A COMPREHENSIVE ANALYSIS OF IT/IS INDIRECT COSTS: ENHANCING THE EVALUATION OF INFORMATION SYSTEMS INVESTMENTS

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Abstract

The level of Information Technology (IT) expenditure within organizations continues to increase over the years in an attempt to gain a competitive advantage in their respective industries. Nonetheless, IT projects still experience budget overruns taking into account the continual fall of hardware costs. This phenomenon presents a dilemma to managers who struggle to evaluate their investments in IT. Adding to the difficulty is the peculiar nature of such investments having Human and Organizational dimensions. Such dimensions are later translated into indirect costs that are both difficult to identify and quantify hence are ignored by managers which hinders the evaluation process. The lack of knowledge of managers about IT/IS indirect costs affect their ability to determine the true costs of deploying IT. It is closing the gap that this paper strives to explore a new method for identifying, managing and controlling IT indirect costs through a case study enquiry of a leading gold producing company. The research establishes a rational that goes beyond the traditional quantification appraisal of costs which is inadequate in the case of indirect costs. It proposes a solution that helps to thoroughly identify the indirect costs, mitigate their effect and achieve the desired control while enhancing the evaluation process through their inclusion.

Keywords: IT/IS, costs, evaluation, investments, case study,

1   INFORMATION SYSTEMS INVESTMENTS

Organisations increasingly rely on Information Systems (IS) to acquire a competitive edge, with this often translating into an increased budget allocation to support their investments in an IS infrastructure. The purchase of IT and development of an IS are seen as a source of increasing cost and concern to management (Heo and Han, 2003; Legris *et al.,* 2003). According to the World Information Technology and Services Alliance (WITSA) (2005) report, Global IT spending is expected to increase from $US 2.1 trillion in 2001 to nearly $US 3.7 trillion in 2008, with a compound growth rate of 7.7%. Furthermore, the latest Mclean report (2005) indicate that the IT budget-to-revenue ratio ranges between 1.1% for construction firms, and 7.5% for banking and financing firms. In line with the rapid advancements in IT, and with the cost of technology continuing to fall, it is no longer efficient for management to try and reduce direct infrastructure costs alone, as competitors are able to secure similar, if not the same discount on hardware and software.

There is the widespread recognition of the need to consider the social and organisational implications associated with the adoption of IT/IS from a cost perspective, if management are

to seek competitiveness through reducing their IS costs. Adding to the complexity of socio-organisational cost identification and evaluation, there is then the difficulty of their accommodation within the portfolio of investment appraisal techniques available to management (Irani and Love, 2002). As IS increasingly evolves with the needs of the business environment, through the use of improved integration technologies, any robust evaluation process will require a deeper understanding of the cost implications throughout the IS project's lifecycle (Irani *et al.,* 2003). In doing so, allowing managers to develop a better understanding of the implications associated with their investment as it matures and evolves. It is here where this dissertation attempts to address a void in the literature, through developing a frame of reference that will allow decision-makers to navigate through the portfolio of cost taxonomies for IS evaluation.

2   INFORMATION SYSTEMS INVESTMENTS EVALUATION

IS investments differ in nature from other capital investments, as there is a substantial human and organisational interface (Irani and Love, 2002) along with characteristics such as high risk, long-term return with erratic timing of cash-flows, portfolio of benefits, and significant proportion of intangible/hidden costs (Milis and Mercken, 2004). Despite these characteristics, IS projects are often evaluated using the same traditional appraisal techniques as those used for other more traditional capital investments, such as facilities' purchase or manufacturing systems. Milis and Mercken (2004) summarise the reasons for the use of such traditional appraisal techniques as being:

- Financial manager's favorite choice
- No approved alternative
- Based on generally accepted principles
- Measure the firm's primary objective
- Well known and understood

Appraisal techniques are used by decision makers to support their evaluation of an investment case. Irani and Love (2002) identified some of the reasons why companies appraise IT/IS and though they highlihgt the importance of investments' appraisals Primose (1991) points out that "many managers view project appraisal as a financial hurdle that has to be overcome and not as a technique for evaluating the project's worth".

3   IT/IS COST TAXONOMIES AND FACTORS

The problem of IT/IS cost identification remains one rooted in the experiences and knowledge inherent in individuals or project teams. According to a survey by Gardnier and Stewart (2000), 63% of all IS projects experience budget overrun, usually between 40 and 200%. One reason behind such an increase in the projected budgets would be that some managers are not aware of the full cost implications of IT/IS investments, such as the indirect costs associated with them. Bannister *et al.* (2001) argue that one of the difficulties presented by IT costing includes a question of cost identification. As managers are becoming aware of the various costs of investment, they tend to face the difficulty of identifying, managing and controlling these costs (Irani and Love, 2001). According to Powell (1992), there is a need for a mechanism to identify and allocate IS costs. Yet managers generally do not have the knowledge and experience to identify and manage them (Irani and Love, 2001). What makes

the process of identification and allocation more complicated is that different kinds of costs occur within and outside the scope of the IS function (Paula and Laurence, 1997). Furthermore, it is the difficulty of identifying these *often* hidden costs, together with not being able to adequately support their control and reduction, that frustrates many project champions. Driven by all these facts, a critical review of the cost taxonomies was undertaken to establish an understanding of the various models available for practitioners, and identify the various indirect cost factors that have been identified in the literature. Thus in culminating the limited literature in the area of IT/IS cost evaluation, Table 1. presents a summary of cost taxonomies that will be analysed in more detail in the following sections.

Taxonomy	Description	Author
Initial/Ongoing costs	Costs identified and assigned during systems' lifecycle. However, they tend to be retrospective, which makes their consideration during ex-ante evaluation difficult. Yet, as legacy systems and enterprise solutions become more integrated, such cost taxonomies warrant closer consideration in terms of identifying their respective cost elements	**Dier and Mooney (1994)**
Financial/Non-financial activities	These costs are classified according to the activities causing them, thus emphasising a causal relationship. Hence, reactive in nature	**Kusters and Renkema (1996)**
Initial investment/Ongoing costs	Based around costs relating to development of an IS infrastructure (initial investment) and its operation (ongoing cost)	**Remenyi *et al.* (1996)**
Development/Hidden costs	Costs related to purchasing, installing, training, and testing system	**Anandarajan and Wen (1999)**
Social Subsystem costs	Costs that reflect changes in social subsystem brought about by new IT Infrastructure	**Ryan and Harrison (2000)**
Direct/Indirect costs	Direct cost element assigned to IT component, whereas indirect element relates to effect of IS on organisation and people	**Irani and Love (2001)**
IS cost divisions – Management, Employee, Finance, and Maintenance	Identifies set of cost factors and sub-systems that impact on organisation. However, falls short of identifying performance measures	**Mohamed and Irani (2002)**
Acquisition/Administration: Control and Operation costs	Identifies set of cost factors that constitute Total Cost of Ownership of IT	**David *et al.* (2002)**

Table 1.   Cost Classification Models

These cost taxonomies offer a variety of cost classification perspectives, but mainly identify and include the direct quantifiable costs associated with IT investments. The taxonomies fail to identify the indirect costs apart from Irani and Love (2001) and Mohamed and Irani (2002). While there is a resemblance between cost some of them (even though they are listed under different taxonomies), yet none of the cost factors listed has been included in all of the taxonomies including the direct costs. The limited presence of indirect costs within the various cost taxonomies could be attributed to the difficulty to identify and quantify those costs. In other words, even if these costs could be identified by managers they would add to the complexity of investment justification and appraisal as they cannot be quantified in monetary terms and hence are difficult to measure. But Irani et al., 2002 explains, indirect costs cannot be avoided as their effect would appear once the implementation of the project is initiated. Hence, managers who choose to avoid the indirect costs by not including them in the overall cost portfolio are only delaying the effect of those costs and are not eliminating it.

The research presented in this paper strove to find a solution and an alternative for the problem of indirect cost identification and management by not looking to indirect costs as actual costs but as 'incidences' that need to be (a) *identified,* which not only includes knowing that they would occur for a particular project but also knowing when they occur (during which stage of a project's lifecycle) and what drives or cause such incidences to occur in the first place. Then we need to plan for the (b) *management* for such cost 'drivers' and try to mitigate their effect so that they do cause the actual indirect cost to occur. Hence, by better *identification* and *management*, (c) *control* over indirect costs can be achieved. Thus when managers can identify, manage and control indirect costs, they would be more willing to include it in the investment proposal and cost portfolios.

4   RESEARCH METHODOLOGY

A preliminary research was undertaken prior to the case study presented in this paper that aimed at confirming the list of indirect cost that was culminated from the cost taxonomies presented in Table 1 (see Ghoneim and Irani, (2005) for more details). A quantitative exploratory survey was conducted to confirm the list of indirect cost identified from the literature and also identify new indirect costs that exist in practice but missing in the literature. The results of the survey confirmed all of the indirect cost factors that are to be further investigated in the case study to be presented in this paper. The author decided to use a qualitative research strategy in the form of a case study inquiry to gain insight of the nature of IT investments in practice and identify the drivers for the indirect costs as well as management strategies for such drivers.

Data was collected from a variery of sources including interviews (structures, semi-structured and unstructured), documentation (reports from the organization, reference material from the internet, and news paper articles), archival record (list of cost items budgeted for previous IT projects) and direct observation (formal and informal meetings with interviewees to gain further insights)

5   CASE STUDY – GOLDCOMP

GOLDCOMP, headquartered in Johannesburg, is a leading global gold producer with 22 operations on four continents. The company conducts an extensive worldwide exploration programme and is involved in gold-mining, refining, and development of gold deposits. The

company was formulated through the merger of GOLDCOMP and a major rival company following a disciplined acquisition strategy that the company adopted since it first started in 1998. This business merger formed Africa's foremost gold producer and one of the world's leading resources companies. GOLDCOMP employs 65,400 people, including both permanent employees and contractors. The company operates in 10 countries, namely Argentina, Australia, Brazil, Ghana, Guinea, Mail, Namibia, South Africa, Tanzania and the United States of America, and is supported by extensive exploration activities. The combined Proved and Portable Ore Reserves of the company amounted to 79 million ounces at the end of 2004. The net profit for 2004 was $100 million, with capital expenditures of $585 million and an expected $655 million in 2005.

As the company expanded through the acquisition of smaller competitors worldwide, this resulted in a mixture of cultural environments and work habits. The mixed cultures caused the company to inherit a loose management style through the decentralisation of the business processes, which in the light of this research is showing in the lack of a standardised financial system which affects how investments are appraised and evaluated in each region. Although all major investments decisions are made in Johannesburg, each of the 8 regions is self-managed. In other words, all non-mining investments decisions are taken locally, and then procedures followed for investments' justification and evaluation are determined by the CFO, and moreover, they even differ from one subsidiary company to another.

5.1   Nature of Information Technology Decision-Making Process

The nature of IT decision-making is affected by two factors, namely the nature and culture of the company, and the sector it belongs to. In the case of GOLDCORP, as expressed by the Business Systems Manager (BSM), because of the way the company has evolved, taking over other companies, and has not put into place a common structure, every region still has its own processes and policies that have been used since each company operated individually.

In addition, GOLDCOMP, as a resource company, gives less attention to investing in IT projects. It fails to see the non-financial benefits of investing in a new technology; its judgment is based solely on financial returns, as the Business Systems Coordinator (BSC) explained. One factor that affects the IT investment decision-making is the management model adopted by the company. In the case of GOLDCOMP, there is no worldwide strategy for IT adoption; there is no standardisation or integration between the different business systems; they operate globally on a stand-alone basis. When asked if the business systems differ from one region to another the, BSC explained:

"Yes, definitely, I know that in South Africa they have a range of legacy systems; they have a large internal IT support team who maintain and develop them."

GOLDCOMP invested in IT for two main reasons, namely due to compliance issues or to necessary upgrades in software when support for old systems is not offered by the vendor. This shows that its investment strategy is a reactive one that only reacts to changes in the environment. This implies that IT is not considered as a strategic investment to the company, although it is used in every aspect of its business. In other words, IT comes second in the capital investment agenda. When asked about IT being considered a strategic investment, the BSC replied:

"I think historically it has been seen more as just it has been done because it had to be done. It has not really been viewed in a strategic way."

In addition, what makes IT a non-strategic investment is the nature and focus of the company, as the BSM indicated:

"It is the focus of the company; their main business is producing gold, not developing clever business systems. They cannot see how IT can improve their overall productivity."

The main priority for the company has therefore always been the development of the mine sites and supporting them, which are more of a technical process. The Senior Consultant (SC) involved in the SAP portal summarised GOLDCOMP's behaviour towards IT investments in one sentence:

"They do not care about IT!"

This behaviour and attitude towards IT investments could have a cascading effect on the adoption process (i.e. justification, evaluation, implementation, and post-implementation processes), and subsequently how well the indirect costs are identified and included within budget proposals. Furthermore, the level of IT expenditure depends on the fluctuation of the resource prices and how well the company is doing in terms of its production and sales. Another fact is that IT investment proposals have to compete against the favourable exploration and mining projects. Furthermore, GOLDCOMP does not have a cost allocation scheme or guideline to follow during investment proposals' preparation, and budget setting.

A major issue that affects investments' justification in general at GOLDCOMP is the fairly relaxed management model, according to both the Project Manager (PM) and the SC. The SC explains:

"It is a big company that is operated like a small company. It does not have a lot of bureaucracy and does not have a lot of standard methodologies, and so. Decisions are made without a great deal of formality and rigour."

This is turns had its effect on investments decisions which was an SAP portal. Before the involvement of the third-party consultation firm, the CFO at GOLDCOMP had already made his decision to invest in the SAP portal. When asked about whether or not having a proper justification and evaluation of the portal project affected the investment decision, the Senior Consultant (SC) for the project replied:

"Yes… I think if we had done a thorough evaluation, we might not have gone ahead with the SAP portal, and chosen a different product."

Acorrding to the BSM there was not any cost-benefits analysis done and they thought that the SAP portal was the logical solution so they needed to do nothing regarding appraising the investment decision.

As was expressed in the previous sections, any strategy concerning IT is a reactive one, and this is due to the nature of GOLDCOMP, as described by the BSC:

"I think it has just been the culture of the company previously, that it started as a small company, and it grew, but there was never really any formal approach to the management of IT. And there just had not been seen a need for it."

5.2   Information Technology Indirect Costs

The only costs that are included in GOLDCOMP's IT investment budgets are the direct initial acquisition costs of software and hardware. When presented with the list of indirect costs the according to the BSM, are all incurred during IT projects.

"I do not see any that we do not incur"

According to the BSM, the main barrier to the identification of the indirect costs associated with IT investment is not having a proven process or methodology, and then having the time to use it to identify the costs. A process that is accurate and reliable that somehow tracks the time spent on certain processes and assigns some sort of value against the time spent on them. Also, to be able to look at how someone is spending his/her time and accurately measuring the time spent on his/her various tasks. Another main barrier, according to the BSC, is that the indirect costs are not avoidable, and as such they are not worthwhile identifying, but later he changed his opinion when presented with the idea of managing instead of avoiding, based on literature evidence that indirect costs cannot be avoided by neglecting them; rather, they can be better managed through better identification and planning. This was also the opinion of the SC who confirmed the literature facts by commenting:

"They might be unavoidable, but are they unmanageable?!"

As for the PM, he thinks that one of the barriers is that some managers are naturally not aware of the existence of such costs. In addition, some of the managers might be somewhat scared to introduce an investment proposal with such a massive figure or list of indirect costs. Thus, they may be aware, but they do not bring it out very openly to senior management, because they might be worried that the project is rejected. Another barrier would be that managers might not be able to plan for these costs. And although the decision to invest in IT does not solely depend on accurate cost figures, producing an accurate estimate of the indirect cost factors would certainly, according to him influence the decision-making body to go one way other than the other, and thus might weaken the chance of an IT project proposal getting accepted, in addition to the difficulty in assigning a monetary value to each cost factor.

Each of the interviewee was asked to confirm whether he would agree on each of the indirect cost factors presented in the list and indicate whether was not each of the costs was incurred by his organization, when was it incurred and what drivers could be liable for each cost. Also each interviewee was asked to provide his opinion for proposed management strategies for each driver and subsequently the indirect cost itself. The results of this exercise were compared and cross-checked and a final table that presented the indirect costs factors, drivers and management strategies was formulated. (see Appendix A). Such a comprehensive table would enable managers to better identify each indirect cost, know when to anticipate its occurrence, how frequently it occurs (once or several times over the different lifecycle stages), its drivers as well as strategies to reduce their impact. This table can act as a frame of reference for IT/IS related indirect costs as an alternative to the problem of identification, quantification and measurement which hinders there inclusion in the evaluation process. The author is limited by the size restriction of this paper and hence it would not be feasible to present further implications and outcomes of the case study research in greater details. However, an interesting observation was concluded which is that all of the indirect costs factor (when incurred) lead to loss in productivity which can be measured in monetary terms. The main point is that rather than avoiding the indirect costs which can be up to four times greater than the direct costs, managers are offered an alternative method to dealing with such

costs. Such a method would not only enable them to identify the costs but also be able to manage and control through early detection and mitigation.

6   CONCLUSION

The process of IS evaluation is one through which managers identify and appraise the perceived benefits, costs and risks of an investment. There are many models that exist in the normative literature, which seek to assist managers in identifying the costs associated with their investments in technology; however, experience is often the overwhelming influence. What makes the evaluation of IS investments difficult is the set of social and organisational aspects that interplay, and the increased recognition of their importance in technology management that translate to indirect human and organizational costs. These indirect costs are difficult to *identify*, *quantify*, *manage,* and then *control*. Yet, such costs cannot be avoided nor ignored, and cannot be accommodated within existing *traditional* economic appraisal techniques, although increasingly, emerging approaches such as the balanced score card are sympathetic to their consideration. The reason for this is that traditional appraisal techniques are based on conventional accountancy techniques, which cannot accommodate costs that are not financially quantifiable. The paper hence introduces a novel method for overcoming the shortfalls of the traditional appraisal techniques through a non-numerical view of such costs. The resulting method enhances the identification, management and control of indirect costs in an effective and efficient way. The method also increases the probability of the successful implementation of IS investments as problems are identified beforehand along with suitable solutions.

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Appendix A: GOLDCOMP's Indirect Cost Factors, Drivers, and Management Strategies

Indirect Cost Factors	Incurred	Lifecycle Stage	Drivers	Reducing Impact
Management and staff resources (integrating computerised administration and control into work practices)	Y	Ongoing. Throughout project	• Availability of staff • Number of people needed to be involved • Time affected by complexity of change needed	• Pre-planning for staff involvement. • Hire consultants
Management time (devising, approving, and amending business plans)	Y	Start of project Ongoing (fluctuates)	• No clear defined business plan • Not enough time for steering committees. • No defined technique for time management	• Proper consideration and allocation of management time
Cost of ownership (system support and troubleshooting costs)	Y	Implementation Maintenance	• Political reasons to gain support for investment • Identification and planning for support and maintenance costs • Avoiding including it in initial budget estimation	• Planning and presentation of estimate figure during planning
Management effort and dedication (to explore potential of the system)	Y	Ongoing (ad-hoc)	• Time allocation • Commitment of management	• Governance process (involving representatives from each department)
Employee time (to explore	Y	Implementati	• No planning for employee time	• Planning for

potential of the new system)		on	• Not identifying stakeholders of system	training and accounting for time needed for it

Appendix A: GOLDCOMP's Indirect Cost Factors, Drivers, and Management Strategies (continued)

Indirect Cost Factors	Incurred	Lifecycle Stage	Drivers	Reducing Impact
Employee training (being trained to use the system and training others)	Y	Implementation	• Time management • Training location (transportation expenses and time) • Number of employees	• Conducting training on-site • Conducting training outside normal working hours
Employee motivation (maintaining employee's interest in computer-aided tasks)	Y	Ongoing	• No employee involvement	• Employee involvement
Staff turnover (increasing interview and training costs)	Y	Implementation	• Loss to competitors • Becoming highly skilled • Personal reasons • No motivation or reward scheme	• Keep staff motivated • Fair reward scheme
Productivity loss (developing and adapting to new systems' procedures and guidelines)	Y	Implementation	• Change management • Employee training • Employee involvement • Employee motivation	• Quality of change management (better planning for change)

Strains on resources (to maximise potential of the new system)	Y	Ongoing Peaks at end of implementation	• Availability of human resources	• Planning for human resources needed beforehand
Organisational restructuring (IS brings change to the organisation hierarchy, and job redefinitions)	N	Planning Implementation	• Difficulty of making changes to organisation	• User involvement • Careful planning

Appendix A: GOLDCOMP's Indirect Cost Factors, Drivers, and Management Strategies (continued)

Indirect Cost Factors	Incurred	Lifecycle Stage	Drivers	Reducing Impact
Business process reengineering (BPR) (redesigning of organizational functions, processes, and structure)	Y	Planning Implementation	• Difficult to get approved by managers • Time-consuming • Costly	• Concept of benefits' realisation through BPR
Changes in salaries (as employees become more skilful)	Y	Implementation	• Employees who took part in project team	• Incentives • Motivations
Opportunity cost and risk (allocating majority of funds to one single project, resulting in wasted opportunities regarding other projects)	N	Planning	• Inappropriate allocation of funds to less-beneficial investments	• Proper evaluation of investments
Hardware disposal (include administrative and accounting, logistics, processes for necessities	Y	Implementation Phasing out	• Users not willing to give up their old equipment on the same day • Disposal of dispersed terminals	• Planning for disposal in a realistic way

	Incurred	Lifecycle Stage	Drivers	Reducing Impact
such as inventory, hard drive erasure, and downtime)				
Disruption (the time spent by IT staff responding to user enquiries rather than doing their main tasks)	Y	Development Implementation Pashing out	• The implementation of new systems • Number of departments and users involved in the system development	• Planned for in the form of task management
Learning (Users of a new system go through a learning curve accompanied by a temporary loss in productivity	Y	Implementation	• No proper training • No Familiarization	• Proper training to reduce the learning curve and disruption time

Appendix A: GOLDCOMP's Indirect Cost Factors, Drivers, and Management Strategies (continued)

Indirect Cost Factors	Incurred	Lifecycle Stage	Drivers	Reducing Impact
Covert resistance (hidden employee resistance towards using the system)	Y	Planning Implementation	• Trying to change business processes • The bigger the system, the bigger the change, and the bigger resistance	• Proper training • User involvement
Redefining roles (changes to the organization's hierarchy, may lead to the introduction of training, redundancy, and promotion)	N	Planning Implementation	• Impact of big systems • Organizational restructuring	• Planning for change • Training • User involvement
Integration (staff members who are influenced by a new system will	Y	Implementation	• Time needed to integrate • People do not integrate	• Planning the introduction of the system

take time to become used it, and fully performing their usual activities)			naturally	• Proper management of the integration process • Stakeholders identification • User involvement
Displacement (people and operations have to be re-allocated to accommodate a new system)	N	Implementation	• Relating the concept of displacement with redundancy	• User education about the purpose of displacement
Reduction in knowledge base (reduction of labour costs might cause high staff turnover, resulting in change in knowledge base of organization)	Y	Implementation	• Joining competitors for higher salaries • Employees leaving for personal reasons	• Offering high incentives to knowledgeable employees • User involvement to increase loyalty and reduce turnover • Value their opinions and beliefs

Appendix A: GOLDCOMP's Indirect Cost Factors, Drivers, and Management Strategies (continued)

Indirect Cost Factors	Incurred	Lifecycle Stage	Drivers	Reducing Impact
Deskilling (assigning less demanding tasks to high-skilled employees)	Y	Implementation	• Automating processes previously performed manually by employees	• Assigning more tasks to skilful employees • Involvement in applications and managerial areas where expertise is appreciated • Planning in advance worth of employees
Redundancy (making redundancy	Y	Planning	• Fewer people needed to	• Identified in advance

payments to workers during redeployment or rationalisation of staff)		Implementation	perform tasks	• Planned for and managed delicately
Moral hazard (state where IS managers use decision rights to maintain own interest rather than trying to meet organisational objectives)	N	Planning Implementation	• Not conducting proper evaluation	• Governance process
Beliefs, feelings, and perceptions (implementation approach not taking beliefs, and perceptions of personnel into consideration)	Y	Ongoing Planning Analysis Design Implementation	• Not identifying pool of stakeholders • Not considering users' beliefs, feelings and perceptions.	• User involvement to ensure opinions and concerns are expressed and dealt with