in hardware, software and personnel. The resulting complexity would have raised costs and eroded performance, making the promise of the next transformation even more appealing.)

From the key issue, the analyst would next develop a small set of 'scenarios', which are mutually exclusive alternatives informing, or bearing on, the key issue. In the case of the foregoing example, three scenarios might be:

1. Enterprises may selectively deploy Internet-based technologies to achieve local improvements in process efficiency.
2. Enterprises must restructure their entire suite of business processes using Internet-based technologies to realise improvements in process efficiency.
3. Enterprises can achieve substantial improvements in process efficiency; comparable to those achieved by using Internet-based technologies, with classical pre-Internet tools, at comparable cost.

The analyst assigns probabilities to each scenario, the sum of which totals 100 per cent.

The analyst then researches the offerings from vendors and the experience of clients, and, finally, using comments from colleagues, develops some specific findings. These findings may take the form of models, such as the opportunity/threat model, to determine the specific size of the risk to the business if a competing enterprise were to adopt Internet-based technologies. Findings may appear as product-acquisition models, such as those developed by our Decision Drivers subsidiary. These models and their associated methodology help clients select alternative products, services or approaches by describing a wide range of factors bearing on the decision. Findings may also take the form of strategic planning assumptions – long-range probabilistic assertions bearing on one or more of these scenarios – or they may be tactical guidelines, which address current conditions immediately.

Some enterprises may achieve durable improvements in process efficiency with Internet-based technologies, while others need not consider this e-business transformation. Effective research and analysis helps each enterprise determine how it fits within the model, how it might apply the planning assumption in its specific circumstances, or why its situation requires a variation of the scenarios or a separate set of scenarios.

In late 1999, Gartner adopted a substantial refinement of this research methodology. Using materials from *The Art of the Long View* by Peter Schwartz, Gartner added longer-range capabilities to its arsenal. The Schwartz methodology, referred to as scenaric planning, added detailed techniques to defining the long-range context for planning assumptions and model development. The salient features of this methodology are:

1. Define a specific area of inquiry (in Gartner's instantiation of this methodology, this would be a key issue).
2. Identify critical uncertainties that bear on the key issue. (In contrast to the classical Gartner style, we do not group these into mutually exclusive scenarios, but leave them as unsorted assertions.)
3. Select the most dominant groups of critical uncertainties.
4. Name the specific critical uncertainty and its logical opposite.
5. Examine pairs of critical uncertainties as axes on a two-dimensional matrix to see if each of the four resulting world-views is plausible.
6. Name and characterise each world-view.

This two-by-two matrix of four contrasting world-views is called a quadrilectic, the value of which lies in its use as a depiction of the most troublesome or advantageous set of circumstances bearing on the original area of inquiry.

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1. Throughout this article, the term 'enterprise' is used to describe any for-profit or not-for-profit corporate entity, or any governmental agency.

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How does this enhanced methodology work?

As a first look at the interplay between information technology and the five general sources of change (namely, economic, societal, technological – including but not limited to information technology – environmental and political) Gartner has identified the following connections from an economic perspective.

The largest issues are the potential impact of information technology on the distribution of wealth and standard of living. In this domain, we are optimistic. Recent investigations suggest that the economic benefit of technological improvements tend to diffuse through a society at a standard rate. This curve – the S curve – has been used within Gartner to discuss the rate of absorption of a technological advance against its target market. In this case, we apply that curve, not to track one technology's eventual market penetration, but rather to track the aggregate effect of a family of technologies on an entire collection of markets.

An analogy between the impact of the Industrial Revolution and that of information technology may be made. The Industrial Revolution entailed the impact of powered machinery on society. Industrial machines amplified the speed, strength and precision of human motion. Those societies that adopted industrial machinery first gained their economic benefits first. Those that delayed their introduction took longer to attain the economic benefits.

Computers by themselves introduced local efficiencies in well-defined domains (typically, within an existing business unit or governmental agency). By coupling computers with high-capacity networks, we now have the increasingly ubiquitous technologies that amplify intellectual and communication capacity.

Recent economic models suggest that different standards of living across different cultural groups are directly related to the time each group began to adopt the technologies of the Industrial Revolution. Early adopters achieved higher productivity by leveraging human strength and speed. Later adopters will achieve the same goals in less time, because they will learn from mistakes made earlier. At first, the difference between the improvement in the standard of living of early adopters outpaces that of later adopters. However, given sufficient time, the incremental gains in productivity that new applications offer machine-assisted culture will diminish, in line with the common technology-adoption curve.

Gartner has developed a series of scenarios on the interaction between information technology and the five general sources for non-linear change previously mentioned. The three key issues that have been defined are:

1. How will information technology influence business and society?
2. What global trends will influence the evolution of information technology?
3. How will successful enterprises best manage the accelerating rate of change?

From these three key issues, Gartner examines possible interactions between information technology the five general sources of change and disruption.

How can enterprises use these findings?

Enterprises should not simply adopt any research or analysis without a hard, cold look at its relevance. Enterprises can successfully employ the decision drivers model if they adhere to the methodology. Enterprises using the opportunity/threat model may need a skilled facilitator to keep the one-day effort focused on its goals. Strategic planning assumptions can serve as tests against a business plan. Tactical guidelines identify immediate actions that often bring about useful results with low costs. The longest-range predictions are most valuable as a stimulus to the strategic planning process at the executive level. By testing enterprise goals against a plurality of possible world-contexts, senior executives can develop a family of optimal strategies for achieving those goals, despite discontinuities in the flow of history.

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Preparing academic papers for publishing

Dan Remenyi,* Arthur Money,† and David Price‡

It is by no means a trivial matter to undertake a research project and produce an academic paper to a publishable standard. However, it is not as difficult as many university teachers who do not publish believe. The single most difficult step is the first one of getting started. Once this has been taken, the apparent enormity of the problem substantially dwindles. Eight points are suggested which it is hoped will be of help to beginners: selecting a suitable topic area, performing a literature review, choosing a methodology, formalising a research question, evidence collection, analysis of evidence, writing the paper and drawing conclusions from the research. It is very important to understand the coverage and requirements of the journal to which the paper is to be sent, as well as following the instructions to authors.

> "If politics is the art of the possible, research is surely the art of the soluble. Both are immensely practical-minded affairs."
>
> Sir Peter Medawar (1915–1987), British immunologist[1]

Introduction

This paper addresses a vital issue for academic staff at a university or a business school, namely, how to prepare for publication an academic or scholarly paper. The issue is important because many university teachers either do not write scholarly papers at all or do not produce a sufficient number to be confirmed in their posts or to be promoted.[2] This paper focuses especially on the problem of preparing a paper to the standard that will be accepted for publication in a refereed academic journal of international standing. This means that the work will have to report on some aspect of research conducted by the author (or authors) and be presented in such a way that it is considered by his or her peers to be a valuable contribution to the discipline.

As the subject of writing an academic paper is seldom addressed in the academic literature, this paper fills a gap. It consists primarily of a discussion of the reasons why would-be authors have problems with their research and the publishing thereof. The paper also includes some empirical evidence from editors of academic journals about how to improve the chance of successful publication.

Finally, it is hoped that this paper will encourage academics that have not yet established themselves as researchers to make a start. After all, research is one of the most interesting and challenging aspects of an academic career. Furthermore, if undertaken in a positive way, it can be great fun. In the words of Keen (1980): "Research should be fun rather than a grind and one should believe in its relevance and value."

Why write academic papers?

Although the primary motivation for writing academic papers is usually for professional purposes, it should not be seen as a burdensome task. Many academics obtain much satisfaction, not only from having their work published, but also from the process of producing high quality research and writing it up in an interesting way. Leading academics are often driven to publish large numbers of papers because of the exciting challenges involved. Others simply find research and the writing up thereof fun.

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It is important to establish why academic papers are written, and at least six common, but not necessarily mutually exclusive, reasons can be identified:

1. To make known the results of research (in other words, a contribution to the body of knowledge)
2. To embark on an academic career
3. To ensure the confirmation of an academic post at a university
4. To obtain promotion at a university
5. To qualify for a degree
6. To obtain funding for the university.

The following sections elaborate on the above six points.

Contribution to the body of knowledge

A key motivation for publishing is to make a contribution to the body of knowledge, which is generally the result of research that has been conducted in an attempt to solve a challenging problem. In this problem-solving process, an in-depth understanding is gained of both the problem (and the answer) and the domain from which the problem arose. This process needs to be documented so as to develop and extend the body of knowledge in that discipline. DeSantis (1993) expresses this need for research succinctly: "The purpose of research is not just to study the problems of today but to provide insight into events and behaviours of the past and to articulate the problems and opportunities of the future."

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1. Sir Peter Medawar (1915–1987), British immunologist, 'The act of creation', in *New Statesman* (London, 19 June 1964; reprinted in *The Art of the Soluble*, 1967)
2. In addition to the issues of confirmation of appointment and promotion within the university or business school, it is increasingly a requirement to be published in order to be awarded a doctorate. Where it is not actually a requirement to be published in a refereed academic journal, having such a publication provides very strong evidence that the doctoral candidate is worthy of this level of degree.

It is for this reason that there are seldom difficulties, especially in the field of business and management studies, in finding suitable research problems or topics on which to write academic papers. In fact, often the real challenge is that of being spoilt for choice.

Embark on an academic career

Throughout the world, universities place great importance on their staff publishing research in academic journals. There are a number of reasons for this, which relate to the purpose and function of such institutions. One of the most central objectives of a university is the creation and dissemination of knowledge. Research and the publishing thereof is a clear demonstration that academic staff are achieving this objective. The best academic journals are edited by leaders in the relevant discipline, and by publishing in such journals, university academics demonstrate their ability to create and disseminate knowledge. Individuals wishing to identify with this creation of knowledge produce scholastic papers and thus embark on an academic career.

Continuing self-development and confirmation of employment at a university

In order to sustain the activity of creating and disseminating knowledge, it is important to a university that its members, both in terms of staff and senior students, are committed to self-development.

The publishing of an academic paper indicates that the author (or authors) has devoted a substantial amount of work to preparing a carefully considered document that represents some contribution to the discipline. This is normally regarded as clear evidence of his or her continuing commitment to self-development, which is essential if the university is to be a leader in the field or discipline. Such evidence is generally required for confirmation of employment at a university.

Academic performance and promotion

Another reason why universities are so concerned about publishing has to do with performance measurement. The role of the university academic has been under debate for a long time. Some argue that university academics should primarily be teachers, while others argue that they should first and foremost be researchers. In the majority of cases, university academic staff members have to fulfil both functions.

However, there is a problem concerning the ability of a university to assess the performance of teachers. There is no generally accepted consensus as to how teaching performance can be measured in the short term. High marks in examinations need not necessarily reflect good teaching. Student ratings of lecturers often reflect popularity rather than excellence in teaching.

Perhaps only in the medium to long term can good, or even great, teachers be identified with any degree of confidence. As a result, universities tend to use publishing records as the primary measure of academic staff performance. It is probably true to say that those who publish frequently are more up to date in their discipline than those that do not publish much, or that do not publish at all. Their published research is generally regarded as demonstrating a stronger intellectual capability than those that do not publish. Having a lecturer who is highly involved in publishing is probably a positive spin-off for his or her students. A research record suggests that the lecturer is aware of the current issues in the discipline and is able to contribute significantly to such issues. This is frequently regarded as grounds for promotion,[3] whereas a lack of research publications is often used as a reason for denying promotion.

Qualifying for a degree

In a few instances, research and the publishing of academic papers are undertaken by students for the attainment of a degree. A growing number of universities now recognise that papers published while the student is registered at the institution are an important part of that student's scholarly development and achievement. In some cases, especially where the papers have been published in leading international journals, the published work may be submitted to the university in lieu of a monograph or dissertation for either a masters degree or even a doctorate. It is, however, important to note that the paper publication route to a degree is often a greater challenge than the monograph or dissertation approach. Publication in academically refereed journals is certainly not an easy option.

Obtaining funds

In addition to academic performance and promotion and qualifying for a degree, there is the fact that universities obtain funding as a result of their research and publishing activities. In some cases, this may be government funding, but even where government funding is not forthcoming, the private sector will generally be more generous if the institution concerned has an impressive record of relevant published research.

Many universities are rated on the number of papers that their academics publish. The higher the number of publications, the better the perception of the university by the public or by the parents of prospective students and eventual employers.

The difficulty in getting started as a published academic

A number of factors seem to deter academic teachers from publishing, or to slow down their progress. It is important to recognise these problems and to find solutions.

Some of the more common barriers to getting started with an academic publishing career include:

- Not understanding what is required
- Fear of failure
- Lack of commitment to the need to publish
- Lack of support from the institution
- Negative motivation.

Not understanding what is required

Many academics that have not yet published a paper in a refereed academic journal believe that the contribution to knowledge that warrants publication is much greater than is actual-

3. There have of course, been very notable exceptions of outstanding academics that have published very little. One such exception is Ludwig Wittgenstein, who is regarded by many to be the most outstanding philosopher of the twentieth century (Kenny 1973). "Although he wrote voluminously, the only philosophical work he published in his life time was the Tractatus and a brief article in the Proceedings of the Aristotelian Society" (Bartley 1974). Nonetheless, Wittgenstein was the Professor of Philosophy at Cambridge University.

ly necessary. In discussion with individuals that have felt unable to publish, the comment "but that would not be good enough" is frequently repeated. To such people, the writing of a paper is a monumentally difficult task, which could be equated in their minds with obtaining a research degree. Of course, this is not the case. They often do not understand the criteria for a published paper, or are not aware of the different types of papers that are acceptable to academic journals.

Research papers may be theoretical or empirical. They may be based on one case study or a large sample. The variety of research approaches, analyses and syntheses is quite vast. The amount of diversity that a new researcher faces is often bewildering and can lead to problems in deciding how and where to start. Once again, the real problem is often that of being spoilt for choice and not knowing how to choose.

University teachers that make the comment "but that would not be good enough" often see themselves exclusively as teachers. They frequently do not understand the nature of scholarship, especially at university or business school level. Scholarship is clearly more than learning the facts, figures and opinions of others published in textbooks or journals. Central to the concept of scholarship is the ability to reflect on and critically analyse the thoughts of others, and perhaps subsequently to synthesise them into new ideas for the purpose of adding to the body of knowledge. It is not sufficient to do this in front of an audience of students, who, by their very nature, will not usually offer much challenge to their teachers. It is essential for sound scholarship that the critical analysis, and perhaps subsequent synthesis, be done before an audience of peers. The importance of researching in the sight of one's academic peers is central to sound research. This is well explained by Collins (1994) when he says: "It is important to note that there is always a judgement to be made. That scientific discoveries are not made at a single point in time and at single places and with single demonstrations. They are made through a process of argument and disagreement. They are made with the scientific community coming slowly toward a consensus."

To those with an appropriate mind-set, the work involved in writing a research paper need not be excessive. The better universities and business schools require their academic staff to publish, on average, two academic papers a year. For some members of staff, this is not a great burden. There is, in fact, a critical mass effect that makes the first couple of papers produced a considerable burden, but as the number of papers published increases, so the marginal effort to produce the next paper decreases.

Fear of failure

The fear of writing a paper and having it rejected is an important inhibitor to those who have not already established a publishing track record. Indeed, would-be authors must be prepared for a considerable amount of rejection (Hamermesh 1992). A paper may be rejected by an editor out of hand because it is not on a topic suitable for his or her journal. A paper may be rejected by one or more of the referees as being poorly written, irrelevant, out of date or misinformed, to mention only four possible reasons (Thomas 1995). Reviewers, especially less experienced ones, can sometimes be very hurtful about the work or the ideas of the author or authors, but fortunately most of the criticisms received from editors and referees tend to be constructive. It is, however, by no means uncommon to find unhelpful comments. When this happens, the researcher should not take such criticism personally, but should have an element of intellectual and emotional resilience. This does not allow him or her to abandon the project, but rather to take the criticisms as challenges to improve the study or piece of work. Of course, academic reviewers, like theatre or art critics, can sometimes be wrong, and authors need to know when reviewers should be challenged. A reviewer may always be challenged by writing to the editor of the journal and putting a counter case to the comments of the reviewer. It is sometimes thought to be surprising just how often this actually happens. It is well to remember the words of King (1993): "The dissemination of new information is controversial business, because new information is often surprising. Sometimes it is threatening to existing interests ...".

Unfortunately, a lack of emotional and intellectual resilience and staying power, which translates into a fear of failure, is one of the primary reasons for abandonment of papers before they are published.

Lack of commitment to the need to publish

From the very outset of the research, a strong commitment to the task at hand is important. If the researcher is not fully committed, there is a high possibility of abandonment of the project. Typically, working on an academic paper is not perceived as having a high degree of urgency. Although it is without doubt very important to publish, it is frequently an eminently postponable event. This is especially true in the case of the first piece of research, as this will clearly occur before any research or publishing momentum has been built up. The first research experience, particularly if it is not undertaken as a collaborative effort with an experienced researcher, has nothing to build upon. Such a case could easily require three or even six months for a thorough review of the literature. In the case of theoretical research, it could take another three months to reflect on the literature and discuss it with colleagues. Where empirical research is involved, there are questions related to evidence collection, evidence analysis and theory building which can take a protracted period of time. For a newcomer to research to be able to maintain the required energy level and to persevere to produce a quality academic paper, a high degree of personal motivation is necessary.

Once the paper is completed and has been submitted to an appropriate journal, there can be substantial delays,[4] and the referees may require changes resulting in considerable additional work. It is not unusual for the researcher's motivation to wane during this process, and in order to see it through, there needs to be a strong commitment to publishing.

Unfortunately, university staff members that see themselves primarily as teachers and that have been confirmed in their posts sometimes lack sufficient commitment to completing the publishing process.

Lack of support from the institution

Undertaking research for publication can be very demanding (Easterby-Smith, Thorpe & Lowe 1993). This activity con-

4. It is not unusual for the authors not to hear anything from the journal for six months. In fact, sometimes it may take a year before any review is received. Once the author has made the corrections, it may take another six months to have confirmation that the changes are acceptable. Then it could take a whole year before the paper appears in the journal. As a general rule, the more prestigious the journal the longer it takes, unless, of course, a very poor paper has been submitted and it is immediately rejected.

sumes a considerable amount of time and may require substantial funding. In addition, the research and publication process may be emotionally demanding. The researcher may experience diverse emotions during the research process, from uncertainty and doubts to exhilaration or interest, from enthusiasm to boredom, from frustration to delight at the anticipation of completion. Easterby-Smith et al. (1993) claim that the emotional cost of crises that arise during research is high, and it is therefore important to consider both the technical and emotional support that are available. Support can be sought in a number of areas, including from colleagues, supervisors or family members.

The process of research utilises a number of different types of resources. The researcher should be aware of the resource requirements that he or she is likely to make use of and ensure that they are available.

Table 1 presents some examples of resources that the researcher may require.

It is impossible to envisage research today without the use of the Internet, and e-mail specifically. E-mail allows the researcher to exchange ideas with colleagues from all over the world directly on a one-to-one basis, or by way of research community lists, or through discussion groups. This facility is extremely powerful and should be used extensively. In addition to the Internet, the Web offers a treasure-trove of useful information concerning many topics and fields of study that the researcher may well find useful. The criticism of the Web is often the over-abundance of data or information, which can cause difficulties in ascertaining which data or information are actually most relevant. Of course, search engines, directories and filters may be used to facilitate the use of the Web.

It is not a trivial matter to become a skilled user of the Web. It takes time to learn about the various search engines and directories and to use them effectively. Many experienced academics have not been able to find the time to devote to this exercise and are therefore not obtaining the full value available to them from the Web.

All research projects incur costs. Large-scale medical or engineering research projects may cost millions of pounds. However, small-scale research projects in the social sciences may cost only a few hundred pounds. In general, empirical research will be more costly than theoretical research.

Empirical research will require the collection of evidence, which usually entails the production of some sort of measuring instrument and its application to a reasonably sized sample. If use is made of personal interviews or a case study, there will be travel and other associated costs. Empirical research often requires the use of computer hardware and software, which can be expensive.

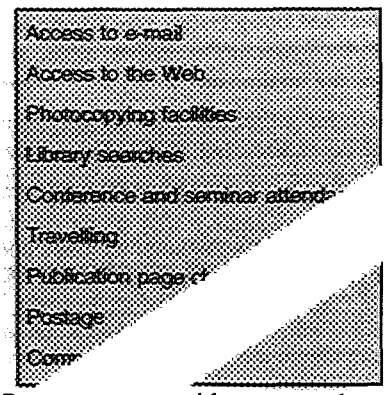

Table 1. F ired for a research project

Theoretical research, however, is sometimes less costly, at least in monetary terms. It relies on the availability of a good library and access to individuals with whom the researcher can establish a suitable level of discourse. This may mean travelling to seminars or conferences, which can sometimes be expensive. The Web and the Internet are ideal tools to support theoretical research as they respectively facilitate the location of useful material and the discourse about its relevance.

Universities usually have some funds available to support researchers, especially new, would-be researchers. However, occasionally there is no money available and the researchers will either have to raise their own funds or, alternatively, pay the research expenses themselves. Ultimately, the amount of funding available may well determine the form that the research will take.[5]

As regards the issue of time, some university teachers state that their teaching and administrative workloads are so heavy that they cannot find the time to conduct research or to write. This may in fact be the case, as doing research and writing it up are time consuming. It is thus important that each individual negotiate with his or her head of department a reasonable workload that recognises that at least one day a week should be available for research purposes. Some universities grant sabbatical leave for the purposes of research, and this time should be used either exclusively or substantially to pursue research interests.

Negative motivation

The expression 'publish or perish' is well known. The concept behind this slogan is that if university teachers do not publish they will not be confirmed in their posts and will not be eligible for promotion. Although this may well express the reality that university teachers face, it conveys a very negative attitude. It is a well-established fact that threats are not good motivating agents, but often work in the opposite way, serving to demotivate those at whom they are aimed. This is probably especially true of university teachers, who are often very ind pendent minded. It would be much more useful if a dir immediate reward were associated with havin papers published.

Factors that contribute to the failur .l project

Factors that may contribute to th academic paper include:

- Unrealistic expectat .s or targets
- Lack of focus
- A high-r
- La .al knowledge and failure to build on one's
  .l methodological skills
  .nability to know when to stop
- Lack of knowledge of appropriate journals.

5. If the cost of the researcher's time is not included, then theoretical research using libraries, the Web, the Internet and discourse with colleague is by far the least expensive. It is not difficult to find topics that lend themselves to this type of research. However, it is not always easy to have this type of work accepted by academic journals. In general, there is a preference for empirical research, especially from newcomers to the field. Even superbly argued theoretical research can be difficult to have published unless it is written by well-known figures in the field of study.

Any of the above seven factors can individually or jointly be the cause of the non-completion of an academic paper, and, even if the paper is completed, these issues could ultimately result in an inferior piece of work. Each will now be considered separately.

Unrealistic expectations, ambitions or targets

Sometimes a researcher will try to do too much or will take on a project that is just too difficult. This is particularly true of the first-time researcher that does not understand the scope required for an academic paper. The guideline is to keep the scope quite narrow, because, as the research proceeds, there is a general propensity for it to broaden without the researcher wishing this to happen.

Lack of focus

Many research projects fail, or academic papers are not completed, because the researcher or writer cannot settle on a precise subject. Under these circumstances, the subject matter is changed time and again until the project is abandoned.

A high risk topic

Some apparently attractive research topics are known to be very difficult to pursue. It is very risky to undertake research in areas in which it is very difficult to make any material progress. Researchers working in such areas may have to admit that they have made little or no progress and that there may therefore not be a publication at the end of the project.

Lack of theoretical knowledge

A research project should not be undertaken unless the researcher has a strong background in the theory underpinning the discipline being studied. If the researcher does not understand the underlying theory, then the research is very fragile and may easily be discredited.

Lack of methodological skills

In a similar way to a lack of theoretical knowledge concerning the discipline being studied, shortcomings in the understanding of the research methodology can have a major impact on the credibility of the work.

Inability to know when to stop

Many researchers suffer from the problem of not knowing when the research is complete. This is an easy trap to fall into, as research is seldom ever completed. However, a point must be reached when enough has been done for the purposes of the study, and it is important to be able to discern that point fairly accurately.

Lack of knowledge of appropriate journals

Even a very sound piece of work can be wasted if it is sent to an inappropriate journal, and it is therefore important to know if the journal will give serious consideration to the work. Usually, this is not a difficult matter as the author can see from the papers already published whether or not the piece of work being offered is relevant to the journal. If the wrong journal is chosen, it could cause a very substantial delay in having the work published.

How to produce a publishable academic paper

Having discussed many of the problems associated with conducting projects and writing an academic paper, some guidelines are offered on how to produce publishable papers.

Although it is by no means a trivial matter to undertake a research project and produce an academic paper to a publishable standard, it is not as difficult as many non-publishing university teachers believe. The single most difficult step is the first one, and once this has been taken, the apparent enormity of the problem dwindles.

The amount of work depends entirely on the starting point of the author. If the author has just completed a masters degree, a doctorate or another research degree, he or she may simply have to rewrite one or more of the chapters in the dissertation and submit that work to a journal. The amount of work involved in such a case may be minimal, perhaps no more than a few days' or weeks' effort. However, if the author has not recently completed a research degree, the production of a publishable academic paper may require commencing a separate research programme. A piece of work of this nature could take from several months to several years to complete.

It is most important for the novice researcher and author to understand that there is a steep learning curve in the production of academic papers. The first paper is a very great challenge and may take a long time to complete. However, by the time three or four or five papers have been published, the researcher will have learnt how to produce a first-class piece of work with only a fraction of the original effort required for the first paper.

A novice, especially one that does not have a research degree, will find it very helpful to publish jointly with an established author. There are many practical things to learn, and having a coach or collaborator at the outset of a publishing career is very useful indeed. Essentially, this is not very different from having a supervisor for a research degree. It is sometimes useful to have two, three or even four authors who can bring to the research different disciplinary or even cultural perspectives. This is sometimes considered an important criterion when the paper is being written with an international journal, and hence an international audience, in mind.

Although it would not be correct to suggest that there is a hard and fast methodology for producing a publishable paper, the following eight points may be useful for beginners to bear in mind when they embark on their publishing careers.

Select a suitable topic area

A topic area could be considered suitable if it is of interest to the researcher and if it provides an opportunity to solve a problem that is regarded as being of some importance to the academic community. At the outset of the research, the topic area needs to be considered as a provisional area of interest until the literature review has been completed. This area of interest should be related to the researcher's strengths, which are normally associated either with his or her original discipline of study or with the field in which he or she has had considerable working experience. It is also advisable not to focus the topic area too narrowly at this stage. It may be interesting to look at other associated disciplines and to enquire if there are any interesting interlinkages.

DeSantis (1993) comments that the research topic should address problems that are important to advancing the body of knowledge. However, it is critical that the researcher does not take on too extensive a project, as this will almost certainly lead to problems that could cause the work to be abandoned. For more than one reason, it is far better for the author to take on several relatively small-scale academic paper production projects than one big one. In the first place, the academic commu-

nity values the number of publications, and thus the greater the number, the better. Secondly, small-scale academic paper projects will usually encounter fewer problems than large-scale ones, and thus there is a much higher probability that they will be completed.

Perform a literature review

The next step is to review the literature in some detail. This means reading as much of the academically published material on the subject as possible. In all disciplines, there are the leading journals that need to be consulted. For example, Hamilton & Ives (1983) performed a study to determine which journals are most respected by management information systems (MIS) researchers. The findings of their research suggest that *Management Science, MIS Quarterly, Communications of the ACM, Decision Sciences, Information Management* and *Transactions of Database Systems* are the most important journals for information systems academics and professionals. The researcher needs to be cautious of making extensive use of textbooks, as even newly published works are inclined to be somewhat out of date because of the length of time publishers require to process a manuscript into a published book. This is especially true of leading-edge subjects.

The Web is an especially powerful tool for obtaining access to current issues and ideas. However, as anyone can place material on the Web at any time, considerable caution needs to be exercised in regarding data or information found on the Web as authoritative. In formal academic research, references to issues and ideas found on the Web need to be used sparingly and, where possible, they need to be corroborated with evidence from more traditional sources.

Thus, the emphasis of the literature study should be on papers published in academically reviewed journals. The popular press, which in the case of business and management studies are newspapers such as *The Economist* and the *Wall Street Journal*, should be given relatively low emphasis. Of course, the research topic may be so new or novel that the popular press or videos have to be used, but, in such cases, support for views expressed in these media should be found from experts in the field.

The literature review should indicate a suitable problem to be researched, as well as give the researcher some idea of the research methods or approaches that have been used in this field (Creswell 1994). It is important to note that the literature should be critically evaluated and not just accepted at face value. It is this critical evaluation that may lead to a suitable research question. The need to be critical of the ideas found in the literature is well expressed by Lorenz (1963): "It is a good morning exercise for a research scientist to discard a pet hypothesis every day before breakfast. It keeps him young."

By the end of the literature review, the researcher should have a vision of what he or she wishes to achieve in the research. This vision should spell out the type of result that the researcher wishes to achieve.

Choose a methodology

There are many factors to be considered when choosing an appropriate research methodology. In the first place, the literature review should reveal not only a suitable problem to be researched, but also a suitable methodology that has been applied to this type of research question before. This certainly implies that the researcher should be familiar with the range of methodologies available, as well as know something about their strengths and weaknesses.

The topic to be researched is one of the primary drivers in the choice of methodology. As a general rule, precedent should be followed, although this may be abandoned if a suitable case can be made for a new methodological approach. The research culture in the institution is also an important determining factor, as is the skill and interest of the researcher's supervisor. Other stakeholders, such as the funders of the research, may also be influential.

In certain cases, researchers may use multi-methodologies. For example, having used case studies to establish a grounded theory (Glasser & Strauss 1967), a researcher may use a survey to confirm a theoretical conjecture. Considerable care needs to be taken when multi-methodologies are employed, as such an approach may lead to confusing results (Patton 1990).

The choice of methodology may change during the course of the research project. It may be seen as a journey in which the researcher can move from one paradigm to another as his or her understanding of the research problem changes.

In choosing the research paradigm, the researcher should be cognisant of other approaches and show why they were not chosen for the particular piece of work. The researcher must also be aware of the weaknesses of the preferred approach and make these clear. He or she should be aware of the reaction of the stakeholder, and, perhaps most importantly, satisfy his or her own ideological preferences.

Formalise a research question

The literature review should reveal problems or areas of incomplete knowledge in the field of interest. These problems will first manifest themselves as research questions that need to be reduced to a formal research problem in such a way that it is testable. This means developing a theoretical conjecture and deriving from it a set either of hypotheses or of empirical generalisations (Remenyi & Williams 1995).

Collect evidence

A suitable strategy for the collection of evidence is required, and the researcher may choose from numerous different combinations, such as case studies, action research or surveys, to mention only three. In general, business and management researchers ask questions using *how* and *why* evidence collection strategies that focus on these sorts of questions. These tend to be of more value than strategies that concern themselves with questions of *how much* or *when*. Some research questions lend themselves to qualitative data, while others require more quantitative evidence (Remenyi & Williams 1993; Remenyi, Williams & Swartz 1998).

Analyse the evidence

Once the evidence has been collected, it is necessary to analyse it. The approaches to evidence analysis vary enormously, depending on whether quantitative or qualitative evidence has been acquired and on the mathematical sophistication of the researcher. In general, much analysis may be performed with relatively little mathematical or statistical background.

Write the paper

It is important to catch the reader's attention from the very beginning. The paper should therefore begin with a convincing argument as to why the subject is important and what the paper has to offer. These statements should, where possible, be related to the literature review, from which it should be clear that the paper addresses a gap in the published knowledge.

It is then very useful to make clear to the reader the research methodological paradigm that the author is using in the paper. Thus, for example, there should be a clear statement on whether or not the paper is theoretical or empirical. The author should then state the practical implications of the work, if any.

In describing the literature review, the author should avoid the excessive use of direct quotations from published texts. Such quotations seldom add much value to the argument. It is fundamental to an acceptable literature review that it is should be critical of the established thinking on the subject wherever appropriate. A simple restatement of the thoughts of others also adds little value. The literature review should not only comment on the state of knowledge of the discipline, but it should also address the research paradigms that have typically been used in previous works.

If the paper being written is based on empirical work, it is important to state the assumptions behind how the evidence was collected, as evidence can only be understood in terms of what sample was used and what collection process was adopted. Following on from this, it is also important to discuss the types of analytical techniques that were used. Assumptions concerning quantitative and qualitative research paradigms should be clearly articulated. Evidence should not be over-analysed. Often relatively simple statistical techniques will provide sufficient insight to be able to deduce interesting conclusions.

In empirical studies, it is most important to ensure that the evidence supports the conclusions drawn. A useful test to apply is to ask if the same evidence could support alternative conclusions. If this is the case, it needs to be clearly stated.

At the very end of the paper, it is valuable to have a detailed discussion that reflects on the strengths and the weakness of the work.

Authors should make every effort to ensure that the paper is interesting. Some academic papers are written in a most unattractive style, which may lead to their not being published, or, if they are, they will probably not be read by a wide audience.

Conclusions of the research

Writing the conclusions is sometimes the most creative part of a research project. As mentioned above, the conclusions must be supported by the evidence. The conclusions must convince the reader that something of value has been added to the body of knowledge. As Collins (1994) points out, the conclusions deduced from the research need to be carefully argued so as to convince the research community.

Generally, the conclusions should offer insights into problems or situations and perhaps give practical advice. These need to be highlighted as the contribution that the author is making to the discipline. It is important that the conclusions not be simple 'motherhood' statements that are completely obvious. However, a research paper, even one published in an international journal, does not have to be capable of winning a Nobel Prize.

Good research results are usually considered to be those that are put to use and remain in use for some time. Bad or poor research results are either not used at all or are only used for a short period. The conclusions section of a paper should also suggest some ideas for further research.

Advice from editors

The following is a summary of advice collected from the editors of three academic journals (*Sloan Management Review, Management Information Systems, Management Science* and *MIS Quarterly*) by the authors of this paper. It is believed that would-be authors of academic papers will find this advice useful.

Fundamentals

Novice authors sometimes do not realise that a paper should only be sent to one journal at a time. It is important to comply with this requirement, as there will be substantial embarrassment if the paper is accepted for publication by two journals simultaneously. If a journal refuses to accept a paper for publishing, the author is free to send it to another journal if he or she so wishes.

Authors need to be realistic about the length of time it can take for a paper to be reviewed. Some journals can obtain comments from referees in a few months (*Sloan Management Review* 1995), whereas others can take a couple of years. This means that authors that wish to maintain a publishing rate of two to three papers per year need to have six to ten papers submitted to various journals at any one time.

There is considerable difference between journals concerning the copyright issue. Some insist that they retain the copyright (*Management Information Systems* 1995). Furthermore, the matter of copyright is becoming increasingly obscure as journals move towards electronic media using the Internet and the Web (Kourrie & Introna 1995).

Relevance, rigour and impact

The author should focus on three key issues that are central to the editor of an academic journal: relevance, rigour and impact (Kourrie & Introna 1995).

Relevance refers to the requirement that the academic paper address issues that are of interest to the target audience of the journal. Rigour requires the research reported in the paper to have been performed using an appropriate research methodology. The impact issue is related to why top scholars or practitioners would be bothered to read the paper. For this to be the case, a high degree of originality is essential.

Relevance is always a critical issue, but it needs to be matched by an appropriate level of academic rigour. In the words of Galliers (1994): "In an applied discipline such as Information Systems, I would argue that it is important that we undertake research that is seen to be relevant by our colleagues in IS Practice, as well as sufficiently scholarly by our colleagues in academia."

There is little doubt that a similar comment is true for nearly all academic fields of study.

Writing style

Many editors advise contributors to ensure that their papers are readable, well organised and exhibit good writing style (*Management Science* 1995). Some journals accept the use of graduate level mathematics in the paper with the proviso that it has to be essential for the understanding of the subject. It is sometimes necessary to demonstrate that a paper appeals to professionals as well as academics (*Management Science* 1995). Furthermore, authors should always ensure that their identity is not revealed anywhere in the body of the manuscript (*MIS Quarterly* 1994).

Choose the proposed journal carefully

It is important to choose a well-regarded journal that will draw the academic community's attention to the work. This is

essential if the work is to be recognised and if it is to be appreciated by both academics and practitioners. King (1993) expresses this well: "New knowledge should make a difference in some way, materially, aesthetically, spiritually. A good academic journal should disseminate new information directly to those who can apply it. At minimum, and as a regular matter, a good academic journal should stimulate the research community to improve its performance in creating new and useful knowledge."

The first consideration in the choice of the journal is to establish if there is a match between the prospective journal and the work. This is perhaps the most important issue in selecting a journal to which to send a paper. Thus, it would usually be a waste of time to send papers on the future of artificial intelligence or techniques in database design to a journal that publishes in the field of computer security systems (Galliers 1995).

Papers that contribute to a continuing debate in a journal usually stand a better chance of being published. Authors should therefore consider whether the proposed paper contributes to an ongoing interest of the journal. If this is the case, it is worth ensuring that the paper quotes work already published in the chosen journal.

It is important that the paper comply with the established style and research methodological paradigm of the journal. Thus, if the journal usually only publishes empirical work, it may not accept a theoretical paper. In fact, such a journal may not recognise the validity or worth of a theoretical piece of research.

Instructions to authors

The prospective author should obtain a copy of the instructions to authors that specify how the paper should be presented to the journal. These should be read carefully and complied with. They differ from journal to journal, and many authors do not notice the differences. It is important to comply with the journal's length requirements. If the paper is too long or too short, the journal may reject it.

The inclusion of an abstract and key words is very important, as they set the tone and focus the mind for the ensuing paper.

Papers submitted in the wrong format – such as in single spacing when double spacing is required, or using the wrong referencing convention – can create a very negative impression from the start. In fact, some journals automatically reject all papers that do not fully comply with the instructions to authors.

Summary and conclusions

An insufficient number of university teachers write academic papers that are publishable in refereed journals of international standard.

There are several key reasons for this poor publishing record, including the fact that many university teachers do not know what is required in order to reach a publishable standard. Many fear failure and rejection of their work. Others do not have sufficient commitment to the publishing process, which can be long, difficult and sometimes quite tedious. Furthermore, sometimes the institution does not provide sufficient resources in terms of time away from teaching and administration, or funds to cover research and publishing costs.

Although it is not a trivial matter, it is also not as difficult to produce a publishable paper as those who do not publish think. Moreover, there is a very definite learning curve, which means that an author's second paper is easier than the first and the third is easier than the second, and so on. It is hoped that the eight-point programme for developing a rigorous academic paper suggested in this paper will be of help to beginners.

It is very important to understand the type of research work that the selected journal will publish. In this respect, a mismatch will delay the work being published. It is vital to follow closely the journal's instructions to authors.

In conclusion, it is not that difficult to produce publishable academic papers of an international standard. Most, if not all, university teachers are capable of this type of work. The barriers to success need to be removed so that a much better achievement record can be attained. It is interesting to note that Hilaire Belloc commented on this issue as long ago as in 1931: "Anyone of common mental and physical health can practise scientific research ... Anyone can try by patient experiment what happens if this or that substance be mixed this way or in that proportion with some other under this or that condition. Anyone can vary the experiment in any number of ways. He that hits in this fashion on something novel and of use will have fame ...The fame will be the product of luck and industry. It will not be the product of special talent."

What is really needed today is a change of attitude towards producing scholarly work. Perhaps the old negative admonition of 'publish or perish' needs to be replaced with a positive exhortation, 'publish and prosper'.

The biggest obstacle to a research and publishing career is to get started, and many novice writers and researchers will thus find co-authoring a relatively easy way to get going. However, care must be taken that junior members of staff working with senior colleagues are given adequate recognition.

Don't delay – get going right now!

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The roles to be played and the competencies required by 21st century South African managers

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This paper seeks to add to the debate on the characteristics required of effective South African managers in the 21st century. It combines the findings of South African and international authorities with research conducted among general managers in the Greater Durban area. The research for this paper addresses three areas, namely:

- *The distribution of general management time in terms of Mintzberg's (1973) managerial roles model*
- *The relative importance of functional, general management and interpersonal skills, as perceived by the respondents*
- *The three most pressing problems facing managers in the immediate future.*

The paper attempts to place the findings of the research in the overall context of the training and development of South African managers for the 21st century, bearing in mind the particular requirements of South Africa as reflected in the Green Paper on Employment and Occupational Equity (South Africa. Department of Labour 1996) and implicit in the establishment of the National Qualifications Framework. The findings of the research indicate that the roles played and competencies required by South African managers are essentially the same as those of managers worldwide. However, the emphasis is on behavioural and cognitive skills, which raises certain questions in regard to the establishment of criteria against which individuals can be measured when making appointment or promotional decisions. It also raises certain questions in regard to the definition of learning outcomes as required by the National Qualifications Framework and the South African Qualifications Authority.

Introduction

This paper seeks to add to the debate on the characteristics required of effective South African managers in the 21st century. It is widely accepted that one of the most pressing needs in South African industry is the improvement of the nation's productivity. South Africa's performance in this field has not been impressive. If one accepts the view expressed by Hall (in Ristow & Amos 1996: 2) that the blame for low productivity should be laid at the door of management rather than labour, it seems appropriate to re-examine the requirements for an effective manager.

It is common cause that it is impossible to develop an acceptable product if the end-use of the product is unknown. This logic holds equally well in the case of the development of managers. If the roles that the manager is to play are ill defined, and if the attributes that the manager needs for effectiveness are unknown, it is impossible to develop an appropriately qualified manager.

The research for this paper addresses the areas of:

- The roles that managers are required to play utilising Mintzberg's (1973) managerial roles model
- The relative importance of functional, general management and interpersonal skills
- The most pressing problems facing South African managers in the immediate future, as perceived by a sample of general managers in the Greater Durban area. This research is combined with other South African and international research in an attempt to determine the roles that South African managers of the 21st century will be required to play and the competencies that they will need.

The paper places this discussion in the specific context of South Africa as expressed in the Green Paper on Employment and Occupational Equity and the recommendations of the National Training Strategy Initiative (National Training Board 1994).

Literature review

According to Ristow & Amos (1996: 2), the central factor in the success of any economy is the management expertise available to that economy. They quote Hall (1988: 72) as saying that the problem of American productivity is "not so much one of labour productivity as it is one of management productivity. The low worker productivity everyone talks about is only a symptom; the real problem is with management." Whetton & Cameron (1995: 5) provide support for this point of view when they contend that "the factor most responsible for business failure is 'bad management' and the best way to overcome the business failures is to provide better management". Since 1995, South Africa has remained between 42nd and 44th place in world competitiveness ranking (*World Competitiveness Report/Yearbook 1995–1999*). In the most recent ranking (April 1999), South Africa ranked 30th in terms of productivity. The findings of the 1999 *World Competitiveness Report* imply that South African managers lack the ability to innovate and to manage organisations profitably and responsibly and indicate that there is a low availability of suitably qualified people in the population as a whole (Ristow & Amos 1996: 2).

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It would seem, therefore, that the challenge facing South Africa is twofold: the development of skills among the population as a whole and, perhaps more importantly, the development of a properly educated, trained and developed management cadre.

In the South African context, the picture is complicated by the need to redress the inequalities that have resulted from past policies in both the national and organisational arenas. The search for a methodology for ensuring employment equity is articulated in the Green Paper entitled *Policy Proposals for a New Employment and Occupational Equity Statute*, issued by the South African Department of Labour (1996). Among other things, this Green Paper places emphasis on the need for employers to "define and communicate clear, non-discriminatory criteria for their decisions, for instance, about promotions and appointments" (para. 3.5.2.2) and to "give reasons for their decisions in these areas in terms of the stated criteria" (para. 33. 5.2.4). It defines acceptable criteria as those that "aim solely to select people who can do the job under normal circumstances" (para. 4.5.3. 1). It suggests, "As far as possible, employers should define criteria in terms of skills rather than formal educational requirements" (para. 4.5.3.2).

The Green Paper places considerable emphasis on the importance of the National Qualifications Framework in this context. It maintains that "the implementation of the National Qualifications Framework is a crucial step to overcoming the barriers to employment" (para. 3. 9. 1). The proposals for the National Qualifications Framework, as laid down in the National Training Strategy Initiative (National Training Board 1994), include certain "Key Characteristics" of a unit of learning. The overall effect of the definition of these key characteristics is to make it quite clear that qualifications that will be recognised by the South African Qualifications Authority as being acceptable for incorporation in the National Qualifications Framework must be defined in very specific terms in respect of the outcomes of learning, the alignment of these outcomes with accepted standards and their expression as a statement of learner capability. Capability is taken to "reflect an integration of knowledge and skill which is able to be understood, applied and transferred to different contexts" (National Training Board 1994: 95). Clearly, it is impossible to define the "Units of Learning" for management education, training and development in these terms unless the outcomes can be defined in terms of those skills and competencies that are necessary for managerial effectiveness.

While international literature is relevant to the South African situation, it is contended that literature generated in South Africa and based on South African research is a more valid source of information in the context of this paper. Much of the international literature relates to different cultures, to different times and to countries with markedly different educational and other infrastructure. Accordingly, South African sources are also utilised in this research.

Ristow & Amos (1996) have conducted research utilising a sample of 20 respondents located in Gauteng and the Eastern Cape. The respondents all held human resources or similar positions in organisations of various sizes in a variety of industries. The survey also included state officials and relevant staff at tertiary institutions (Ristow & Amos 1996: 11). Their research took as its point of departure the nine areas of business leadership practices identified by Chamberlain (1995: 27), to which they added the concept of 'beliefs' as a mechanism for addressing the values and attitudes of the manager. The beliefs of the manager are held to be of particular importance in the South African context because of the racism and narrow focus that characterised South African management in the past. Ristow & Amos (1996) found that strategic thinking skills was the category that scored highest, followed by the beliefs competency, motivational skills and innovative skills categories.

Herbst (1998) has also listed the skills that she sees as being important for an effective manager. Herbst's list concentrates more on specific rather than general skills, including such skills as self-management, coping, computer and research skills. However, she also includes communication, leadership, problem solving and decision making, assertiveness, and coaching and facilitating skills. Some of these skills can also be categorised as personal skills, as they depend in some measure on the personality of the individual. It is therefore arguable that they are difficult to impart to an individual whose personality is not aligned with them.

Shaw & Scriven (1996: 28) suggest that the personal characteristics of an individual are the prime determinant of potential. They contend that there is an important difference between competence and potential. They argue: "Competence is the possession of knowledge and a skill which enables someone to do a particular task now. Potential is the ability to acquire competence now and at any time in the future." Given that it takes considerable time to develop a manager and that the tasks that the manager must perform change markedly with increasing seniority, it is clear that potential is what determines whether an individual can become an effective manager or not. The problem is to identify indicators of potential and then to develop appropriate mechanisms to enable the individual to achieve the full extent of his or her potential.

Shaw & Scriven (1996: 29) utilise research conducted on the nature of potential over more than a decade to arrive at the following conclusions:

- "There is no relationship between 'academic success' and 'success as a manager'.
- Successful managers possess and use certain individual fundamental qualities that distinguish them from the less successful.
- The qualities are fundamental in the sense that they are fully developed and stable by the time most people begin their working lives and can be observed and measured at this stage. They are not enhanced by knowledge, training or experience.
- The qualities are fundamental in the sense that they are not influenced by gender, ethnic or social origin, being part of the make-up of all individuals.
- The qualities are widely recognised as being related to success in almost any organisation. Variations in these qualities between organisations – even between cultures and nationalities – were relatively small compared with the levels of agreement."

They identify three areas into which these qualities fall:

- "Intellect – the ability to think and to learn from experience; to identify key issues in complex problems; to make correct decisions utilising creativity, and forward vision. It is the determinant of potential.
- Temperament – the right combination of the desire to succeed, persistence in the face of a natural sensitivity to people.

- Practicality – the ability to organise oneself and others; to plan the work and work the plan" (Shaw & Scriven 1996: 30).

These findings are interesting in that they indicate a return to the school of thought that believes managers are born not made, but without the social, race and gender implications of previous versions of this school of thought. Shaw & Scriven (1996: 33) suggest that possession of these qualities is the outcome of "basic cognitive and social development patterns influenced primarily by inherited ability and good parenting in pre-school years".

Shaw & Scriven's position is relevant in the current context as it suggests a different basis on which to select employees for management positions. They claim that "a 10-year study of some 1600 graduates hired as management trainees has shown clearly that managers trained to assess potential over a period of a couple of days correctly estimated the long-term management potential of candidates at the recruitment stage, in 73% of cases" (Scriven & Shaw 1996: 31).

Whetten & Cameron (1995: 8) argue that "the characteristics of effective managers are no secret". They list the ten most frequently cited skills of effective managers as being verbal communication; managing time and stress; managing individual decisions; recognising, defining and solving problems; motivating and influencing others; delegating; setting goals and articulating a vision; self-awareness; team building; and managing conflict.

Cameron & Tschirhart (in Whetten & Cameron 1995: 11) bring together the research findings of an impressive array of authorities in the field – Ghiselli (1963), Livingston (1971), Miner (1973), Katz (1974), Mintzberg (1973), Flanders (1981) and Boyatzis (1982) – and conclude that "effective managers are required to demonstrate paradoxical skills. That is, the most effective managers are both participative and hard-driving, both nurturing and competitive. They are able to be flexible and creative while also being controlled, stable and rational." It is, perhaps, precisely the paradoxical nature of the skills 'toolkit' required for effective management that has made the field of management education, training and development so difficult. A further point of contention is the distinction between leadership and management.

Whetten & Cameron (1995: 16) suggest. "Traditionally leadership is used to describe what individuals do under conditions of change. When organisations are dynamic and undergoing transformation people at the top are supposed to exhibit leadership. Management, on the other hand has traditionally been used to describe what executives do under conditions of stability." Given that South African organisations are undergoing transformation on a number of fronts, the finding by Ristow & Amos (1996) that strategic thinking ranked first in the skills necessary for effective South African managers is particularly interesting.

Mintzberg's (1973) research on the roles that chief executive officers are expected to perform forms the basis for the current research into South African general managers. Mintzberg identifies three categories of managerial roles: interpersonal roles, informational roles and decisional roles. He subdivides each of these roles further, as follows:

- Interpersonal roles – figurehead, liaison and leader
- Informational roles – monitor (information seeking), disseminator and spokesperson
- Decisional roles – entrepreneur (initiator of change), negotiator, disturbance handler (response to threats to the organisation) and resource allocator.

This approach is held to be appropriate, because Mintzberg's subjects held the rank of chief executive officers, who can be deemed to approximate closely to the rank of a general manager, and also because of the widespread acceptance of Mintzberg's findings about the nature of management work.

Kotter's (1982) research also shows that managerial work is characterised, among other things, by frequent interruptions, much verbal communication, impromptu decision making and attendance of meetings. His research finds that such roles and activities facilitate managerial effectiveness. He does not develop a typology of managerial roles, but his research confirms what Mintzberg (1973) discovered about the nature of managerial work.

More recently, Bartlett & Goshal's (1999) research has shown that managerial roles / tasks, attitudes / traits, knowledge / experience and skills / abilities are not generic as most literature on the topic implies. They argue: "Rather than trying to develop a list of generic competencies with universal application, we were able to differentiate the profiles of managers who succeeded in adding value in very different ways at each level of the organisation" (Bartlett & Goshal 1999: 104). They classify managers into operational, senior-management and top-level categories. According to their research, certain managerial roles at each level assume greater significance. This precise identification of important managerial roles at each level of the managerial hierarchy is useful in selecting managers for various ranks in an organisation. They criticise Mintzberg's roles model because it is a generic model of managerial roles. While Bartlett & Goshal (1999) provide a further insight into managerial roles at different levels in the hierarchy, their criticism of Mintzberg's model is not warranted because Mintzberg made an observation of roles played by managerial staff, without comparing these roles at different levels in the organisation. Mintzberg's typology of managerial roles is easy to adapt for establishing the emphasis of the identified roles at various managerial levels. This research focuses on identifying the significance of each role at the general management level.

Research methodology

Introduction

The research conducted for this paper consists of two parts – a review of the available literature on the subject of managerial roles and the characteristics of an effective manager, and empirical research conducted utilising a convenience sample of 110 general managers in the Greater Durban area. The respondents to the survey were located in both the manufacturing sector (28.9%) and the service (71.1%) sector. The imbalance in the sample is simply due to the fact that it is a convenience sample, so inter-sector comparisons have been kept to a minimum in analysing the findings of the research.

Research instrument

The research instrument took the form of a questionnaire administered to a convenience sample of 110 general managers in the Greater Durban area. Second-year students enrolled for Business Administration (General Management module) at the University of Natal conducted the fieldwork

Asking the respondent to provide his or her name, designation and telephone number served as a deterrent to students against cheating in their fieldwork. Of the 110 questionnaires used, 13 were rejected on the grounds of incompleteness, illegibility or failure of the respondent to fulfil the requirements of the general management rank. The total number of questionnaires available for analysis was thus reduced to 97.

The questionnaire consisted of a mixture of open- and closed-ended questions. The question relating to managerial roles was closed-ended. The questions relating to the challenges facing South African managers and to the skills required for managerial effectiveness were open-ended to avoid undue prompting.

Validity and reliability

The validity of the questionnaire was assessed on two measures: convergent and face validity. The similarity between the findings of the current research and those of other researchers in the field, such as Whetten & Cameron (1995: 8–11), indicate that the requirements for convergent validity are fulfilled for related items in the questionnaire used for this study. Content validity can also be claimed for questionnaire items that measured respondents' allocation of time to the various managerial roles identified by Mintzberg (1973) because those questions were derived entirely from role descriptions given by him. Since a substantial portion of the questionnaire thus meets validity requirements, it is contended that the research provides a useful insight into the areas that it addresses. Once convergent validity is present, reliability can be assumed, because reliability is a necessary condition for validity (Malhotra 1993).

Findings of the empirical research

Length of time in a general management position

The data reveal that almost 25% of the respondents have been in their present position for less than five years, 31% for between six and ten years, and 44% for more than ten years. Seventy-one per cent of the sample population have thus held their present position for more than five years. The sample can therefore be held to comprise respondents whose experience equips them adequately to express an opinion about the issues addressed in the questionnaire.

Span of control of the respondents

The span of control of the respondents is illustrated in Table 1. The data would appear to suggest that the majority of the respondents manage relatively flat organisations.

Managerial roles played by respondents

The study utilises Mintzberg's (1973) model of managerial roles as a means to discover the extent to which South African general managers perform certain specific roles. The data collected in this connection are presented in Table 2. The data in Table 2 have been arranged to illustrate the similarities and differences between the responses received from respondents in the service and manufacturing sectors. The data indicate that the figurehead, leadership and negotiator roles receive a statistically different degree of emphasis in the two sectors.

The data in Table 2 would seem to suggest that there are differences in the amount of time that general managers in the manufacturing and service sectors spend on the various roles. In the manufacturing sector, the most important role that the general manager plays is that of decision maker, with the interpersonal role being the next most important one. In the service sector, these two roles occupy almost equal amounts of the general manager's time. The general manager in the service sector spends less time on all components within the decision-making role, but only one of the differences noted is statistically significant in comparison with the manufacturing sector. However, the general manager in the service sector spends more time on the interpersonal role components of figurehead and leader, and, in this case, the differences in the time spent on the components are statistically significant.

Within the decision-making role, the respondents in the manufacturing sector regard entrepreneurship as being the

Table 1. The number of subordinates reporting directly to the respondents

Number of subordinates	Responses by category (n = 97)	
	Number	Percentage
Up to 3	6	6.2
4–6	23	23.7
7–10	27	27.8
More than 10	41	42.3
Total	97	100.0

Table 2. Time allocation according to Mintzberg's (1973) managerial roles model, by industrial sector (n = 95)

Managerial roles and components (Mintzberg)	Manufacturing sector		Service sector		Significance for T-test at $p < 0.10$
	Time allocation (percentage)	Standard deviation	Time allocation (percentage)	Standard deviation	
INTERPERSONAL ROLES:					
- Figurehead roles	2.64	2.02	5.54	7.48	YES
- Leadership role	14.21	8.91	18.92	12.89	YES
- Liaison role	13.86	12.89	11.90	9.39	NO
Sub-total	30.71		32.26		
INFORMATION PROCESSING ROLES:					
- Seeking information	7.18	4.59	8.69	5.17	NO
- Disseminator	10.93	9.20	11.68	8.25	NO
- Spokesperson	4.39	4.69	5.16	4.88	NO
Sub-total	22.5		25.53		
DECISION-MAKING ROLES:					
- Entrepreneurship	14.00	14.92	12.58	10.84	NO
- Negotiator	11.75	10.63	7.28	5.64	YES
- Disturbance handler	11.36	8.18	9.34	8.77	NO
- Resource allocator	8.64	5.19	6.97	4.53	NO
Sub-total	45.75		37.17		
Other roles	1.04	3.22	2.04	7.31	
TOTAL	**100.00**				

most important. The negotiator and disturbance-handling components rank second and third respectively. The almost equal allocation of time to negotiating and disturbance handling is intuitively acceptable, as these two components can be seen as related in that the need to negotiate is often the outcome of a disturbance of some sort. Respondents in the service sector regard the situation in regard to negotiation and disturbance handling somewhat differently. They reverse the ranking of these two components and reflect them as taking up a smaller percentage of their time, but retain them as the second and third largest consumers of time in this role. The difference between the time allocation given to negotiating in the manufacturing sector, as opposed to that in the service sector, is statistically significant. The difference between the manufacturing and service sectors in respect of disturbance handling is not statistically significant. While the research does not give any indication as to why there should be a difference in the time allocated to negotiation in the manufacturing and service sectors, it could conceivably be due to the greater diversity of the employee body in the manufacturing sector in terms of culture, education and occupation. It could also conceivably be related to the greater potential for industrial strife in the manufacturing sector. The component of entrepreneurship is reflected as taking the greatest percentage of the general manager's time in both sectors.

Within the interpersonal role, respondents from both sectors rank the leadership component first, even though a statistically significant difference in magnitude exists between the sectors. This is a particularly interesting finding in the light of Whetten & Cameron's (1996: 16) contention that "managers cannot be successful without being good leaders, and leaders cannot be successful without being good managers". It would appear that the respondents also subscribe to this point of view.

Within the interpersonal role, the ranking of the liaison component in second position by the respondents from both sectors

is interesting, as the question emphasises external liaison with suppliers, customers, government agencies and financiers. The data suggest that the general manager directs his or her attention outward in this component. This finding is consistent with the general view that the higher the rank of the manager, the more extroverted his view tends to be.

Within the information-processing role, the disseminator component ranks as the biggest consumer of time. This suggests that general managers perceive internal communication as consuming a considerable amount of their time.

Examination of the data in Table 2 as a whole suggests that, in the manufacturing sector, leadership and entrepreneurship combined consume some 28% of the general manager's time. The liaison role ranks as the second biggest time consumer (14%) in the manufacturing sector, followed by that of negotiator (12%). In the service sector, the leadership component stands out as the largest consumer of the general manager's time at 19%. The entrepreneurship component is the second largest time consumer (13%) and the liaison (12%) component the third. Although no firm conclusions can be drawn, owing to the limitations imposed by a convenience sample for this study, these findings would seem to suggest that the manufacturing sector is more concerned with dealing with change. The entrepreneurship component is directly concerned with the identification of, and adaptation to, change; the need for extensive liaison and negotiation to adapt to change could possibly explain this emphasis. The service sector would appear to be less affected by change consequences, and the general manager's role is thus more concerned with ensuring that all the organisation's employees are moving in the right direction and doing the right things to maintain the organisation's competitive position.

Managerial skills regarded as being important by respondents

As already indicated, the question relating to the skills that the respondents regarded as being important for business graduates was an open-ended question. Respondents were requested to identify up to three skills that they consider important for business graduates.

The analysis of the data obtained in response to this question differentiates between functional skills, general management skills and interpersonal skills. The skills designated as functional include, among others, skills in the areas of marketing, finance, technology and public relations.

The general management category includes skills such as planning, organising, controlling, coordination and leadership. Interpersonal skills include negotiating, motivation, human relations and communication.

The data obtained from the responses to this question are presented in Table 3.

The data in Table 3 indicate that respondents in the manufacturing sector rank interpersonal skills first and general management skills second. Respondents in the service sector reverse this order, regarding general management skills as being most important and interpersonal skills second. This ranking is consistent with the findings from the question on managerial roles, as leadership is included in general management skills. This component ranks first in terms of managerial time consumption for the service sector. For the respondents in both sectors, functional skills rate lowest in the requirements for business graduates. This is an intuitively acceptable finding as it is to be expected that business graduates would not necessarily be functional specialists but rather generalists.

A number of the respondents interpreted this question as requesting information on the personal qualities that business graduates should have. While not directly related to the research or the subject matter of this article, it is interesting to note that the highest scoring personal qualities were commonsense and risk taker/entrepreneur, both of which were mentioned nine times. The next most frequently mentioned qualities were intelligence/willingness to learn (mentioned seven times), empathy, integrity/sound ethics, and initiation, all of which were mentioned four times. The emphasis on commonsense and intelligence/willingness to learn is interesting, as it could be seen as an echo of Shaw & Scriven's (1996) viewpoint. It suggests that the respondents also place considerable value on what Scriven & Shaw label "intellect".

Consideration of the data in Table 3 overall suggests that general management skills and interpersonal skills are seen by all the respondents as being the prime categories of skills required by the business graduate. This is an interesting finding, as it suggests that general managers, irrespective of sector, appreciate the role that the human resources division of the organisation plays in maintaining its competitive position. A degree of support for this viewpoint can be found in the responses to the question that addressed the problems that managers will be faced with leading up to the year 2000.

Table 3. Skills considered important for business graduates

Skills category	Manufacturing sector (n = 28)		Service sector (n = 69)		TOTAL (n = 97)	
	Number	Percentage	Number	Percentage	Number	Percentage
Functional skills	10	22.7	24	21.6	34	21.9
General management skills	15	34.1	46	41.5	61	39.4
Interpersonal skills	19	43.2	41	36.9	60	38.7
TOTAL	44	100.0	111	100.0	155	100.0

Major problem areas for management – looking ahead

Respondents were asked to identify up to three areas in which they foresaw problems that needed attention before the pending turn of the century. The data obtained from the responses to this question are given in Table 4.

The data in Table 4 indicate that the biggest problems facing managers leading up to the year 2000 are those relating to human resources management within the firm. This area accounted for nearly 30% of the responses. If this area is combined with the area of labour relations and human resources management problems arising externally to the firm, then these three areas contribute approximately 47% to the list of problems. In the light of the importance ascribed to interpersonal skills and the amount of time consumed by the respondents' interpersonal role, this finding is consistent with the overall picture described by the data.

Time taken to reach general management rank, educational qualifications and hours of work

Other findings from the research are that there appears to be no significant relationship between the level of educational qualification and the time taken to reach general management rank. This is a particularly interesting finding in the light of the viewpoint adopted by Shaw & Scriven (1996). The respondents indicate that it takes an average of 11 years to reach the rank of general manager. It would appear that the respondents that reached the rank of general manager in five years or less were often employed in family businesses. Almost 44% of the respondents took between six and ten years to reach general manager rank, and approximately 40% took more than ten years.

It appears that the level of academic qualification attained by the respondents was mixed, with 27% having some degree of high school education as their highest qualification, 2% having obtained a technikon education and 50% a university education. The respondents claimed to work between 30 and 85 hours per week, with an average of 55.13 hours per week.

Conclusions from the empirical research

The picture of the South African general m
emerges from the data is that of a hardworkir
(though not necessarily with high formal educa
cations), mature person, endowed with commo
high degree of integrity and initiative. He or she
have a high level of interpersonal and decision-
be able to demonstrate strong leadership skills a
in the manufacturing sector, be a good negotiat
bance handler. He or she especially needs to be
change through the possession of strong innovat
preneurial skills. The ability of the general ma
links and networks through liaison with constitu
and outside the organisation is also seen as imp

Perhaps the most important aspect of these fi
the characteristics attributed to the general mana
ly behavioural and affective, rather than cogni
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which to assess the suitability of any given perso
ment or promotion to the rank of general manag

The research portrays the general manager as
have to deal with employee-related problems in
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the skills that the general manager must possess
employee relations implies the need for integri
interpersonal and negotiating skills. A changing
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necessity for dealing with competitive pressures
bance-handling skills.

The findings of the research conducted for thi
tially confirm the findings of other research conc

Table 4. Problems facing managers before the turn of the 20th century

Type of problem anticipated	Responses over sectors	
	Number	Percen
Human resources management (internal)	68	28.3
Changing environment	51	21.3
Competitive pressures	48	20.0
Labour relations	34	14.2
Financial management	22	9.2
Human resources management (external)	8	3.3

roles that general managers are called upon to perform and the skills that they require to perform them. This still leaves unresolved the problem of defining the criteria against which aspirant general managers should be judged. Admittedly, this is outside the scope of the paper, but it would seem appropriate to make some suggestions in this regard.

Recommendations

MacDonald (1993) proposes that the competent manager is the combination of management education, management training and experience that, when 'filtered' through the personal attributes of the manager, contribute to his or her development and growth. The position held by the manager acts as a further filter that ultimately leads to the emergence of distinctive competencies, and these in combination make up the competent manager. This model is shown in Figure 1.

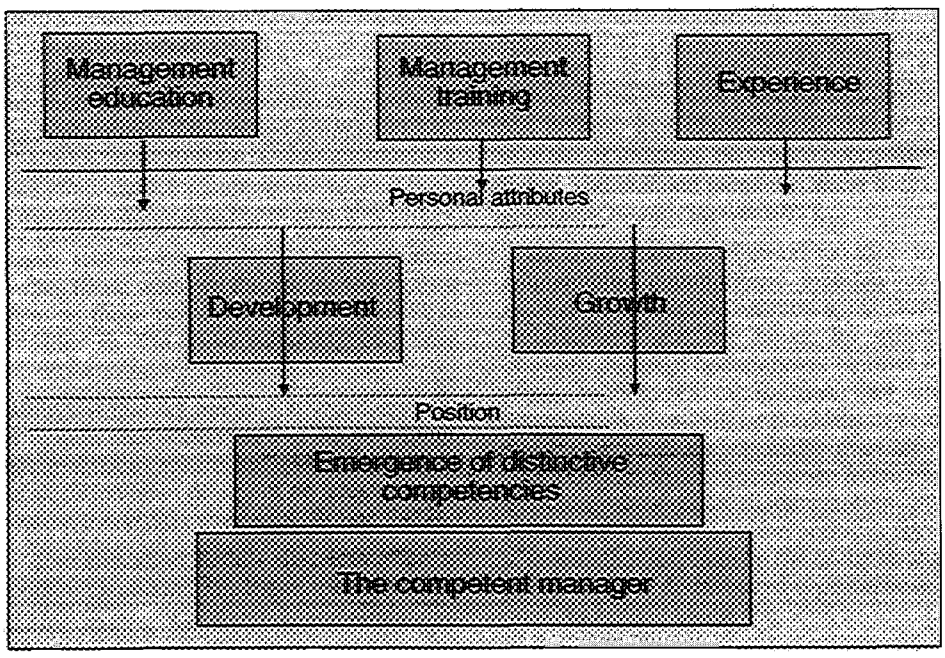
The model depicted in Figure 1 provides a basis on which to build criteria for eligibility for appointment or promotion to any given management position. Criteria should be established that define the necessary knowledge, gained through management education, the necessary skills, gained through management training, and the necessary experience, gained through exposure to appropriate environments. There should be criteria that establish that development and growth has occurred as a result of the education, training and experience to which the aspirant manager has been exposed. The degree to which the manager has exhibited the ability to grow and develop will provide insight into the degree to which the manager has demonstrated potential. Adherence to the criteria set can be assessed through an analysis of employee appraisal systems for internal candidates, and through a combination of career information and references from previous employers for external candidates for the post.

If one accepts that all managers below the rank of general manager are essentially general managers in training, then it is legitimate to contend that the precise mix and level of the skills identified in the research will, to some degree, be determined by the position held by the individual and by the position to which he or she aspires. It is to be hoped that experience in a particular position, allied with appropriate management education and training, will result in the individual's acquiring and demonstrating distinctive competencies that can then be assessed against the relevant criteria for the position for which he or she wishes to be considered.

This scenario requires that South African organisations adopt a systematic approach to the development and growth of employees. It implies that organisations should establish clear criteria for each managerial position in the organisation, ensure that these criteria are clearly and uniquely related to the ability to successfully discharge the duties and responsibilities of the position, and communicate the criteria clearly and widely. It implies that organisations must reassess their whole approach to management development and be prepared to use all the resources of the country to provide their employees with the required management education and training. The need to register courses and programmes with the South African Qualifications Authority will tend to reinforce this situation.

It further implies that organisations will need to pay some attention to their employee appraisal systems to ensure that they generate the data that the organisation needs to validate its internal promotion or appointment decisions. Attention will also have to be paid to ensuring that references obtained from previous employers for external candidates are structured in such a way as to provide useful data. This may require the development and use of a standard form of some sort.

The research conducted for this paper indicates that South African managers of the future require essentially the same skills as managers worldwide. The problem of integrating this finding with the special realities of the South African business environment is, however, somewhat different from the situation in other parts of the world. South African organisations will therefore have to give some thought to modifying their management development programmes, appraisal systems and selection procedures to accommodate the requirements of the Labour Relations Act (No. 66 of 1995), the Green Paper on Employment and Occupational Equity and the South African Qualifications Authority.



Source: MacDonald 1993: 2.13

Figure 1. The development of the competent manager – a synthesis of theory

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The socio-political and work environment as sources of workplace discrimination: Implications for employment equity

Mahamed Rajah*

The article deals with before-the-market and within-the-market discrimination. Discrimination before the market denies those who are discriminated against the same opportunities as those not discriminated against to develop their capabilities in the most advantageous way, employment-wise. Discrimination within the market means that workers who are distinguished by certain characteristics that do not directly affect their current capabilities are treated less favourably in a given employment situation than others of no greater capability who do not possess those characteristics.

In South Africa, historical antecedents impact on the employment opportunities that people have had and may have, with implications for employment equity and affirmative action. The article reviews the legislation over a period of a century and a half that systematically excluded blacks from the skilled labour market and ensured that race and skills were coincidental.

Introduction

The 2006 soccer bid experience is an important lesson for South Africans. The media reported a feeling of rejection at having been denied the opportunity to host the World Cup in spite of hard work, perseverance and having the ability. The decision makers, who for years have been in a privileged and controlling position, did not give the honour to South Africa. South Africans generally felt it was unfair discrimination. This was in some minor way similar to what the majority of South Africans felt under the previous government, namely, the feeling of somehow having been cheated or deprived of a legitimate expectation – an important lesson, perhaps, for how important it is to avoid unfair discrimination and implement employment equity in the workplace.

For a better understanding of the current position, problems and complexities within which employees that are classified as "designated groups" in South Africa's Employment Equity Act (No. 55 of 1998) find themselves, it is necessary to examine the historical and current forces and circumstances that impact on employment equity. Such an examination will also aid in understanding the attitudes and perceptions of black employees, white employees and their managers regarding employment equity and affirmative action in the work environment.

Discrimination

A distinction is made between discrimination before the market and discrimination within the market. Discrimination before the market denies those who are discriminated against the same opportunities as those not discriminated against to develop their capabilities in the most advantageous way, employment-wise.

Discrimination within the market means that workers who are distinguished by certain characteristics that do not directly affect their current capabilities are treated less favourably in a given employment situation than others of no greater capability who do not possess those characteristics (Brown 1977).

Before-the-market discrimination entails discrimination in upbringing and opportunity, and within-the-market discrimination mainly involves discrimination by status within society, or status as perceived by others.

Discrimination in upbringing essentially involves the social, economic, legal and political factors that impede certain children from developing their potential capabilities; for example, the differential provision of social services (in particular, education and residential segregation). Such children are further disadvantaged through their parents' being similarly situated, with only limited ability to motivate and develop them. This kind of discrimination sets in motion a self-perpetuating vicious circle. Though this kind of discrimination affects the development of capability, it does not in itself cause whatever capability is developed under it to command lower pay than the same level of capability an unaffected person would command (Brown 1977); neither does it imply that the chances for occupational mobility of such a person should be lower than those of someone possessing the same capabilities.

Discrimination in opportunity occurs when, by a series of political, legal, social and/or economic factors, the entry of workers that posses some given characteristic into a given occupation is hampered or prevented, while there is no such barrier to the entry of persons of no greater capability who do not possess that characteristic. Those excluded increase the number of entrants into those occupations that they can enter freely, and the rate of pay in these areas of endeavour is consequently lower (Brown 1977).

These two forms of discrimination lower the relative pay and relative occupational mobility of those discriminated against – the first, by restricting the development of potential capabilities, and the latter, by affecting their allocation between different occupations. Neither implies, however, that when, with given capabilities, they are admitted to given occupations, they will be paid less or receive fewer opportunities for occupational mobility than others in like cases. The possibility of this phenomenon occurring is raised, however, by within-the-market discrimination. Such discrimination, in turn, mainly centres on the political, social, legal and economic factors that impinge on the occupational mobility and pay of persons of the disfavoured type because of their lower status.

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The socio-political and work environment as sources of workplace discrimination: Implications for employment equity

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Some of the legislation that affected the upward and horizontal occupational mobility of blacks (including people previously classified as Africans, coloureds and Indians), as well as opportunities for equal pay for work of equal value, prior to 1994, is summarised in the following section. It is to be noted that the Industrial Court, which operated prior to the 1995 Labour Relations Act that came into effect on 11 November 1996, accepted the principle of equal opportunity. Such legislation basically concerns discrimination in opportunity and discrimination within the market. With regard to discrimination in opportunity, such legislation has historically impeded the entry of certain black workers into given occupations; entry to such occupations had been the sole prerogative of whites of no greater capability. Those blacks who had been excluded increased the number of entrants into those occupations that they could enter freely, thus lowering the rate of pay. With regard to discrimination within the market, the paper will concentrate on the legislation that impinged on the occupational mobility of blacks because of their lower status in South African society.

According to the International Labour Organisation (ILO) Convention No. 111 and Recommendation No. 111 of 1958: "The term 'discrimination' includes – any distinction, exclusion or preference made on the basis of race, colour, sex, religion, political opinion, national extraction or social origin which has the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation", and, "the terms 'employment' and 'occupation' include such access to vocational training, access to employment and particular occupations, and terms and conditions of employment".

Historical background and current situation

Attempts were made in other countries to eliminate the problem of discrimination through legislation but, in South Africa, racial discrimination in employment and occupation had been condoned and perpetuated through legislation. The South African government had argued that separate development, based on the equality of different groups at different stages of socio-economic evolution, provided a segregated labour system that avoided problems of social and economic injustices. This explanation was put forward in the report by the government of the day to the ILO Conference in 1963: "Socioeconomic conditions in the sphere of employment and occupation have necessitated the enactment of legislative measures peculiar to the needs of the different population groups so that they may progress in the direction of self-determination. The introduction of an integrated labour system would inevitably lead to economic and social injustices, bearing in mind that there are distinct communities, which differ culturally, ethnically and socially. These differences can be minimised only by affording such legislative protection as circumstances warrant in order to ensure that no group is deprived of the benefits to which its energies, labours and initiatives entitle it" (ILO, 1966b: 73).

In South Africa, discriminatory legislation in employment and occupation that affected mobility can be traced to the latter part of the nineteenth century. The discovery of diamonds and later gold saw the beginning of the transformation of South Africa from a mainly agrarian society to the most advanced industrialised country in Africa. The demand for, and shortage of, skilled labour resulted in high wages for those recruited mainly from Britain, other parts of Europe, America and Australia. Unskilled labour was recruited locally and, because of the demand, the wage rates of unskilled blacks were often nearly as high as those of white overseers (Hutt 1964: 48). The subsequent increase in the number of unskilled black workers resulted in their wages being much lower than those of skilled workers (see Hutt, 1964: 48; Houghton, 1976: 148). A preference for white supervisors, who had favourable alternative employment opportunities on farms, resulted in their being paid inflated wages (Hutt 1964: 48). "The distinction between skilled and unskilled soon became to be more or less identified with the distinction between the races, and the operation of market forces came in some measure to be replaced by the convention that a white man's wage was usually five to ten times the wage of a black man's"(Houghton, 1976: 148; see also Hutt 1964: 48). Legislation was not needed to protect the privileged position of whites until the end of the Anglo-Boer War (1902) when there was a shortage of unskilled black labour. This led to the indenturing of Chinese unskilled workers for the mines and the beginning of legislation supporting traditional prejudice and white trade union policy. Both had consistently restricted the vertical and horizontal occupational mobility of blacks.

Between 1841 and 1904, a series of Master and Servants Acts were enacted to regulate employer–employee relations. Under these acts, a breach of contract was rendered a criminal offence. In practice, it was applied mainly against unskilled workers, and therefore Africans were mostly affected (see Horrell, 1978: Doxey, 1961: 129; Human 1984). The purpose of the law, according to a former South African Labour Member of Parliament, was to "ensure that African workers were unquestionably obedient and respectful to their white masters" (Pogrund 1975, Human et al. 1984). In 1972, according to the then Minister of Labour, the Acts were "still considered necessary to safeguard the rights of both master and servant where applicable (Human et al. 1984). In 1974, these acts were discarded. However, they are significant in that they had an important influence "on the framing of later legislation and in formulating attitudes towards employees, particularly non-white employees" (Doxey 1961:128). According to Pogrund in 1975, the spirit of these laws remained, and the attitude existed that black workers were objects rather than participants, even in industries where they were relatively better placed (Human et al. 1984).

The first example of discriminatory legislation in South Africa to make a distinction on the basis of race or national extraction was Ordinance No. 17 of 1904 of the Transvaal. This ordinance was aimed at regulating the employment of unskilled Chinese immigrants. Indentured Chinese 'labourers' were restricted to employment in unskilled positions in mines and confined to the Witwatersrand. They were forbidden to change jobs and, at the end of their contract period, had to return to their country of origin. The ordinance was enacted because of pressure from white trade unions that feared that competition from blacks would result in lower wages and a lower standard for whites, who, in turn, wished to maintain a 'civilised standard'. This ordinance was instrumental in establishing the policy of legislated job reservation and the tradition of skilled jobs for whites and unskilled jobs for members of other population groups. It made the white trade unions aware of their economic power and the political influence they could use to lobby for legislation to maintain their privileged position (see Jones & Grifiths 1980: 3). Traditional prejudices and white trade union power, supported by legislation, led to limited rights and discrimination against blacks in all spheres

of the socio-economic development of South Africa. According to Rex (1971), what is interesting about some of the forms of labour used in South Africa is that they enabled the employer to control a variety of forms of legitimate violence, which he was allowed to use against his workers, but at the same time did not require that he should buy the worker for life. "Indeed, it might be said, at least in theory, to be the most perfect system of labour exploitation yet devised" (Rex 1971, in Schlemmer 1972: 2).

Legislation affecting access to education and training

The insatiable demand for skilled labour in South Africa adversely affected the economic growth of the country. The reason often given for the skills shortage was that there were not enough whites (who traditionally filled skilled positions) to meet the demand because of the negative population growth rate among whites, including the impact of emigration and the limited immigration of skilled whites. The lack of skills and the abundance of unskilled labour contributed to the huge gap in wages between skilled and unskilled labour. This was an unfortunate development, considering the vast potential of the black population. The vast majority of blacks lack a sufficiently high standard of education and training to qualify for skilled positions, which limits their horizontal occupational mobility opportunities. This does not imply that they lack the capability to obtain higher education or training. Rather, blacks were denied the opportunities enjoyed by whites to develop their capabilities in the most advantageous way, employment-wise. According to an ILO report on Apartheid in Labour Matters, "A general discrimination based on race with regard to access to vocational training is the result mainly of the organisation of the whole education system, which is based on racial segregation and on inequality of conditions for persons of different races" (ILO 1966a: 7–8).

The majority of blacks in South Africa were not able to progress beyond a primary school education because of the lack of facilities and resources. It is for this reason that the Apprenticeship Act (No. 26 of 1922) was seen to provide greater employment opportunities for whites at the expense of blacks (see Jones & Griffiths 1980: 19; Horrell 1978: 7; Doxey 1961: 131–132; Houghton 1976: 154). The required Standard VI qualification, in terms of the act, excluded the majority of blacks. This provision, according to Jones & Griffiths (180: 21), "established the tradition of skilled artisan work being performed by white workers only, a tradition which carried on and entrenched itself". This is reflected in the Report of the Commission of Inquiry into Labour Legislation, which comments on the Apprenticeship Act (No. 37 of 1944) that repealed the 1922 Act. A number of factors prevented blacks from becoming apprenticed: apart from establishing the high prescribed educational qualifications, which were raised to Standard VII and in some cases Standard VIII, there was resistance from white trade unions whose members served on apprenticeship committees, there were work reservation instruments, and there was the Department of Labour's policy of not permitting the indenturing of black apprentices in white urban areas (Wiehahn Report Part 1 1981: 52).

The assertion has often been made that the Apprenticeship Act itself did not prohibit the training of blacks; however, blacks were indirectly excluded. To better appreciate this point, one has to look at the origin of the Act, which was part of the 'civilised labour' policy and the 'poor white' problem of the early 1920s. It formed part of the strategy to offer whites better opportunities than blacks. Whites, who could no longer rely on farming to earn a living and who lacked the skills for better jobs, had to seek employment as unskilled labour earning similar wages to unskilled blacks. It was feared that this would lower the 'civilised' standard of whites. The object of the Act was to provide white youths with the skills to upgrade their standards and to make conditions attractive to whites who were reluctant to enter the trades (see Jones & Griffiths 1980: 18; Doxey 1961: 131; Houghton 1976: 155).

Like the Apprenticeship Act, the Training of Artisans Act (No. 38 of 1951), was non-racial in its provisions. The Act provided for the training, retraining and recognition of adult artisans where there was a shortage. Blacks were, however, denied the same opportunities as whites to develop their capabilities. Whereas, for example, a Trade Training Centre was established for whites in the Cape, no facilities were made available for Africans in 'white' South Africa. Africans had to seek training in the black self-governing territories (Jones & Griffiths 1980: 88). To provide for training and registration of African building workers, the Native Building Workers' Act (No. 17 of 1951) was passed. According to government policy, these workers could gain artisan status for employment in African areas only. Furthermore, the courses offered did not cover the full range of training as for other racial groups, and the rates of pay of Africans were lower (Horrell 1978: 259). Africans could, according to the policy, be trained in the homelands only, thus denying them access to training facilities, of a higher standard, in the 'white' urban areas.

The system of separate and unequal educational opportunities was established under the Bantu Educational Act (No. 47 of 1953). The purpose of this Act was to perpetuate the low status and lack of opportunities for Africans in conformity with state policy. This is expressed in the statement by Dr H.F. Verwoerd, the then Minister of Native Affairs, on submitting the Bill: "Education must train and teach people in accordance with their opportunities in life, according to the sphere in which they live ... Native education should be controlled in such a way that it should be in accord with the policy of the state" (ILO 1966a: 8; see also Horrell 1978: 298). Similarly, the Coloured Persons' Education Act (No. 47 of 1963) and the Indian Education Act (No. 61 of 1965) were enacted to conform education to state policy.

Under the Extension of the University Education Act (No. 45 of 1959), university education was brought under strict government control. With the exception of a single university – the University of South Africa – blacks were prohibited from gaining admission to universities that were open to whites. The purpose was the deliberate denial of skills, as the ILO report (1966a) points out: "The general effect of the legislation is to establish inequality of opportunity for people of different races to attain the level of general education necessary for access to all technical or higher training" (ILO 1966a: 8). By restricting the development of their potential capabilities, this form of discrimination lowers the relative pay and relative occupational mobility of those discriminated against.

Though discrimination in education and training denied blacks the same opportunities as whites to develop their capabilities in preparation for the labour market, it did not in itself cause whatever capability was developed under it to command lower pay than the same level of capability in whites

would command; neither did it imply that their chances of occupational mobility should be lower than those of whites with the same capabilities.

Legislation that affected occupational opportunities

Discriminatory legislation directly or indirectly limited the employment opportunities of blacks, as opposed to whites whose capabilities were not superior. Discriminatory legislation lowered the relative pay and relative occupational mobility of blacks by restricting the development of their potential capabilities, as has been shown, and by directly or indirectly limiting their vertical and horizontal occupational and employment mobility.

As with Ordinance No. 17 of 1904 of the Transvaal, under the Mines and Works Act (No. 12 of 1911), a distinction was made on the basis of race rather than skills in the employment allocation provisions. The Governor-General exercised his power in reserving certain job categories for whites, such as blasting operations in mines, banksmen, gangers and onsetters in the provinces of the Transvaal and Orange Free State, and mine managers and overseers throughout the country. Under the Mines and Works Amendment Act (No. 25 of 1926), job reservations in the mines were legalised. Certificates of competency issued to 'coloured persons' in the Cape Province and Natal were not valid in the Orange Free State and Transvaal, thus limiting their job opportunities *vis-à-vis* whites with the same capabilities. Subsequently, under the Mines and Works Act (No. 27 of 1956), which repealed and replaced the original Act of 1911 and its Amendments (Acts No. 25 of 1926, No. 22 of 1931 and No. 5 of 1934), top administrative, technical and supervisory positions, among others, were reserved for whites, Cape Coloureds or Cape Malays, Mauritius Creoles or St Helena persons or their descendants. Africans and Asians were implicitly excluded, irrespective of potential capability.

Under provisions of the Native Labour Regulations Act (No. 15 of 1911), the occupational mobility opportunities of Africans and their opportunities for higher pay were severely restricted. It was a criminal offence for Africans to change jobs, for increased earnings or for other reasons, before the termination of the term of service entered into through an oral or written contract. Employers were forbidden to recruit Africans already employed in any mining work through the offer of higher pay. Penal sanctions under the act were likened to those under the Cape Masters and Servants Apprentices Ordinance of 1856, which replaced the Masters and Servants Law of 1841 (see Doxey 1961: 12 and Horrell 19778: 6). Doxey aptly comments: "The application of criminal actions to breaches of contract is archaic in modern society, constituting a serious barrier to the orderly settlement of disputes, and as the law only affects unskilled labouring workers it is largely the non-white who suffers. Consequently, there is an understandable tendency for non-whites to regard the masters and servants laws as a manifestation of racial discrimination" (Doxey 1961: 129).

The Black Building Workers Act (No. 27 of 1971) limited the job opportunities of Africans who were confined under its provisions to doing skilled work in the building industry in designated African areas. Africans were not allowed to compete with whites, whose capabilities were not superior, in 'white' urban areas. This included those Africans who were registered as wiremen in 'white' urban areas under the Electrical Wiremen and Contractors Act(No. 20 of 1939). Their job opportunities were limited on the basis of race and not skills.

The Black (Abolition of Passes and Coordination of Documents) Act (No. 67 of 1952) made it compulsory, under section 2 of the Act, for all Africans over the age of 16 years to obtain a reference book. Employment was denied under this law to those Africans who did not have such reference books.

The Physical Planning and Utilization of Resources Act (No. 88 of 1967) – later the Environmental Planning Act – aimed at the decentralisation of industries towards rural homeland areas to limit the influx of Africans to urban areas. Certain areas were 'off limits' to African work-seekers unless no other workers were available. The Western Cape, for example, was declared a white and coloured labour preference area. The zoning and control of land were placed under the control of the Minister of Planning. The written permission of the Minister was necessary, under the Act, for the extension or establishment of a factory, since this would probably mean an increase in the number of African employees. The Minister exercised the power of refusing permission for the extension or creation of factories in areas not zoned for such purposes. Between January 1968 and January 1976, 92 645 African employees were affected by refusals and a number of employers prosecuted for illegally extending factories; a large number of factories in the Transvaal had to close because they were not allowed to employ the number of (African) workers that were needed (Horrell 1978: 274). As a direct result of the ratio imposed, the occupational opportunities of Africans were restricted *vis-à-vis* others whose capabilities were not superior.

The Black (Urban Areas) Consolidation (Act No. 25 of 1945), which repealed and replaced the Black (Urban Areas) Act (No. 21 of 1923), severely restricted the occupational and employment mobility of Africans who were, under its provisions, considered 'temporary sojourners'. Taken together with the Black Labour Act (No. 67 of 1964), the freedom of Africans to change employment or to seek better-paid employment was restricted, unlike the situation for others who were not better qualified. Recruitment of African employees and their employment search in 'white areas' were channelled through labour bureaux established by the government. African work-seekers and workers were at the mercy of these bureaux, with the power to refuse employment or to cancel an employment contract, which could result in the worker's being repatriated to a remote 'African reserve'. Wages were kept artificially low because the system enabled the recruitment of workers from impoverished areas. According to a Cabinet Minister in 1968, judicial recognition was given of the expressed policy of building the economy on migrant labour (Schlemmer 1972: 13). This appeared to be in line with the government policy of denying Africans equal rights (see Schlemmer 1972: 13).

The Industrial Conciliation Act (No. 11 of 1924), which provided for the settlement and prevention of disputes between employers and employees, excluded most African men from the definition of 'employee' (and subsequent legislation excluded all Africans). Africans were thereby denied official collective bargaining rights and prevented from freely competing with whites who were not more capable. The reason for this is found in a statement by the then Minister of Labour (as quoted by Horner) indicating a concern that: "In the competitive wage-production system in a situation such as we have in South Africa the lower civilisation will gradually drive out the higher civilisation" (Schlemmer 1972: 10). This policy, which was pursued and developed by successive governments, particularly the National Party government after 1948, gave rise

to about 57 racially discriminatory laws restricting the employment opportunities, mobility, wages and working conditions of blacks.

The 1924 Act was repealed and replaced by the Industrial Conciliation Act (No. 36 of 1937), which in turn was repealed and replaced by the Industrial Conciliation Act (No. 28 of 1956). In terms of its provisions, Africans were denied access to registered trade unions and the Industrial Council System. Mixed unions consisting of whites and people registered as coloureds under the Population Registration Act were denied registration under the Act.

The Black Labour (Settlement of Disputes) Act (No. 48 of 1953) provided for the establishment of the committee system as a substitute for African trade unionism and the Industrial Council system, thereby creating separate industrial conciliation machinery for Africans. Strikes by African workers and lockouts of African workers were prohibited. The maximum penalties for Africans found guilty of contravention were far more severe than the maximum penalties for illegal strikes under the Industrial Conciliation Act (Horrrell 1978: 281). By prohibiting strikes, Africans were denied effective collective bargaining power for improving working conditions and pay.

In terms of Regulation No. 7 of the Shops and Offices Act (No. 75 of 1964), which repealed and replaced the Shops and Offices Act (No. 41 of 1939), the separation of working areas and facilities for different races could be enforced. This indirectly affected the job opportunities of blacks because employers were reluctant, in small organisations, to incur expenses for providing separate facilities.

The Group Areas Act (No. 36 of 1966), which repealed and replaced the Group Areas Act (No. 77 of 1957), which in turn had repealed and replaced the original Group Areas Act of 1950, affected the vertical and horizontal occupational mobility of blacks. Under the Act, certain areas were set aside for occupation by different race groups. Blacks could not take advantage of better employment opportunities in different areas because of the severe shortage of accommodation in the black group areas that resulted from the Act. Under subsections (1) and (2) of section 26 of the Act, blacks could not be employed as charge-hands, executive managers or supervisors in white group areas. Furthermore, blacks had to be placed under the constant supervision of a white supervisor in certain industries. Although the Act was not always rigidly applied, it contributed to the perception that whites were managers and blacks subordinate.

Apart from the adverse effect on education, training and occupational opportunities, legislation and policy had an adverse effect on pay and occupational status. Blacks were denied political representation and excluded from the industrial relations system.

The Industrial Conciliation Act (No. 11 of 1924) has been described as the cornerstone of discrimination in labour matters (Schlemmer 1972: 10). Under section 24 of the Act, the majority of African males were excluded from the definition of 'employee', thus denying them access to the negotiation process. All Africans were eventually excluded from the definition of 'employee' under the Black Labour (Settlement of Disputes) Act (No. 48 of 1953). Africans were denied access to registered trade unions and the Industrial Council system, from which they were excluded up until 1981. Employers and employees, who were equally represented, negotiated terms and conditions of employment. Africans, who comprised the majority of the labour force, were represented by a white 'Bantu Labour Officer', and had no say in matters of pay and working conditions that directly affected them. Wages in the industries in which there was no organised labour were fixed by the Minister on the recommendation of the Wage Board. Blacks were not represented on the Wage Boards and had no voice in determining statutory minimum levels of pay.

Within-the-market discrimination resulted not only from the exclusion of Africans from the industrial relations system or from the structuring and conditions in the public service; Africans were also the victims of a host of influx control and pass laws that did not affect others whose capabilities were not superior. As Pogrund (1975) observed: "Not a single Black is free from the determining force of these laws. They dictate the course of every individual's life: where he (or she) can live; where he can work; and, even, what sort of work he can do" (in Human et al 1984).

Discrimination within the market resulted also from the Group Areas Act (No. 36 of 1966). By providing for separate areas of residence and areas for business purposes, the Act restricted the vertical and horizontal employment opportunities of blacks. Such persons were denied job advancement opportunities – if such advancement meant moving to another area – because of the lack of accommodation. This meant that their chances of occupational mobility and improved pay were lower than for whites with the same capabilities.

Conclusion

The imposed imbalances of the past in the workplace are still reflected in the positions occupied. White males are in the majority in senior positions, out of proportion to their distribution in the total population.

The need for employment equity has been accepted, as indicated by the Employment Equity Act. Decision makers must avoid unfair discrimination, correct the imbalances in employment and be careful not to allow 'apartheid' in reverse.

According to former President Mandela (October 1991):

> The primary aim of Affirmative Action must be to *redress imbalances created by Apartheid*. We are not asking for handouts for anyone ... nor are we saying that just as a *white skin* was a *passport to privilege in the past*, so a black skin should be the basis of privilege in the future. Nor ... is it our aim to do away with qualifications. What we are against is not the *upholding of standards* as such but the *sustaining of barriers* to the attainment of standards; the special measures that we envisage to overcome the legacy of past discrimination are *not intended* to ensure *the advancement of unqualified persons*, but to see to it that those who have been denied access to qualifications in the past can become qualified now, and that those who have been qualified all along but *overlooked* because of past discrimination, are at last given their due. The first point to be made is that Affirmative Action must be rooted in principles of *justice and equality*. (Italics introduced by the author)

The forms of discrimination discussed impact directly and indirectly on employment equity opportunities of the vast majority of South Africans who are classified as "designated groups" in the employment equity legislation.

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ECITE is now an established platform for academics and practitioners from Europe and elsewhere who are involved in the study, management, development and implementation of IT/IS to come together and exchange ideas. The advisory group for the conference invites submissions of papers on both the theory and practice of all aspects of IT/IS evaluation. The conference in September 2001 is seeking quantitative, qualitative and experience-based papers from industry and academia. Topics may include, but are not limited to, the evaluation of e-commerce and e-business, intranets and knowledge management, as well as papers on general evaluation methodologies for both the appraisal and post implementation of projects. Other areas of interest include decision-making processes for new investments; the management of IT benefits, costs and risks; research methods for IT/IS evaluation; human and organisational aspects of IT/IS; the evaluation of IT project management; the management of IS development and IT departments; and the impact of IS on work and organisations.

Submission details:

Abstract details:	No more than 500 words to be received no later than 30 April 2001
File type:	Word for Windows
Submission:	By e-mail attachment to: conferences@mcil.co.uk
Full paper:	Only required on acceptence of abstract and not to be more than 5 000 words. Submission date will be no later than 31 July 2001

All abstracts received by the submission deadline will be considered for presentation at the Conference. Papers accepted will be published in the conference proceedings, provided that authors present their work at the Conference. Selected papers will also be considered for inclusion in the *Electronic Journal of Information Systems Evaluation*.

Important dates:

Abstract submission deadline:	30 April 2001
Notification of acceptance:	31 May 2001
Final copy of full paper due:	31 July 2001

Conference executive:
Ms Ann Brown, City University Business School, London,
Professor Egon Berghout, Delft University of Technology, e.w.berghout@its.tudelft.nl
Professor Arthur Money, Henley Management College, UK, arthurm@henleymc.ac.uk
Dr Dan Remenyi, Trinity College, Dublin, remenyid@tcd.ie

Conference committee:
The conference programme committee consists of key people in the information systems community, both from the UK and abroad. The following people have confirmed their participation:

Frank Bannister (Trinity College, Dublin), Egon Berghout – Joint Conference Chair (Delft University of Technology, Netherlands), Carole Brooke (University of Lincolnshire & Humberside, UK), Ann Brown – Joint Programme Chair (City Business School, UK), Sven Carlsson (Lund Universty, Sweden), Mike Cash (Butterworth Heinemann, UK), Aileen Cater-Steel (University of Southern Queensland, Australia), Yolande Chan (Queen's University, Ontario), Baggy Cox (Imperial College, London), Reet Cronk (Harding University, USA), Enrique Dans (Instituto de Empresa, Spain), Barbara Farbey (University College, London), Catherine Griffiths (Imperial College, London), Gus Liston (Irish Management Institute, Dublin), Roger Lundegard (Applied Value Corporation, Sweden), Arthur Money – Joint Conference Chair (Henley Management College, UK), Chris Morse (FI Group, UK), René Pellissier (SBL-UNISA, South Africa), David Pennington (Sainsburys plc, UK), Dan Remenyi – Joint Programme Chair (Trinity College, Dublin), Mike Sherwood-Smith (University College, Dublin), Elisabeth Somogyi (Team Consulting, UK), Claudine Toffolon (Lil Littoral University, France), Leslie Willcocks (Templeton College, Oxford) and Les Worrall (Wolverhampton University, UK).