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The enigma of evaluation: benefits, costs and risks of IT in Australian small–medium-sized enterprises

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Abstract

The evaluation of information technology (IT) is fraught with misconception and there is a lack of understanding of appropriate IT evaluation methods and techniques. The benefits, costs and risks of IT need to be identified, managed, and controlled if businesses are to derive value from their investments. This paper presents findings from an exploratory study that used a questionnaire survey to determine the benefits, costs and risks of IT investments from 130 small-to-medium-sized enterprises (SMEs) in Australia. The analysis revealed that organizations from different industry sectors significantly differ in the amount they invest in IT but that firm size (in terms of turnover and number of employees) does not influence IT investment levels. Second, strategic benefits vary across different industry sectors. Third, the way employees adapt to change as a result of IT implementation depends on the size of the organization. Based upon the findings, a series of benchmark metrics for benefits, costs, and risks of IT are presented. It is posited that these can serve as a reference point for initiating a quality evaluation cycle in which benchmarking forms an integral component of the strategic process.
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Keywords: Australia; Benchmarking; IT evaluation; SMEs

1. Introduction

As businesses continue to invest in information technology (IT), there is a growing awareness of the need to derive value from them. This is especially the case for small to medium-sized enterprises (SMEs), as poor IT investment decisions can have a critical impact on organizational profitability [2,3]. The investment required to meet most of the reorganization costs arising from the adoption of IT, as well as the associated risks involved in these projects, typically exceeds the budget and the capabilities of an average SME [51–53,63]. Yet, scant attention has been paid to IT evaluation and benefits realization in the context of SMEs [4,5,38] especially in Australia [24,42]. SMEs are a major business sector in the industrialised world

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and have been recognized as making a significant contribution to gross domestic product [48]. IT can contribute to improving their performance [9,33,71], yet without an effective IT benefits management strategy in place, the desired performance improvements may not materialize and thus IT may be deemed an investment sinkhole. This study used a questionnaire survey to explore the benefits, costs, and risks experienced by 130 Australian SMEs.

2. Benefits, costs, and risks of IT

2.1. Benefits management

Benefits management comprises a range of management activities designed to ensure that an organization realizes benefits from an investment [23]. Managers can use an array of appraisal techniques to quantify in financial terms the amount and timing of benefits associated with implementing IT [15,32]. This enables decision-makers to decide between competing investments. Some of the most common techniques used by Australian business managers have been identified as *return on investment*, *internal rate of return*, and *net present value* [41]. Such methods are built on the underlying rationale that the cost of an investment needs to be related to the benefits. One of the problems with this is that the costs tend to be incurred immediately, whereas benefits occur in the future. The longer the delay in receiving the desired benefits, the greater the *risk*, which thus needs to be factored into the justification of IT investment. Unfortunately, actual realization of benefits is modified by future conditions, and a countless array of factors beyond the control of decision-makers. Additionally, those involved with the IT justification process will invariably make subjective judgements, based on their different interpretations of future costs, quantification of tangible and intangible benefits and their view of how technology will affect the work activities of all the stakeholders [46,57,62].

Assessing the benefits from these services is a complex task and very difficult to implement [43,54,55]. To assist managers and decision-makers, a number of frameworks have been developed [6,31,39,40,65]. For example, IT benefits have been classified as *strategic*, *tactical* and *pecuniary* [16,17]. Similarly, Peters [50] proffered that the benefits of IT typically fall into three categories: *enhanced productivity*, *business expansion* and *risk minimization*. Farbey et al. [22] and Irani and Love have categorized IT benefits as *strategic*, *tactical*, and *operational* but acknowledge that benefits at the strategic level are arduous to quantify as they are 'soft' and uncertain. Indeed, traditional investment appraisal techniques are no more accurate than intuition when it comes to measuring strategic benefits [8]. Tactical and operational benefits focus on efficiency gains within specific processes, functions, or departments and so are able to be identified and quantified much more readily.

The evaluation process has become more complex with the emergence of interorganizational systems. Previously, benefits could be measured with a transparent financial business case made for the investment of IT [59]. With the emergence of electronic customer relationship management (e-CRM), and enterprise resource planning (ERP), the identification and quantification of benefits has become even more complex and challenging [1,64]. The pay-off from implementing such technologies cannot be controlled and invariably depends on other business functions [18]. Changchit et al. [13] suggested that the ''dynamic nature of IS, the variety of technical options readily available, the uncertainties of projected pay-offs, the potential presence of intangible benefits and stakeholders contribute to the problem of benefit identification.'' While the process of benefits identification can contribute to the success of an IT implementation, organizations find the evaluation process difficult and tend to use notional arbitrary values for assessing benefits. In large Australian organizations, Lin and Pervan found that 45% did not prepare a benefits delivery plan. Furthermore more than half of the organizations could not determine whether expected benefits were being achieved. Inadequate and inappropriate appraisals/evaluation processes have been found to be the most important inhibitors to effective IT evaluation [37,58,61].

2.2. Costs

Difficulties in measuring costs lead to uncertainty about the expected benefits and hence are a major constraint to IT investments [56,60]. Although these

costs often exceed the estimate, it is the focus adopted by management that dictates the project's budget, and its justification.

Direct IT costs are due to the implementation and operation of new technology. Interestingly, Ballantine et al. suggested that straightforward payback investment evaluation techniques are appropriate for SMEs since the majority of them use IT for automation. Even so, direct IT costs are often underestimated and go beyond the obvious hardware, software and installation costs. Initial cost estimates are often governed by the performance characteristics established by an IT manager during the system requirements planning stage. These often change during the testing and implementation stages. They may include unexpected need for hardware and storage devices, etc. Installation and configuration also tasks involving direct costs; they also include consultancy, installation and maintenance, and networking hardware/software support.

Indirect costs are more significant than the direct costs. They are not simply restricted to human factors, but also encompass organizational costs relate to the transformation from old to new work practices and any influence of the system on work activities. At first, a temporary loss in productivity may be experienced: employees go through a learning curve while adapting to new systems, procedures, and guidelines. Additional organizational costs may also be experienced due to management's attempts to capitalize on the wider potential of the system at the business and project level; management attempts to integrate information flows and increase its availability and may change their corporate shape by reducing their number of management levels [29].

Management time is the most significant indirect cost in many organizations. Invariably it is spent leading, planning, and integrating new systems into the work practices. The use of new technologies may also force management to spend time revising, approving, and amending IT related strategies and in investigating the potential of IT. Unfortunately, the majority of organizations cannot afford the time or resources to perform evaluation of benefits and impacts. Clearly, such indirect costs associated with employee pay and rewards, together with the cost implications of increases in staff turnover need capturing, and bringing into the IT decision-making arena. Research undertaken by Ballantine et al. revealed that more than a third of respondents could not estimate the relevant opportunity cost and/or the cost of supporting IT in relation to the original purchase price. Those respondents that did provide an estimate thought that the cost was a small fraction of the original cost of acquisition and less than 20% of their original purchase price.

2.3. Risk

IT projects are renowned for their high failure rate. Given this, organizations must improve their ability to manage the risks so that projects can be delivered successfully [26,28,34,70]. According to McFarlan [45] and Willcocks and Margetts [67] risk refers to exposure to such consequences as failure to obtain some, or all, of the anticipated benefits due to:

- implementation costs being higher than expected;
- technical systems performance significantly below the estimate; and
- Incompatibility of the system with selected hardware and software.

Risk management is an essential process for the successful delivery of IT projects, however there is evidence that the lack of risk identification and management is a major contributing factor to project failure—especially for SMEs [7], which frequently suffer from limited IT competencies and poor understanding of IT capabilities and the risks involved [12,21]. The assessment of risk during the justification process allows managers to identify outcomes that may adversely influence behavioural, structural, and strategic aspects within the organization [35,36,44]. In addition, it is important to consider the risk of computer systems security breach and the costs of systems breakdown for the organization [10,20].

3. Research methodology

A questionnaire survey was designed to elicit data about the IT evaluation processes of SMEs during the development of their information systems infrastructure. The taxonomy of IT benefits (strategic, operational and tactical) and costs reported in Irani and Love were used as the underlying constructs. The risk

variables were derived from Willcocks and Griffiths [69].

Definitions of an SME can be found in the literature; typically they consider the number of people employed [11,14]. In this paper, an SME is defined as employing less than 250 people.

3.1. The pilot and survey samples

Stratified random sampling was used to select the study sample from the 'Yellow Pages' telephone directory. Prior to the main study, a pilot survey of several selected organizations was conducted to test the potential response rate, suitability, and comprehensibility of the questionnaire. Each organization was contacted by telephone and informed of the aims of the research. On obtaining their consent, the questionnaire was mailed, with a stamped addressed return envelope enclosed, for respondents' returns, comments, feedback, and completion. The respondents were also asked to review the design and structure of the survey. All comments received were positive, and the questionnaire remained unaltered for the main survey. The response rate for the pilot survey was 100%.

In the main survey, 250 questionnaires were mailed to businesses throughout Australia; 130 valid responses were received, representing a relatively high response rate (52%).

3.2. Sample characteristics

Table 1 provides background information collected from those SMEs that responded. Most organizations were from New South Wales (21.5%), Victoria (20.8%), South Australia (16.9%), and Western Australia (16.9%). The industry sectors that were represented were information and communication technology (24.6%), health services (20%), manufacturing (16.9%), financial services (15.4%), and hospitality and tourism (14.6%) sectors. An overwhelming majority of the respondents were managing directors (63.1%). It can be seen in Table 1 that 62% of SMEs sampled had less than 51 employees and 80% had a turnover of less than Australian $20 million.

Figs. 1 and 2 provide a breakdown of the valid responses by organization type and State. Figs. 3 and 4 provide details about the sample's distribution in terms of the number of people employed and turnover.

Table 1
Sample characteristics

	$n = 130$	Percentage
Respondents by State		
New South Wales	28	21.5
Victoria	27	20.8
South Australia	22	16.9
Western Australia	22	16.9
Queensland	16	12.3
Tasmania	11	8.5
Northern Territory	4	3.1
Firm size by number of employees		
Less than 51	81	62.3
51–100	12	9.2
101–150	19	14.6
151–200	8	6.2
200–250	10	7.7
Respondents by job type		
Managing Director	82	63.1
Systems Manager	9	6.9
IT Manager	8	6.2
Accountant	8	6.2
CIO	7	5.4
Other	16	12.2
Percentage of turnover invested in IT		
<1%	41	31.5
2–5%	72	55.4
6–10%	13	10.0
11–20%	4	3.1
Turnover of organizations sampled		
Less than $10 M	44	33.8
$10–20 M	60	46.2
$21–50 M	11	8.5
$51–100 M	8	6.2
>$250 M	7	5.4
Industry sectors		
Information and communication technology	32	24.6
Health services	26	20.0
Manufacturing	22	16.9
Financial services	20	15.4
Hospitality and tourism	19	14.6
Agriculture	9	6.9
Engineering/mining/construction	2	1.5

4. Data analysis

Prior to undertaking the detailed analysis, each of the constructs were tested for reliability using Cronbach's coefficient alpha (α). An α value of 0.70 or above indicates a reliable measurement

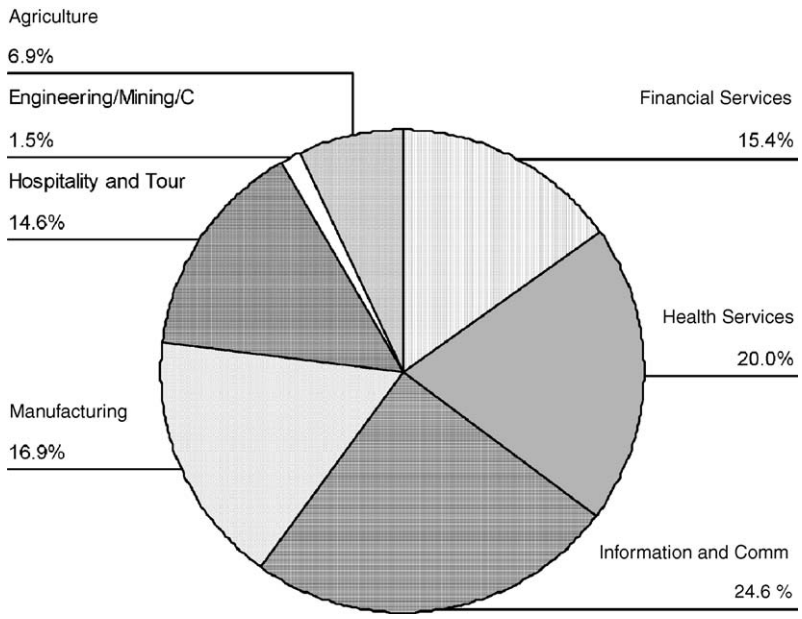

Fig. 1. Respondents by organization type.

instrument [47]. The α level for each of the constructs are presented in Table 2. Internal consistency requires homogeneity. As a measure of internal consistency, the inter-item Pearson correlation coefficients were calculated (Table 2). These were significant at the $p < 0.000$ level.

A measure has content validity if there is general agreement that the instrument has measurement items that cover all aspects of the variable. Content validity was not evaluated numerically, but was subjectively judged. The measures of the constructs developed had content validity since the selection of measurement

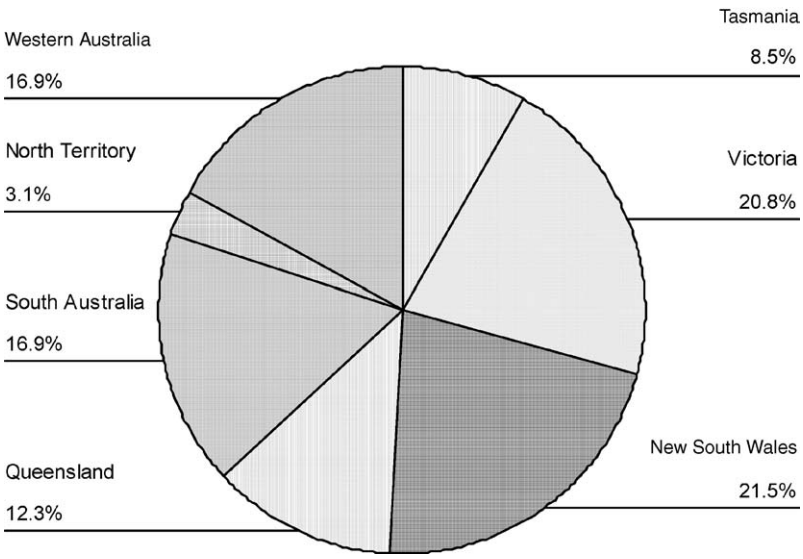

Fig. 2. Respondents by State.

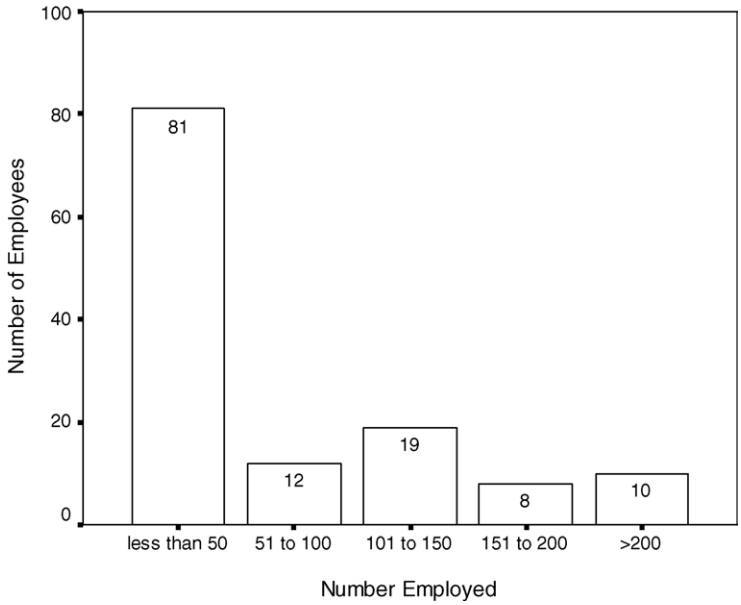

Fig. 3. Firm size by number of employees.

items were derived from the literature. Furthermore, pre-test subjects indicated that the content of each factor was represented properly in the questionnaire.

One-way analysis of variance (ANOVA) was used to compare the means of respondents IT investment as a percentage of turnover and to determine if there were any significant differences among them. The Kruskal–Wallis test was undertaken to determine whether there were differences between respondents' rankings of benefits, costs, and risks, because variables had a

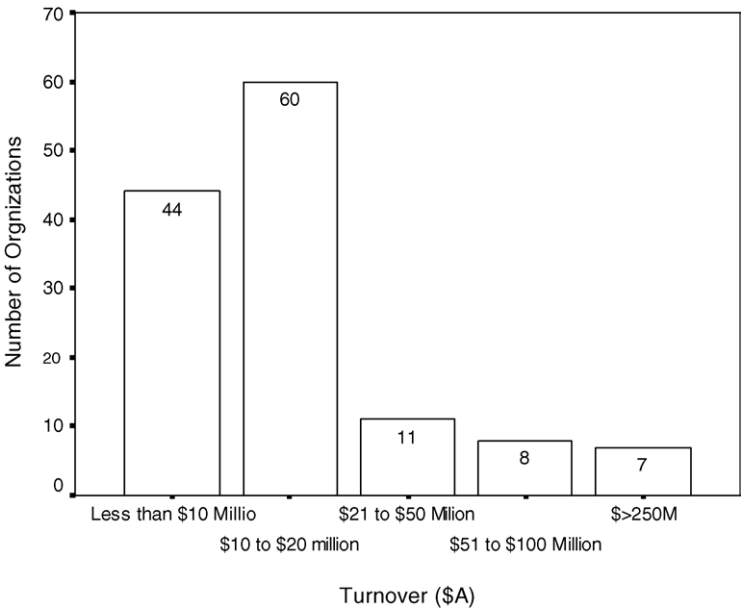

Fig. 4. Turnover of organizations sampled.

Table 2
Reliability and consistency measures for scales

Scales	Mean ($n = 130$)	Cronbach's alpha (α)	Pearson correlation
Strategic benefits	2.70	0.90	0.46
Operational benefits	3.11	0.86	0.38
Tactical benefits	2.91	0.84	0.37
Direct costs	2.90	0.88	0.37
Indirect costs	2.45	0.91	0.47
Risk	2.30	0.92	0.45

continuous distribution and were measured using an ordinal scale. To interpret the output it was important to look at the chi-square, degree of freedom corrected for ties. These values are used to indicate whether there is a difference between respondents (p-values < 0.05).

Rankings obtained for the benefits, costs, and risks that respondents had experienced were used to develop an 'IT benchmark index' (IT_{bi}). All the numerical scores for the benefits, cost, and risk constructs were transformed to indices to assess their relative rankings [30]. The IT_{bi} was calculated using the formula:

$$\frac{\sum w}{AN} \quad (0 \leq IT_{bi} \leq 1)$$

where w is the weighting given to each factor by the respondent, which in this case ranged from 1 to 5, where 1 is 'not at all' and 5 is 'a very large extent'; A: the highest weighting (i.e. 5 in this case); and N: the total number of respondents.

5. Findings and discussion

5.1. Sample characteristics

Table 3 reveals that all engineering/mining and construction firms sampled and most of the financial services providers sampled (85%) invested less than 1% of their turnover on IT, whereas over 55% of the other organizations invested between 1 and 5% of their turnover. Table 4 indicates that 87% of organizations

Table 3
Organizations types in relation to IT investment as a percentage of turnover

Organization type	IT investment as a percentage of turnover				Total
	<1%	1–5%	6–10%	11–20%	
Financial services	17 (85%)	3 (15%)	–	–	20 (100%)
Health services	3 (12%)	17 (65%)	4 (15%)	2 (8%)	26 (100%)
Information and communications technology	6 (19%)	21 (66%)	3 (9%)	2 (6%)	32 (100%)
Manufacturing	5 (23%)	15 (68%)	2 (9%)	–	22 (100%)
Hospitality and tourism	5 (26%)	11 (58%)	3 (16%)	–	19 (100%)
Engineering/mining/construction	2 (100%)	–	–	–	2 (100%)
Agriculture	3 (33%)	5 (56%)	1 (11%)	–	9 (100%)
Total	41 (32%)	72 (55%)	13 (10%)	4 (3%)	130 (100%)

Table 4
Number of employees in relation to IT investment as a percentage of turnover

Number employed	IT investment as a percentage of turnover				Total
	<1%	1–5%	6–10%	11–20%	
<50	31 (38%)	40 (49%)	8 (10%)	2 (3%)	81 (100%)
51–100	4 (33%)	6 (50%)	2 (17%)	–	12 (100%)
101–150	3 (16%)	13 (68%)	3 (16%)	–	19 (100%)
151–200	1 (13%)	7 (88%)	–	–	8 (100%)
>200	2 (20%)	6 (60%)	–	2 (20%)	10 (100%)
Total	41 (32%)	72 (55%)	13 (10%)	4 (3%)	130 (100%)

invested less than 5% of their turnover on IT, with 32% investing less than 1%. Only 13% of organizations sampled invested more than 5%, these were mostly information and communications technology firms. Noteworthy, 23% of SMEs from the health services sector invested over 5% of their turnover on IT. According to Gomolski [27] and De Souza et al. [19] the health services sector is predicted to be the fastest growing industry sector in terms of their IT spending. The latter predicted that spending on IT in the health services sector was likely to increase by 8.2% between 2001 and 2006.

The ANOVA revealed that investments in IT did not significantly vary with firm size in terms of annual turnover ($p < 0.05$). However, there were some significant differences in IT investments with firm size in terms of number of employees ($p < 0.05$). Furthermore, no differences in IT investments were found between organization types ($p < 0.05$). A Tukey's *honestly significant difference* (HSD) post hoc test was undertaken but did not identify differences between organizations ($p < 0.05$).

5.2. Benefits

If firms are not obtaining the benefits sought then the organization needs to re-think their approach to IT adoption. Tables 5–7 present the construct characteristics and benefit benchmark metrics of IT adoption at the strategic (IT_{sbi}), tactical (IT_{tbi}) and operational (IT_{obi}) levels; they provide a basis for benchmarking; monitoring IT performance, and give the organization a frame of reference for determining the extent to which business value is being obtained.

Table 5 shows that 'improved organizational and process flexibility' was the highest ranked strategic benefit obtained (IT_{sbi} 0.666). In fact, 94% of the organizations considered that they had achieved this with IT.

Likewise, 92% of organizations identified ''improved customer/supplier relations'' as a strategic benefit (IT_{sbi} 0.657) and it was ranked a close second. A key motivation for adopting IT was to improve service quality and perceived ''improvements in customer/supplier satisfaction'' (IT_{sbi} 0.657) and ''improved customer/supplier relations'' (IT_{sbi} 0.618) ranked highly.

Table 5
Benchmarks for strategic benefits of IT (IT_{sbi})

Strategic benefits	Scale details		Mean		Financial services		Health services		ICT sector		Manufacturing		Hospitality and tourism		Engineering/mining/construction		Agriculture	
	Mean	S.D.	IT_{sbi}	Rank	IT_{sbi}	Rank	IT_{sbi}	Rank	IT_{sbi}	Rank	IT_{sbi}	Rank	IT_{sbi}	Rank	IT_{sbi}	Rank	IT_{sbi}	Rank
Improved growth and success	2.78	0.91	**0.557**	**5**	0.440	5	0.608	4	0.581	5	0.527	5	0.621	3	0.500	1	0.533	6
Reduced marketing costs	2.02	1.06	**0.405**	**9**	0.380	8	0.431	9	0.413	9	0.418	9	0.368	9	0.400	4	0.400	9
Leader in new technology	2.54	1.32	**0.508**	**6**	0.400	7	0.608	4	0.556	6	0.509	6	0.421	7	0.300	8	0.511	7
Improved market share	2.40	1.08	**0.480**	**8**	0.360	9	0.523	8	0.488	7	0.500	7	0.516	6	0.400	4	0.489	8
Market leadership	2.44	1.21	**0.488**	**7**	0.420	6	0.585	7	0.488	7	0.482	8	0.411	8	0.300	8	0.578	5
Improved customer/supplier satisfaction	3.28	1.07	**0.657**	**2**	0.480	3	0.685	**1**	0.731	**1**	0.645	2	0.705	**1**	0.400	4	0.689	**1**
Improved customer/supplier relations	3.09	1.07	**0.618**	**3**	0.500	2	0.600	6	0.706	2	0.609	3	0.621	3	0.400	4	0.689	**1**
Enhanced competitive advantage	3.02	1.16	**0.605**	**4**	0.470	4	0.654	2	0.681	4	0.573	4	0.589	5	0.500	**1**	0.622	4
Improved organizational and process flexibility	3.33	1.06	**0.666**	**1**	0.600	**1**	0.654	2	0.706	2	0.682	**1**	0.674	2	0.500	**1**	0.689	**1**

Table 6
Benchmarks for tactical benefits of IT (IT_{tbi})

Tactical benefits	Scale details		Mean		Financial services		Health services		ICT sector		Manufacturing		Hospitality and tourism		Engineering/ mining/ construction		Agriculture	
	Mean	S.D.	IT_{tbi}	Rank	IT_{tbi}	Rank	IT_{tbi}	Rank	IT_{tbi}	Rank	IT_{tbi}	Rank	IT_{tbi}	Rank	IT_{tbi}	Rank	IT_{tbi}	Rank
Improved response to changes	3.25	1.11	**0.651**	**3**	0.530	3	0.631	3	0.700	2	0.655	2	0.726	2	0.500	2	0.667	3
Improved service quality	3.38	0.97	**0.677**	**1**	0.500	4	0.731	**1**	0.725	**1**	0.655	2	0.737	**1**	0.500	2	0.711	**1**
Improved teamwork	2.76	1.19	**0.552**	**5**	0.450	7	0.538	6	0.631	3	0.591	5	0.505	6	0.400	6	0.578	5
Promotes proactive culture	2.76	1.17	**0.552**	**5**	0.490	5	0.577	5	0.606	4	0.527	6	0.526	5	0.300	7	0.600	4
Improved integration with other business functions	2.92	1.25	**0.585**	**4**	0.620	2	0.592	4	0.575	5	0.618	4	0.537	4	0.500	2	0.556	6
Improved planning	2.24	1.01	**0.448**	**7**	0.480	6	0.415	7	0.400	7	0.473	7	0.495	7	0.500	2	0.467	7
Improved administrative procedures	3.36	1.21	**0.672**	**2**	0.720	**1**	0.723	2	0.563	6	0.682	**1**	0.726	2	0.600	**1**	0.689	2

Table 7
Benchmark metrics for operational benefits (IT_{obi})

Operational benefits	Scale details		Mean		Financial services		Health services		ICT sector		Manufacturing		Hospitality and tourism		Engineering/ mining/ construction		Agriculture	
	Mean	S.D.	IT_{obi}	Rank	IT_{obi}	Rank	IT_{obi}	Rank	IT_{obi}	Rank	IT_{obi}	Rank	IT_{obi}	Rank	IT_{obi}	Rank	IT_{obi}	Rank
Improved data management	3.87	1.03	**0.772**	**1**	0.720	**1**	0.792	2	0.806	**1**	0.800	**1**	0.747	3	0.700	3	0.711	**1**
Improved communication	3.72	1.15	**0.743**	**3**	0.690	2	0.738	3	0.806	**1**	0.727	3	0.747	3	0.700	3	0.689	2
Improved decision-making	2.67	1.06	**0.534**	**9**	0.550	9	0.538	9	0.563	6	0.500	9	0.537	6	0.600	5	0.444	9
Reduced paperwork	2.25	1.29	**0.449**	**10**	0.480	10	0.400	12	0.513	9	0.391	12	0.442	11	0.600	5	0.422	10
Reduced bottlenecks	2.23	0.97	**0.446**	**12**	0.430	12	0.462	11	0.450	11	0.436	10	0.453	10	0.500	9	0.422	10
Reduced labor costs	2.24	1.11	**0.448**	**11**	0.450	11	0.515	10	0.419	12	0.427	11	0.432	12	0.500	9	0.422	10
Reduced rework	3.48	1.20	**0.695**	**4**	0.680	3	0.723	5	0.625	5	0.736	2	0.789	2	0.500	9	0.644	4
Improved quality of output	3.78	1.06	**0.755**	**2**	0.630	5	0.838	**1**	0.788	3	0.727	3	0.821	**1**	0.500	9	0.667	3
Improved ability to exchange data	3.38	1.18	**0.675**	**5**	0.580	8	0.738	3	0.656	4	0.691	5	0.726	5	0.600	5	0.644	4
Improved response time to queries	3.02	1.14	**0.605**	**6**	0.620	7	0.708	6	0.538	7	0.636	6	0.537	6	0.600	5	0.578	6
Improved forecasting and control	2.78	1.21	**0.557**	**8**	0.630	5	0.577	8	0.506	10	0.545	8	0.505	8	0.900	**1**	0.578	6
Improved control of cash flow	2.99	1.38	**0.598**	**7**	0.650	4	0.692	7	0.519	8	0.627	7	0.495	9	0.900	**1**	0.578	6

''Market leadership'' was found to be significantly different between the size of the organization with respect to turnover ($\chi^2 = 14.8$, $p < 0.00$) and number of people employed ($\chi^2 = 12.0$, $p < 0.02$). Other strategic benefits that were found to be significantly different between the sizes of the organization with respect to number of people employed were:

- ''reduced marketing costs'' ($\chi^2 = 10.0$, $p < 0.04$);
- ''leader in new technology'' ($\chi^2 = 13.3$, $p < 0.01$); and
- ''improved market share'' ($\chi^2 = 12.1$, $p < 0.02$).

Differences between percentage of turnover invested on IT and the level of strategic benefits attained were ''improved growth and success'' ($\chi^2 = 8.64$, $p < 0.04$) and ''reduced marketing costs'' ($\chi^2 = 10.0$, $p < 0.02$). In addition, differences between SMEs from different sectors and the level of strategic benefits attained were ''improved customer/supplier satisfaction'' ($\chi^2 = 19.8$, $p < 0.00$) and ''improved customer/supplier relations'' ($\chi^2 = 15.6$, $p < 0.02$).

''Improved response to changes'' (IT_{tbi} 0.651), ''improved service quality'' (IT_{tbi} 0.677), and ''improved administrative procedures'' (IT_{tbi} 0.672) were identified as being experienced by more 90% organizations sampled and were ranked by the SMEs' respondents as the three most important tactical benefits. At the tactical level, 'improved service quality' was found to significantly differ with respect to turnover ($\chi^2 = 14.4$, $p < 0.00$), percentage of turnover invested on IT ($\chi^2 = 16.2$, $p < 0.00$), and between industry sectors ($\chi^2 = 20.6$, $p < 0.00$). Whether customers and suppliers are satisfied with the service that they receive was outside the scope of this research. In addition, ''improved organizational and project planning'' was also found to be significantly different between turnover ($\chi^2 = 14.9$, $p < 0.01$). No significant differences between numbers of people employed for tactical benefits were revealed ($p < 0.05$). Other tactical benefits that were found to be significantly different with respect to the percentage of turnover invested on IT were:

- ''improved response to changes'' ($\chi^2 = 8.64$, $p < 0.03$);
- ''improved teamwork'' ($\chi^2 = 12.9$, $p < 0.01$);
- ''promotes proactive culture'' ($\chi^2 = 14.4$, $p < 0.00$);
- ''improved integration with other business functions'' ($\chi^2 = 12.7$, $p < 0.01$); and
- ''improved administrative procedures'' ($\chi^2 = 13.5$, $p < 0.00$).

'Improved management of data' was found to be a significant benefit at the operational level by 68% of organizations and thus ranked first using the metrics of Table 7 (IT_{obi} 0.772). 'Improved quality of output' (IT_{obi} 0.755) and 'improved communication' (IT_{obi} 0.743) were also ranked second and third, respectively. ''Improved communication'' was found to be significantly different between number of people employed ($\chi^2 = 9.69$, $p < 0.05$). ''Improved quality of output'' ($\chi^2 = 15.4$, $p < 0.00$), ''improved availability to exchange data'' ($\chi^2 = 13.1$, $p < 0.02$), and ''improved control of cash flow'' ($\chi^2 = 13.6$, $p < 0.00$) were also found to be significantly different with respect to the percentage of turnover invested on IT. ''Improved availability to exchange data'' was the only operational benefit that was found to be significantly different between industry sectors ($\chi^2 = 14.7$, $p < 0.02$).

Overall, 94% of SMEs sampled indicated that some benefits were delivered through adoption of IT. While benefits have been achieved at the tactical and operational levels, this has not been the case at the strategic level. Strategic benefits take time to materialize and are difficult to quantify in terms of direct contributions to organizational performance.

5.3. Costs

Direct and indirect costs of IT are incurred by organizations and can be seen in Tables 8 and 9. Hardware costs (IT_{dci} 0.725), upgrades (i.e. increases in processing power) (IT_{dci} 0.709), networking of hardware and software (IT_{dci} 0.657), and overheads (includes running costs) (IT_{dci} 0.594) were the major direct costs incurred by organizations. Management and staff resources (IT_{idci} 0.594), cost of ownership (i.e. systems support and troubleshooting costs) (IT_{idci} 0.594), and management time (IT_{idci} 0.588) were major indirect costs incurred by SMEs sampled.

Table 8
Benchmark metrics for direct costs (IT_{dci})

Direct costs	Scale details		Mean		Financial services		Health services		ICT sector		Manufacturing		Hospitality and tourism		Engineering/ mining/ construction		Agriculture	
	Mean	S.D.	IT_{dci}	Rank	IT_{dci}	Rank	IT_{dci}	Rank	IT_{dci}	Rank	IT_{dci}	Rank	IT_{dci}	Rank	IT_{dci}	Rank	IT_{dci}	Rank
Hardware accessories	3.62	0.94	**0.725**	**1**	0.740	**1**	0.708	**1**	0.775	**1**	0.718	2	0.674	2	0.700	**1**	0.689	**1**
Increases in processing power	3.55	1.03	**0.709**	**2**	0.680	2	0.669	2	0.738	2	0.745	**1**	0.811	**1**	0.700	**1**	0.600	3
Consultancy support	2.65	1.19	**0.531**	**5**	0.590	5	0.523	7	0.488	8	0.582	5	0.505	5	0.400	7	0.533	5
Installation engineers	2.45	1.18	**0.491**	**8**	0.580	6	0.438	9	0.469	9	0.482	8	0.432	8	0.600	3	0.533	5
Networking hardware and software	3.28	1.07	**0.657**	**3**	0.660	3	0.608	3	0.688	3	0.709	3	0.611	3	0.600	3	0.667	2
Overheads	2.97	1.15	**0.594**	**4**	0.640	4	0.554	4	0.650	4	0.573	6	0.547	4	0.500	6	0.578	4
Training costs	2.38	1.22	**0.475**	**9**	0.550	8	0.469	8	0.494	7	0.464	9	0.442	7	0.300	8	0.400	9
Maintenance	2.69	1.04	**0.538**	**5**	0.580	6	0.538	5	0.531	5	0.545	7	0.505	5	0.600	3	0.511	7
Networking security	2.49	1.23	**0.498**	**7**	0.440	9	0.531	6	0.525	6	0.600	4	0.368	9	0.300	8	0.511	7

Network security was found to be significantly different between turnover, the number of people employed, percentage of turnover invested on IT, and industry sector. Significant differences were also found between turnover and direct costs for hardware accessories, overheads, and maintenance costs ($p < 0.05$). Also, there were significant differences between the number of people employed and direct costs for hardware accessories, networking hardware and software, and overheads ($p < 0.05$). Upgrades (i.e. increases in processing power), installation engineers, overheads, and training costs ($p < 0.05$) were found to be significantly different between the percentage of turnover invested on IT and direct costs. SMEs appear to invest in networks to some extent. However, organizations which are linked to the Internet are prone to ‘‘cyber-attacks’’ and therefore security should be given serious consideration, irrespective of size.

A considerable number of respondents (74%) indicated that organizational restructuring was not addressed or only to a minor extent during IT implementation. This could explain, in part, why only tactical and operational benefits are predominately being achieved. Employee training and staff turnover were found to vary significantly according to turnover levels and the number of people employed. Other indirect costs that were found to be significantly different in relation to the number of people employed were:

- ‘‘changes in salaries’’ ($\chi^2 = 10.3$, $p < 0.04$);
- ‘‘strains on resources’’ ($\chi^2 = 10.4$, $p < 0.03$); and
- ‘‘organizational restructuring’’ ($\chi^2 = 18.2, p < 0.00$).

In addition, indirect costs that were found to be significantly different with respect to the percentage of turnover invested on IT were:

- ‘‘management and staff resources’’ ($\chi^2 = 11.9$, $p < 0.01$);
- ‘‘management time’’ ($\chi^2 = 13.7$, $p < 0.00$);
- ‘‘cost of ownership’’ ($\chi^2 = 9.80$, $p < 0.02$);
- ‘‘employee motivation’’ ($\chi^2 = 11.1$, $p < 0.01$); and
- ‘‘changes in salaries’’ ($\chi^2 = 12.2$, $p < 0.01$).

Indirect costs that were found to be significantly different between industry sectors were:

Table 9
Benchmark metrics for indirect costs (IT_{idci})

Indirect costs	Scale details		Mean		Financial services		Health services		ICT sector		Manufacturing		Hospitality and tourism		Engineering/ mining/ construction		Agriculture	
	Mean	S.D.	IT_{idci}	Rank	IT_{idci}	Rank	IT_{idci}	Rank	IT_{idci}	Rank	IT_{idci}	Rank	IT_{idci}	Rank	IT_{idci}	Rank	IT_{idci}	Rank
Management and staff resources	2.96	1.07	**0.592**	**1**	0.720	**1**	0.554	3	0.569	3	0.709	3	0.537	3	0.300	4	0.556	2
Management time	2.92	1.03	**0.585**	**4**	0.590	4	0.577	**1**	0.588	2	0.682	4	0.505	5	0.400	**1**	0.556	2
Cost of ownership	2.96	1.05	**0.592**	**1**	0.640	2	0.554	3	0.594	**1**	0.645	5	0.547	2	0.400	**1**	0.600	**1**
Management effort	2.94	1.13	**0.588**	**3**	0.600	3	0.577	**1**	0.544	4	0.745	**1**	0.537	3	0.400	**1**	0.511	5
Dedication to explore the potential of the system	2.84	1.10	**0.568**	**5**	0.590	4	0.515	5	0.519	5	0.727	2	0.568	**1**	0.300	4	0.511	5
Employee time in detailing, amending and approving the computerization	2.54	1.12	**0.508**	**6**	0.580	6	0.508	6	0.475	7	0.555	6	0.484	6	0.300	4	0.444	8
Employee training	1.06	1.12	**0.455**	**8**	0.450	8	0.408	9	0.475	7	0.555	6	0.347	8	0.300	4	0.556	2
Employee motivation	1.83	0.98	**0.366**	**11**	0.370	11	0.338	11	0.394	10	0.364	11	0.347	8	0.300	4	0.400	10
Changes in salaries as a result of improved employee flexibility	1.68	0.87	**0.335**	**12**	0.340	12	0.292	12	0.356	12	0.355	12	0.316	12	0.300	4	0.378	12
Staff turnover	2.14	0.96	**0.428**	**9**	0.410	9	0.462	7	0.413	9	0.482	9	0.379	11	0.300	4	0.422	9
Productivity losses	2.36	1.15	**0.472**	**7**	0.510	7	0.446	8	0.481	6	0.509	8	0.432	7	0.300	4	0.467	7
Strains on resources	1.98	1.06	**0.395**	**10**	0.410	9	0.408	9	0.381	11	0.445	10	0.337	10	0.300	4	0.400	10

Table 10
Benchmark metrics for risk factors (IT_{ri})

Risk factors	Scale details		Mean		Financial services		Health services		ICT sector		Manufacturing		Hospitality and tourism		Engineering/ mining/ construction		Agriculture	
	Mean	S.D.	IT_{ri}	Rank	IT_{ri}	Rank	IT_{ri}	Rank	IT_{ri}	Rank	IT_{ri}	Rank	IT_{ri}	Rank	IT_{ri}	Rank	IT_{ri}	Rank
Reluctance of employees to adapt to change	1.95	0.95	**0.391**	**11**	0.460	9	0.377	10	0.369	11	0.409	11	0.358	10	0.300	9	0.400	11
Lack of IS infrastructure support	2.50	1.09	**0.500**	**5**	0.550	5	0.454	7	0.500	5	0.518	5	0.516	**1**	0.400	6	0.467	7
Technical uncertainty and lack of knowledge	2.55	1.02	**0.511**	**4**	0.530	7	0.508	4	0.513	3	0.536	2	0.484	4	0.400	6	0.489	6
Minimal IT expertise	2.49	1.00	**0.498**	**6**	0.620	**1**	0.431	8	0.506	4	0.491	6	0.453	5	0.500	2	0.511	5
Maintenance costs	2.45	1.06	**0.489**	**7**	0.590	3	0.515	3	0.444	8	0.482	8	0.442	7	0.500	2	0.467	7
Uncertainty about how to measure potential benefits	2.67	1.28	**0.534**	**2**	0.620	**1**	0.623	**1**	0.469	6	0.491	6	0.453	5	0.500	2	0.600	**1**
Uncertainty about how to measure the costs involved	2.32	1.18	**0.463**	**8**	0.500	8	0.492	6	0.419	10	0.455	9	0.421	8	0.500	2	0.556	3
Capital outlay with no guarantee of likely returns	2.61	1.27	**0.522**	**3**	0.590	3	0.500	5	0.525	**1**	0.527	4	0.421	8	0.700	**1**	0.578	2
Security issues	2.72	1.23	**0.545**	**1**	0.540	6	0.569	2	0.519	2	0.609	**1**	0.495	3	0.400	6	0.556	3
Training expenses on staff that leave the organization	2.29	1.11	**0.458**	**9**	0.460	9	0.346	11	0.463	7	0.536	2	0.526	**1**	0.300	9	0.467	7
Theft of software and hardware	2.02	1.23	**0.405**	**10**	0.420	11	0.431	8	0.431	9	0.418	10	0.295	11	0.300	9	0.422	10

- "management and staff resources" ($\chi^2 = 15.6$, $p < 0.02$);
- "management effort and dedication to exploring the potential of the system" ($\chi^2 = 15.0$, $p < 0.02$);
- "employee time in detailing, amending and approving the computerisation" ($\chi^2 = 9.80$, $p < 0.02$); and
- "employee motivation" ($\chi^2 = 14.7$, $p < 0.02$).

The adoption of IT by smaller SMEs may require employees to undertake training and thereby increase their immediate workload. Additionally, in the smaller SMEs less attention may be given to organizational restructuring as there may be limited reflection on the way work is carried out after the adoption of IT. Attention may be given to more urgent pressures that do not leave time for reflective thought about the effectiveness of operations.

5.4. Risks

Table 10 presents a series of benchmark metrics for IT related risks. 'Security issues' (IT_{ri} 0.545), 'uncertainty about how to measure potential benefits (IT_{ri} 0.534)', and 'capital outlay with no guarantee of likely returns' (IT_{ri} 0.522) were identified as the primary risk factors.

These two factors relate to the benefits management process, specifically its measurement and ways of identifying the business value of IT. Most SMEs function at the micro level and are reliant on their cash flow to stay in business. Thus, any expenditure would be expected to provide returns almost immediately. SMEs are prone to adverse shifts in their marketplace and are thus often cautious about tying up much needed capital.

Significant differences were found between industry sectors and 'training expenses on staff that leave the organization' ($\chi^2 = 13.1$, $p < 0.04$). Table 1 shows that organizations in the hospitality and tourism sectors ranked 'training expenses on staff that leave the organization' higher than any of the other sectors. Maybe these organizations, which have high staff turnovers, tend to spend significant amounts of money to train causal or unskilled employees. The ability to retain skilled employees is probably one of the key factors that contribute to an SME's performance. The analysis also revealed significant differences between the size of the organization (both in turnover and number of employees) and the 'reluctance of employees to adapt to change' ($\chi^2 = 13.8$, $p < 0.01$). Medium-sized enterprises with formal structures and systems in place may be more adverse to change than smaller enterprises because of the degree of change that may be imposed due to the introduction of IT.

6. The potential role of benchmarking IT for SMEs

For benchmarking to be effective as a learning mechanism, each organization in a supply chain must create and be willing to share and apply knowledge gained from implementing IT applications. The authors suggest that the metrics promulgated in this paper could serve as reference points for individual industry sectors for monitoring respective IT performance. The metrics could be used to promote learning within and between organizations through continuous improvement. SMEs could create new knowledge about how their IT infrastructure and applications are performing and about how they are influencing their processes when they are engaged in a learning cycle. SMEs need to be conscious about the use of IT in improving their product/service quality as well as in adding value throughout the supply chain. The plan-do-check-act (PDCA) cycle, which is implicit to continuous improvement and benchmarking, is integral to an SME's strategy to monitor its IT performance. Considering this, the authors posit that the cycle can be used to assist with the management of IT:

- *Plan*: the organization determines *why* and *how* IT can improve its business processes and then develops a strategy and objectives to achieve the expected results.
- *Do*: the organization implements the plan. Implementation produces a set of results about the benefits and costs and their impact upon organizational performance (e.g. profits, increased market share, and improved customer satisfaction).
- *Check*: this stage forms an integral part of the learning cycle as the organization reflects on the associated plans and results to determine the

effective and ineffective actions that were taken. The output is a series of IT benchmark metrics and lessons-learned; these can be used to overcome the barriers to intra- and inter-organizational learning and knowledge sharing. The lessons-learned process can provide an invaluable and immediate opportunity for the organization to reflect and therefore gain a full understanding of the results achieved at a particular point in time. The lessons-learned are also a mechanism to document experiences that can be shared with others.

- *Act*: closes the loop to demonstrate the decision to continue with or alter the form of process improvement that has been implemented. When the project is completed, the loop is closed and rework metrics are identified. The IT metrics that are established can be used for the purposes of industry (functional) and competitive benchmarking.

The lessons-learned for SMEs should become an immediate focal point for re-examining business processes. This has been advocated by Tallon et al. in large organizations. By implementing a continuous improvement philosophy built around an effective quality management approach that utilizes benchmarking as its driving force for best practice, an organization's performance and competitive advantage may be improved through IT. Once organizations have evaluated themselves against 'best practice' firms within the industry, they need to determine how they can learn from these firms—a process known as *benchlearning* [25]. Often, however, double-loop learning will need to be implemented to prevent employees resorting to 'old habits' (e.g. paper-based systems) and so that they can obtain maximum benefit from technology. The actual implementation of planned changes may take place through developing the skills of staff, training and organizational development. This process has been called *benchaction*, a critical means for creating readiness and flexibility for change throughout all levels of an organization [49]. If SMEs are to become effective at obtaining value from their IT, modes of behavior and work practices may need to change. The first step for an SME that wishes to use benchmarking is to determine its motivation and attitude to growth and hence establish its strategy. Evidence of change can be seen in those businesses that have implemented enterprise solutions, such as e-CRM and ERP.

7. Research limitations

The various definitions of SME make research findings difficult to compare. While there has been considerable research on IT adoption and diffusion in SMEs, there has been limited work undertaken in the area of IT benefits, costs, and risk management, and comparisons are difficult to make. The concern for generalizability is also brought about by the relatively small sample sizes of IT adoption studies in the SME domain. The 130 valid responses in this study may be compared with sample sizes of 50, 68, 83, 87, and 96 in previous studies of SMEs. Also a limitation may be seen in the choice of variables. They may not capture the complex nature of the benefits management process of the business environment in which SMEs operate. Equally, benefits do not remain static, particularly during the different stages of an IT life cycle. An additional limitation is that the views are those of a single individual in the organization; indeed, only those interested in the research topic are likely to complete and return the questionnaire, while those replying may be more likely to carry out evaluation and be satisfied with their processes [66,68].

8. Conclusions

The inherent difficulties in identifying and assessing the benefits and costs of IT adoption are often a cause for uncertainty about the impact the investment might have on the business. It is often all too easy for businesses and management to ignore, or ineffectively evaluate their IT investment. To improve the benefit and cost management process we have sought to determine benefits, costs and risks that have been experienced by various industry sector groupings of SMEs. The analysis identified the following key findings:

- IT investment levels among SMEs were not influenced by organizational size (i.e. in terms of turnover and number of employees);
- organizations in different industry sectors significantly differ in the amount they invest in IT;

- 'improved organizational and process flexibility' is the highest ranked strategic benefit for almost all industry sectors;
- 'hardware costs' is the highest ranked direct cost for almost all industry sectors; and
- security is the number one risk factor associated with IT investments for Australian SMEs.

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