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Swanepoel, Marinus

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Excellence in service: the enabling power of well managed technology

Marinus Swanepoel [(*)]
[(*)] Technikon Pretoria, P/Bag X 680, Pretoria, South Africa
E-mail: marinus@techpta.ac.za

ABSTRACT
One of the five main areas identified for this conference is **Technology Enabled Services for Cultural Heritage.** It can be stated as fact that all information services are reliant on technology to some extent.

The benefit of information technology in service delivery can only be achieved if it is well managed. This statement provides some background as to why it is necessary to manage information technology. Information technology is probably the fastest changing of all resources utilized in the information industry and therefore one of the more difficult resources to manage properly. A holistic and logical approach towards managing the information technology resources will go a long way in assuring success of the enterprise.
The paper proposes a meaningful way in which this can be achieved. The study is based on the premise that change management will provide useful guidelines for the management of information technology, as the rate of change experienced in the information technology arena is notoriously high. The resulting management model has some elements of technology management and change management and provides a way in which information technology can be maximized to provide an information enterprise with the competitive edge IT is capable off.

KEYWORDS: Information, Technology, Management, Model

INTRODUCTION
One of the five main areas identified for this conference is **Technology Enabled Services for Cultural Heritage.** It can be stated as fact that all services are reliant on technology to some extent.

However, the real benefit of information technology in service delivery can only be achieved if it is well managed. This statement provides some background as to why it is necessary to manage information technology. Information technology is probably the fastest changing of all resources utilized in the information industry and therefore one of the more difficult resources to manage properly.

It is observed that some managers are of the opinion that they are managing their IT if large sums of money are thrown at it. However, this is no guarantee that the competitive edge that IT can provide an enterprise with will be realized, nor is following the market trends or buying the latest and greatest the answer.

However, a holistic and logical approach towards managing the information technology resources will go a long way in assuring success of the enterprise or organization.

Even though many reasons can be found why IT in information services should

be well managed it is observed that there seems to be no generally acceptable way of doing so. Best practices and models for the management of IT in information services (or anywhere else for that matter) are curiously lacking in the literature (Swanepoel 2000:124).

RESEARCH QUESTION

The core problem that this study is aimed at solving can be formulated as: What is the most effective way (model) of managing changing information technology and how can the disciplines of the management of change and the management of technology be used to find such a way?

The hypothesis is that by integrating the knowledge on the management of change, the management of technology and criteria for evaluating information technology management models, an information technology management model suitable for application in an information service can be identified or designed.

In order to explain why the management of change was brought into the picture it can be mentioned that the underlying assumption was that because IT is a fast changing resource, clues how to best manage it will most probably be found in the discipline of change management.

METHODOLOGY

To accomplish the goal of this study namely, to find/develop an appropriate model for managing information technology, a thorough study and analyses of existing literature has been done.

The purpose of the analyses of the appropriate literature was not only to find information on the management of change, technology and information technology, but also specifically to find models in these subject areas. From these models and the theory on the management of change, technology and information technology 11 criteria to judge information technology management models by, were formulated.

The criteria have been sent to directors of academic information services of South African universities and technikons to be ranked. This empirical process not only identified the key criteria, but it also established what the priority order of the criteria were.

Information technology management models identified in the literature study have been critically examined and evaluated by means of the criteria ranked by the directors. The model that complied with the most criteria was the Consistency Model. It complied with four of the key criteria and was adapted to accommodate all of them. Still it was found lacking in the requirements of a successful model. This finding led the researcher to design a new model, accommodating all the key criteria and answering to the requirements of a successful model.

THE PHENOMENON OF CHANGE AND THE EXAMINATION OF CHANGE MODELS

By looking at the external environment of information services it is obvious that change is an inescapable phenomenon. Change has to be faced in all arenas of life, personal, organizational, technological and others. It was found in the literature that change has many aspects to it and that change is difficult to categorize because of this multifaceted nature.

The literature on the subject of change

management is bountiful and no less than twelve models or theories by means of which change in certain situations can be studied and clarified were found.

1. Force field analysis (Fossum 1989:13)
2. Configurational learning (Fossum 1989:17)
3. Gap analysis (Fossum 1989:19)
4. Innovative change (Cheese, Warren & Whelan 1995:1)
5. Leadership intervention (Burnes 1996:347)
6. Naca (notice, attitude, choice, action) cycle (Fossum 1989:25)
7. Systems theory (McLeod 1995:7)
8. Pendulum theory (Fossum 1989:29)
9. Business process re-engineering (Applegate & Zawacki 1997:19)
10. Grief cycle (Blair & Meadows 1996:19)
11. Oracle Organisational change management model (Pienaar 1998:90)
12. T.R.Y. change model (Moran & Brightman 1997:28)

In studying these models the objective was to identify design considerations that could be adapted to serve as criteria with which models for the management of IT could be evaluated.

Ten such design considerations were found and carried forward to a gross list and were ultimately incorporated into the eleven criteria.

TECHNOLOGY, INFORMATION TECHNOLOGY AND THE MANAGEMENT THEREOF

Subsequently a study of technology, information technology and the management thereof was conducted. I doing so more design considerations have been identified. During this process the search for technology management models produced eight models:

1. Fixed and changing technology models (Ironmonger 1983:50)
2. Industrial development model (Benkenstein & Bloch 1993:22)
3. S-curve model (Foster 1982:32)
4. Technology life-cycle models (*Institute for Futures Research*, 1992:188)
5. Systems model (Benkenstein & Bloch 1993)
6. Model for technology management (Best & May 1997:3)
7. Technology assessment toolkit as a model for managing technology (Henriksen 1997: 617)
8. Technical audit as a model for managing technology (Waterman & Neale 19? :3)

The literature searched for models on information technology management produced a further ten models:

1. Application planning model (Brain 1998)
2. Technology acceptance model (TAM) (Chau 1996:185)
3. Computer self-efficacy model (Henry & Stone 1994:25)
4. Information technology management model (Brain, Honeycutt & Soper 1997)
5. Model for change (Brunt 1994)
6. Multidimensional model of information resource management (O'Brien & Morgan, 1991:6)
7. Implementation success model (Mahmood, 1990: 12)
8. Consistency model of information technology management (Tan 1995:45)
9. Generic change model for

information systems (Jay & Smith 1996:68)
10. DeLone and McLean's model of information systems success (Ballantine 1996:6)

From the eight technology models and the ten IT models 24 aspects were identified, as design considerations. These design considerations were also carried forward to the gross list and were ultimately incorporated into the eleven criteria.

DEVELOPMENT OF VARIABLES FOR THE DESIGN OF INFORMATION TECHNOLOGY MANAGEMENT MODELS

The next step was to develop criteria with which to evaluate the models for the management of information technology with the purpose of identifying or developing an information technology management model suitable for information services.

When surveying the gross list, it was clear that some narrowly focussed design considerations were incorporated in more broadly formulated ones. To solve this, groupings were made of similar aspects. For example the following aspects/considerations were grouped.

- Scanning of the information technology environment.
- Cognisance of the impact of the external and internal environment
- Emergent change in the technological environment
- Driving and opposing forces with reference to technological change
- Technological change as an accelerating process
- The automatic improvement of technology when better choices are available
- Being on the lookout for inevitable technology change.

The heading "environmental scanning" was formulated as being embracive of the aspects in this group. The embracive formulated headings were used as criteria.

From the gross list of 34 design consideration eleven criteria were formulated to summarise all the considerations grouped together in the same way that criteria 3 (environmental scanning) is a summary of the eight design considerations above.

1. Vision of the role of information technology in the enterprise.
2. Integrated strategic information technology and business plan of the enterprise.
3. Environmental scanning.
4. Available resources in the enterprise.
5. Centralised management responsibility.
6. Information technology standards and architecture.
7. Technological forecasting.
8. Market analysis.
9. Man, or the human aspect with reference to his influence on and use of technology.
10. Evaluation of the information technology.
11. Risk assessment

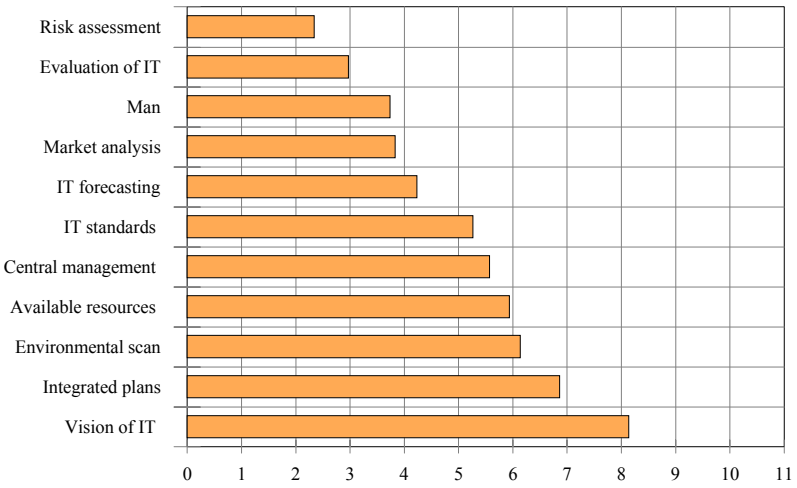

Figure 1: Average ranking of variables

This list was send to the directors of academic information services with the request to rank them as variables which should be included in a IT management model. The resulting list produced in this way reflects what variable the respondents deem more important than the other. The average ranking for each variable was calculated to arrive at the final order of priority.

The results of the ranking exercise have the variables arranged in the order of importance with 11 as being the most important variable and one as least important (on the scale of 1 - 11) as reflected in Figure 1.

The first step in any model building process is to identify the key variables because the usefulness of a model depends upon the correct identification of key variables (Rowley 1994: 82). A sound modelling principle with regard to the number of variables is to keep it as small as possible. This is supported by Jenkins (1979:26) who advises the modeller to aim for parsimony in parameterisation and to avoid over parameterisation.

From Figure 2 it is clear that there are six variables with significantly more support than the others, they are the key variables:

1. vision of the role of information technology in the enterprise
2. integrated strategic information technology and business plans of the enterprise
3. environmental scanning
4. available resources in the enterprise
5. centralised management responsibility
6. Information technology standards and architecture.

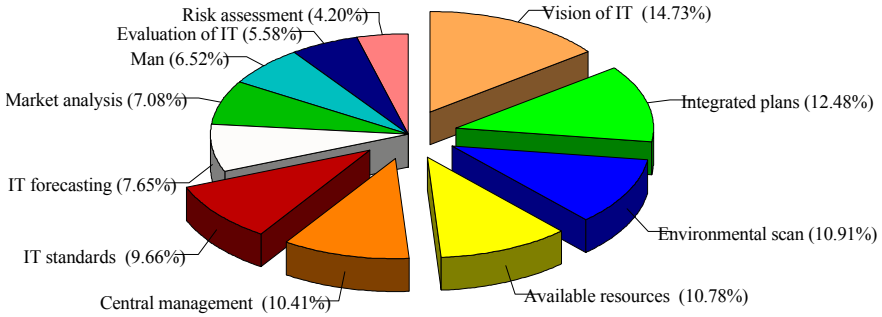

Figure 2: Identification of the key variables

When existing information technology models were evaluated these key criteria were used. It has also been established that there are relationships and influences between variables that could be used as additional measures for the evaluation of models.

EVALUATION OF EXISTING MODELS AND DEVELOPMENT OF OWN MODEL

Having identified the criteria to evaluate information technology management models with, the next step was to do it.

The process of evaluating the ten identified information technology models consisted primarily of determining the number of criteria each model comply with. The evaluation process turned up one model complying with four of the six key variables. An attempt was made to modify this model (the Consistency Model) to answer to all the requirements put to an acceptable model (the six key variables must be present, the model should portray the management process in a meaningful way and the identified relationships between the key variables must be clear). It was possible to adjust the model in such a way that all six key criteria were present. However, efforts to adapt the model so that the other two requirements also be met were unsuccessful.

Designing a new model

Subsequently the development of a new model was embarked upon. The result was a model which not only accommodated the six key variables but also satisfied the requirements of an acceptable model.

Value or purpose of the model

In deciding to develop a new model, a fresh look at modelling in operations research was necessary. Models in operation research usually take the form of equations. Although it is not the purpose to build a mathematical model the following simple equation does provide some insight into the use of models.

The equation is of significance because all models have this underlying

structure (Ackoff & Sasieni 1968:9):

$U = f(X_i\ Y_j)$ where

U = the utility or value of the system's performance.

X_i = the controllable variables.

Y_j = the uncontrollable variables.

f = the relationship between U and X_i and Y_j.

The value that this equation has for the effort of trying to develop a new model is that it underscores the importance of the value/result or product of the model. Up to this point all the attention has been focussed on the variables. The narrow focus on the variables had the result that the aim or value (U) of the model was lost. The value that a successful model for the management of information technology should confer to the enterprise is:

"Effective information technology contributing to the competitive advantage of the enterprise."

This insight made a significant improvement to the new model, changing it from a model concerned only with information technology, as illustrated in Figure 3, to a model putting the management of information technology in the context of its contribution to the enterprise, as illustrated in Figure 4.

Relationships between the key variables

The model, as displayed in Figures 3 and 4, contains only the six key variables and the relationships between them (Swanepoel 2000:176).

The relationships among the six key variables, numbered in Figure 4 are explained as follows: the relationship between

A. Environmental scanning and the vision of the role of information technology in the enterprise. In this relationship management has to judge whether the latest available information technology developments warrant any change in the vision they have for the role of information technology in the enterprise

B. Available resources in the enterprise and vision of the role of information technology in the enterprise. The availability of human and financial resources in the enterprise will affect the vision the manager has of the role of information technology in the enterprise: the more he believes that he will be able to obtain the necessary resources (money), the more challenging will his vision be.

C. The vision of the role of information technology in the enterprise and integrated information technology- and strategic business plans. The business plan may be technology driven or the information technology plan may be driven by the business plan.

D. The vision of the role of information technology in the enterprise and centralised management responsibility. The vision is the primary responsibility of the leader in whom the management responsibility seats.

E. The vision of the role of information technology in the enterprise and information technology standards and architecture. The information technology standards and architecture should be included and

determined by the vision of the role of information technology in the enterprise.

F. Centralised management responsibility and integrated information technology- and strategic business plans. From these two variables it is evident that the strategic information technology plan will, at least in part, originates from the information technology leader/manager and that this plan will of necessity have a significant impact on the strategic business plan of the enterprise.

G. Centralised management responsibility and information technology standards and architecture. When the standards and architecture have been decided upon the duty for applying them rests with the centralised management responsibility.

H. Integrated information technology- and strategic business plans and available resources within the enterprise in as much the existing physical hardware and software are a part of the available resources. This relationship shows that the available information technology resources will be increased/adapted to suite the business goals.

I. Centralised management responsibility and the available resources of the enterprise. Control over existing information technology infrastructure must be exercised centrally to ensure for example the adherence to standards.

J. Information technology architecture and standards and available resources in the enterprise. This implies that if standards/architecture are changed within the enterprise the necessary expertise will have to be bought. Also that should current hardware and software not comply with the set standards, it will have to be physically replaced or upgraded, putting pressure on the financial resources of the enterprise.

K. The available resources in the enterprise and effective information technology contributing to the competitive advantage of the enterprise. This is the ultimate relationship in the sense that if the information technology has been managed in the correct way, it will result in the enterprise being more competitive.

L. Effective information technology contributing to the competitive advantage of the enterprise and the vision of the role of information technology in the enterprise. The (positive or negative) effect of the contribution of information technology to the competitive advantage of the enterprise will either stimulate or inhibit the vision of the role of information technology in the enterprise.

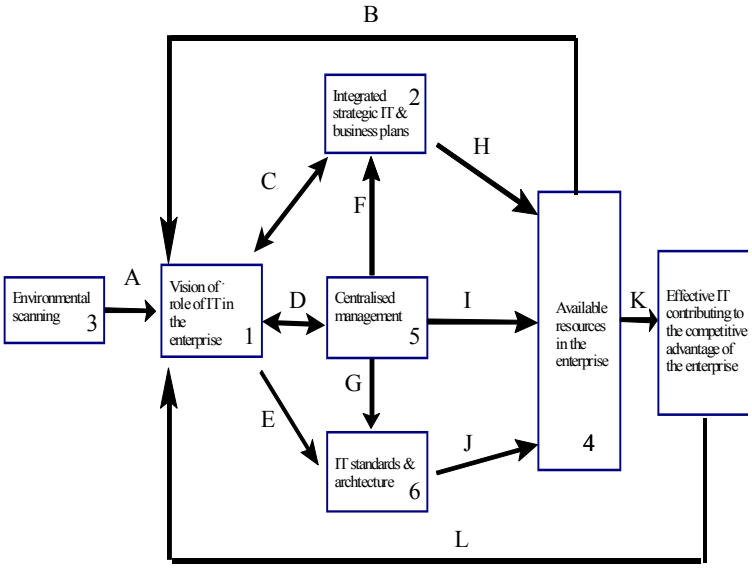

Figure 3: Model with key variables without value (U) COMPONENT

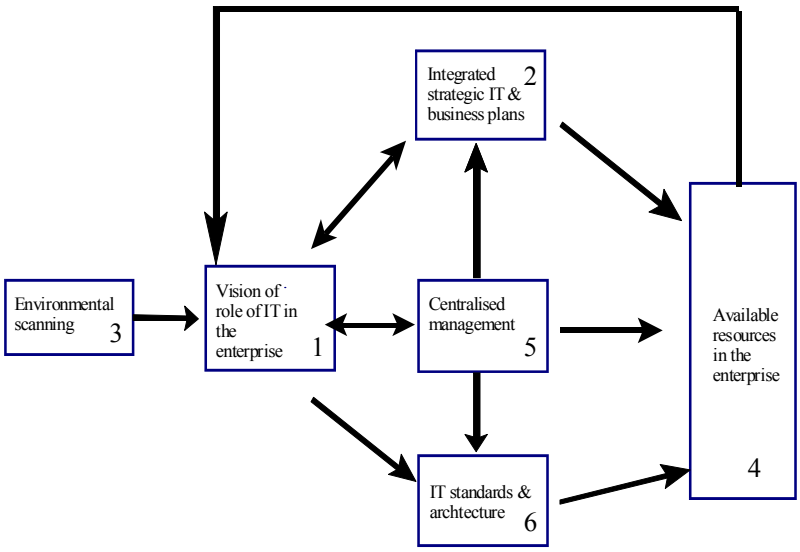

Figure 4: Model with value (U) component

CONCLUSION

Nigerian journalist Omololo Folobi has been awarded the 2000 Innovative Use of the Internet in Africa Award at the opening of the New Media Highway Africa conference in South Africa (SABC 2000).

Folobi won the award for starting an e-mail bulletin informing journalists about the high price his country pays because of HIV/Aids. Military rule and government control of information about HIV/Aids has made it difficult for journalists to disseminate information about the pandemic. Folobi's e-mail bulletin is cheap, easy to use and allows for feedback.

Folobi had the vision of what can be done with the new technology as far as his environment is concerned and he realised the benefit to be reaped from this technology. This positive outcome will surely motivate him to scan his technological environment for more (advanced) technology that he can apply in an even more visionary manner. He was in control of his newsletter and he determined the standard thereof. His IT plan is sure to develop in an integrated manner with his business plan as he discover that he can use the technology to do others tasks with and as he discover that the technology allows him to do new things he never thought of.

However in reality much of Africa is more like a dusty track than an information super highway. Similarly the road to information is not always tarred and the onramps are not always clearly marked. Even as new technology develops, it will remain a highway in the making. Whether you are in the rural areas of Africa or in a modern museum in some metropolis, taking charge of the technological environment of your information service by actively managing it by means of a plan will contribute greatly to reaping the benefits of the information super highway.

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ABOUT THE AUTHOR

Marinus Swanepoel is Director: Library Services at the Technikon Pretoria.

He obtained a masters degree in library and information science with a thesis: *Electronic source databases at South African universities and technikons*. His doctoral dissertation was titled: *An information technology management model for academic information services.*

Apart from fifteen publications, he has seventeen national and international papers to his credit, some were read in countries such as the USA, Taiwan, Estonia and Russia.