

Health: IT leader or laggard? A comparative assessment of IT maturity

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Abstract

The health industry has acquired a reputation as lagging in the use of IT. This reputation is usually based upon the relatively narrow measure of comparative IT expenditure, often examined as a proportion of total revenue. This study has been undertaken to assess health's use of IT using a broader frame of reference. The health industry was compared to the banking industry, on the basis that the banking industry is widely perceived as a leading IT user.

The research confirmed that in these two 'knowledge' industries, health is slower to adopt IT with an apparent lower maturity level. This was the case across a range of best practice management, procedural and cultural topics as well as in the level of resources applied to IT.

Background

It has been asserted that the health sector generally lags in the application of information technology. This phenomenon is often promoted as an issue that needs to be addressed (CSC 1998; CSC 1999; Shortliffe 1998). The slow adoption of health IT is a global trend, not just an Australasian one, yet little research has been published. Underlying the comments is an assumption that the current level of spending is somehow "wrong", but again this has not been examined.

To develop a better understanding of this phenomenon a research project is being undertaken at QUT's Centre for Public Health Research using Innovation Diffusion Theory as its theoretical basis. Earlier work has shown that Innovation Diffusion Theory predicts a slow uptake of IT in health (England, Stewart, & Walker 2000). The applicability of this theory was verified through a qualitative research project in which senior health executives were interviewed about IT investment (England 2001).

This left a fundamental question to be answered before any causal analysis could be undertaken – is the IT adoption level in healthcare substantially different to that in other industries? The assertion that health IT lags is usually based on the measurement of IT expenditure as a percentage of revenue (CHIC 2000; CSC 1998; CSC 1999). However, the validity of IT expenditure against revenue as a measure is dubious as it ignores inherent differences between industries and their strategies (Strassmann 1997a; Strassmann 1997b). Therefore the next stage in the research has been to develop a broader measure of IT adoption and apply this to the health industry. To provide a benchmark, measurements were also taken of the banking industry's IT adoption. Based upon the traditional IT expenditure against revenue measurement, banking was selected as an industry that is perceived to have enthusiastically adopted information technology.

Theoretical basis

Nolan (1979) developed a model that explored the maturity of IT in organisations. He also linked increasing maturity with increasing expenditure, thereby tying the concepts of maturity, expenditure and adoption together. Since the time of Nolan's work, many projects have looked at facets of IT maturity. One of the most developed and well known is the Software Engineering Institute's Capability Maturity Models (Paulk et al. 1993). This concept of IT maturity asserts that organisations demonstrate increasingly sophisticated behaviours and practices with regards to IT as their maturity increases. Therefore, it was decided that assessment of IT behaviours and practices, as well as expenditure would give a multi-dimensional view of IT maturity, and hence level of IT adoption. Several writers have reported on best practices in IT (Boar 1994; Boar 1997; Cortada 1998) whilst the Software Engineering Institute has proposed procedures and assessment techniques.

Methodology

This research was conducted through a survey of senior health IT managers in major state and territory health departments across Australia. In states where IT management is more decentralised, the IT management in the largest areas or networks were surveyed. To provide a frame of reference, managers of a similar level were surveyed in the major, nationwide Australian banks. The survey was developed to assess IT maturity as well as traditional measures of IT expenditure. In addition, measures of IT expenditure per employee and numbers of IT staff as a proportion of total staff were gathered to give a broader understanding of the data.

It was intended to create a survey using Nolan's theoretical base combined with current best practice guidelines. However, a review of the literature found that the UK's National Health Service Executive developed a survey to assess the maturity of a hospital's IT in preparation for initiating clinical information systems projects (Gronlund & Crouch 1997). This survey, being close to the requirements of this project, was therefore modified and validated for Australian conditions prior to being applied.

The survey addressed the following major topics:

- *Vision, direction & strategy* (9 questions), addressing the IT planning processes, the linkage to business planning and measurement and feedback processes;
- *Culture* (9 questions), addressing cost allocations, involvement of non-IT staff in IT planning and review, attitude to organisational change and degree of centralisation;
- *Communications* (4 questions), investigating how well the IT function communicates its plans, projects and procedures;
- *Standards* (8 questions), addressing areas in which standards and process are implemented, especially those relating to procurement, benefit realisation and change management;
- *Technical infrastructure* (2 questions), to assess the level of availability and use of IT systems;
- *Vendor effectiveness* (5 questions), measuring the IT departments' beliefs in the value, quality and relevance of their vendors;
- *Information resource* (8 questions), determining the organisations' attitudes to information as a resource; and
- *General information and statistics* (5 questions), measuring IT budgets and number of staff.

Each topic was surveyed using a number of questions to investigate different facets. The survey captured responses on a 7-point scale from 0 to 6 with respondents indicating their level of agreement with the range of statements. An average score was computed for each topic and for the maturity scale in total. Each topic was viewed as being of equal importance so no weightings were applied when calculating the overall maturity. The measures of IT and e-mail usage were performed by surveying the percentage of users falling into five categories of frequency of use, ranging from "not at all" through to "most of the day". A numeric indicator of usage was calculated by giving each frequency a rating between 0 and 4 and multiplying the percentage of users within that category by the weighting and summing them to gain a total score for each organisation. This paper presents a simple average of those total scores.

Slightly different versions of the survey, to ensure face validity, were used in health and banking. The questions were the same but minor aspects of language were adapted to make them more relevant to the audience, such as references to patient or customer.

The survey was mailed to multiple senior IT managers within each organisation of interest, aiming to ensure at least one response per organisation. Where multiple responses from one organisation were received these results were averaged. A second mail-out was undertaken some weeks later to non-respondents to increase the response rate.

The data were collated and analysed using Excel and SPSS. In most cases simple averaging and ratios were used to analyse the data.

Results

The health industry provided a broad range of responses allowing a census of all states to be prepared. Due to confidentiality and commercial sensitivity, only 2 of the 4 major banks provided responses. However, these two appear to be representative of the population when attributes such as turnover, size and use of IT are examined. This has meant that rather than a statistical comparison being possible between the industries, a descriptive approach has been adopted.

The highest-level analysis has developed average maturity scores across all the responses from each industry. Health scored 3.63 compared to banking's score of 4.57 (out of 6). These are shown in Table1.

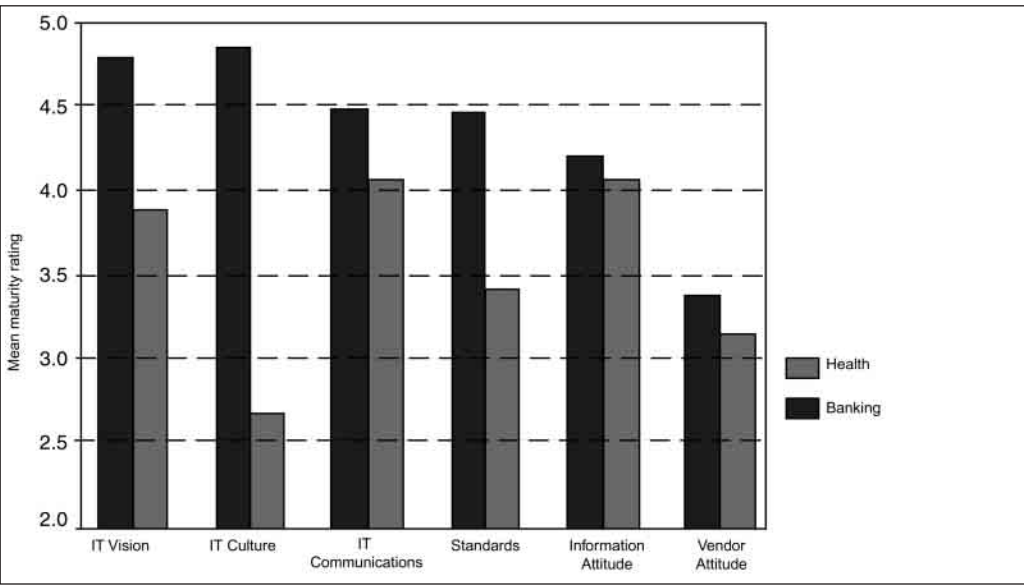
Table 1: Overall measures of maturity

Industry	Number of Observations (N)	Minimum	Maximum	Mean	Std Deviation
Health	6	3.02	4.18	3.6338	.4153
Banking	2	4.37	4.77	4.5708	.2848
Combined	8	3.02	4.77	3.8681	.5682

As can be seen, banking's total maturity scores ranged from 4.37 to 4.77 whilst health's ranged from 3.02 to 4.18. There appears to be complete separation in the ranges with banking showing a distinctly higher level of maturity.

At the next level a bar chart (Figure 1) has been presented showing each of the major topics used to assess total maturity.

Figure 1: Maturity factors by industry



This graph shows some distinct differences between the scores achieved in banking and health. For example, the largest difference is evident in the application of leading practice techniques assessed under the culture topic (4.86 banking; 2.69 health). Other significant differences are apparent in IT vision (4.81 banking; 3.91 health) and the use of standards (4.47 banking; 3.43 health). In no area did health score higher than banking.

Areas with relatively small observed differences were the attitude to vendors (3.40 banking; 3.15 health) and the attitude to the use of information, as a business resource, within the organisation (4.22 banking; 4.07 health).

Table 2: Other measures of maturity

Measurement	Health	Banking
IT usage (a weighted total of staff frequency of IT use)	245	380
E-mail usage (a weighted total of staff frequency of e-mail use)	199	206
IT expenditure as a % of revenue	2.24%	7.7%
IT expenditure per employee per year	\$2,410	\$19,366
IT staff as a % of total staff	0.85%	5.44%

Additional measurements are shown in Table 2. They show that the traditional measure of IT expenditure as a proportion of revenue is 7.7% in banking versus 2.24% in health, again showing a significant difference in adoption levels. Other measurements related to staffing and IT are also provided, generally reinforcing banking's higher use of IT per staff member. While these findings support the view of a different adoption level, it is through these measures that the differences in the nature of banking and health industries are most apparent. Health is a hands-on service where staff members are required to interact with patients, whereas banking requires far fewer staff to deliver client service.

Analysis

It is apparent that by every measure within this survey, banking is a more advanced user of IT than health. This is confirmed by measurements of a number of leading practice approaches as well as tangible items such as IT expenditure versus revenue, proportion of IT staff and frequency of usage of IT by general staff. The banking data collection is incomplete (being only 50% of the population) and therefore not strong enough for a statistical review. However, it is evident that the banking sector has more mature usage, procedures and practices than health. This is also reflected, as predicted by Nolan (1979), in increased expenditure levels with increased usage.

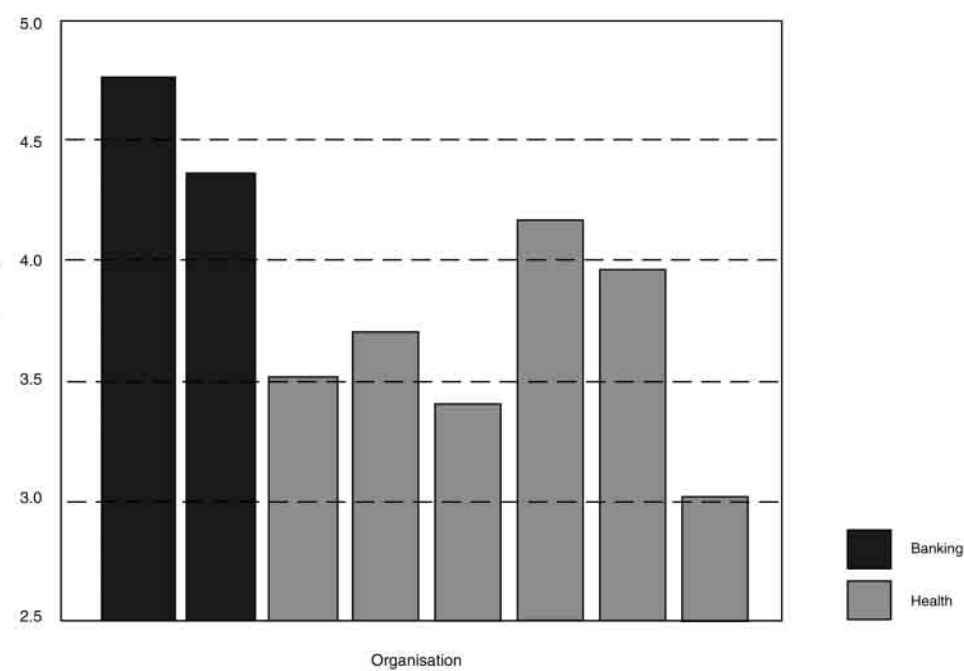
Table 3 summarises the significant differences found between the two industries, showing the measurements and a description of the different patterns of survey response. Of significant concern is the generally comparable view of the uncertainty of value contributed by IT vendors across both of the industries, with each finding difficulty in identifying the return on investment from IT.

Table 3: Detailed results of maturity factors

Topic	Banking	Health	Description of response patterns
Vision, direction and strategy	4.81	3.91	The banking organisations appear to implement more rigorous planning processes and link them more closely to the organisation's strategic plan. The banks' IT departments also introduce "feedback loops" ensuring they assess the perception of their performance amongst the user communities and measure the effectiveness of their suppliers.
Culture	4.86	2.67	The banks have a culture that aligns IT more closely with the business. One of the most significant areas of difference appears to be the way that the banks allocate costs for IT back to business units and involve business unit management in IT decisions. Health appears to do this less readily, retaining a centralized funding model and seeking low levels of clinician involvement.
Communications	4.50	4.08	A similar pattern of response, though banking appears to include more IT awareness as a part of staff induction.
Standards	4.47	3.43	Basic technical standards appear to be equally implemented across both health and banking. However, banking implements a wider range of standards than health, particularly in the areas of organisational change and benefits realisation. This ties in with the difference in culture, where banking IT staff seem to take a stronger view of their role in supporting the business.
Vendor effectiveness responses	3.40	3.15	Similar views of vendors, with value delivery and return on investment gaining neutral.
The information resource available where needed	4.22	4.07	Both industries view information as a business asset to be managed wisely and made.

It is interesting to note that the different health organisations across Australia have a wide range of maturities. These are shown, in an anonymous form, in Figure 2 as well as through the mean, and range of the results shown in Table 1.

Figure 2: Maturity variations between surveyed organisations



It is apparent that some states have relatively sophisticated approaches to IT whilst others lag a significant way behind. The states that appear most mature show strengths across all measured areas but, in particular, stand out for their cultural behaviours, specifically their allocation of costs and involvement of clinicians in IT decision making.

Conclusions

The objective of this phase of research was to discover whether the often-asserted slow adoption of IT in health was fact or myth. It appears from the analysis that, at least in Australia, IT in health lags behind banking in nearly all facets. It appears that health implements less sophisticated management practices, has less strategic attitudes towards IT and applies fewer resources to IT. The closest health and banking have come to agreement is a common view of the performance of their IT suppliers and value gained from IT.

The view proposed by health executives that their use of IT is as effective as that of any other industry, but restricted only by a low return on investment, is not valid (England 2001). The health industry seems to make poorer use of IT, and in fact, has no better or worse experience with IT return on investment than the banking industry. It seems probable that the behaviour of the health industry related to IT adoption is therefore the result of attributes of the industry itself.

Having established that it is likely that a difference in IT uptake exists between health and other industries, the next stage of this research project will be to use Innovation Diffusion Theory to assess health organisations to find the underlying factors. Topics which will be examined include policy pressures to favour investment in areas directly related to patient care rather than investments in supporting infrastructure; cultural issues, such as the complexity and diversity of health professions and their behaviours, and technical issues such as the complexity and compatibility of available IT. The theoretical expectation that policy, organisational and technical issues determine health's behaviour is predicted by innovation diffusion theory (England, Stewart & Walker, 2000). The next stage of the research will apply quantitative methods to test the hypotheses that policy, organisational and technology factors are significant determinants of health's IT adoption both individually and in combination. By understanding the causes of health's behaviour towards IT, it is hoped to improve the performance and value of IT to health organisations.

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