

Assessing Information Management Competencies in organisations

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Abstract: The history of the management of information systems includes many ideas that were intended to simplify the complexities of the management task, but there is still a great deal of wasted investment that produces no significant benefits. Much of the thinking has been rational and structured, but it can be argued that structured thinking will not solve the problems presented by the ever-increasing scope and depth of information systems, the need for improved responsiveness and agility, and the need to deal with a range of requirements that are sometimes behavioural and sometimes legislative. Three of the more frequently cited frameworks for information management (Zachman, Henderson & Venkatraman, Ward), are briefly reviewed and found to have common characteristics. They are combined into a new, simple arrangement of the central (and critically important) ideas. This new framework has been used as the basis of a survey instrument that is introduced and explained; it works at two levels - the "micro" and "macro" levels. It assesses perceptions of organisational capability to manage information well, as seen by respondents who are normally employees working in different roles with varying responsibilities. The survey instrument comes with an analysis and reporting package that is found to be suitable for the needs of busy managers, and the way in which micro and macro data is presently analysed and presented is demonstrated using data from a reference dataset, a CIO workshop, an investigation within a real estate agency and a large financial services organisation. The contribution of this work to the research programme from which it emanated is summarised and future directions briefly explained.

Keywords: Information management; perceptions; IS/IT strategy; alignment; assessment

1. Background

There is a history of difficulty in delivering benefits from information technology investments, and for the last 40 years experts have worked to ease the problems.

During the 1990s business managers and academics strove to find answers to critical questions. An early, extensive, review of literature concerning information systems "success" (DeLone & McLean, 1992) was well received and has since been updated; specific research has looked at process-based collaboration across corporate boundaries (Bytheway & Braganza, 1997); academic attention focused on strategic alignment (Kearns & Lederer, 2000; Chan & Reich, 2007); concerns about "agility", ethics and alignment have emerged (Tallon et al., 2000; Sambamurthy et al., 2003; Symons, 2005).

More recently, there has been increasing attention to the management of benefits (Chatterji, 2007; Ward & Daniel, 2005) but business newspapers still report problems (Anon, 2008) and there is still difficulty with enterprise-wide systems (Seddon et al., 2010). It is reported that information systems strategy is still not properly understood (Chen et al., 2010), and ethics (Mingers & Walsham, 2010) and behavioural issues (Beaudry & Pinsonneault, 2010) are of concern. There are staggering losses involved in information technology investments in the public sector (Anon, 2010).

In the face of all this, how can the complexities of managing information technology and systems be dealt with? When costs of technology are spiralling, how can they be justified to senior business managers in the board room? Concepts of information technology strategy might mirror business strategy, but exactly what do the "alignment" of these IT and business strategies really mean?

This paper briefly reviews some ideas from this history and derives a new framework that proves to be comprehensible and workable. The framework leads to a survey instrument that assesses organisational capability to manage information well.

2. Some important ideas

2.1. Zachman reveals complexity

The complexities of information technology management were first revealed in the 1980s in a framework for information systems architecture (Zachman, 1987); Zachman took a broad view of the issues but his ideas were necessarily detailed, and his frequently cited six-by-six matrix, with layers of technology management down one side and different perspectives of the business across the top,

was beyond many managers' willingness to work with. 36 different points of concern (the intersection of the six rows and six columns of the matrix) were just too many to handle. Although there has been subsequent reference to the Zachman framework (Frankel et al., 2003) it has failed to gain currency in the general context.

2.2. Henderson and Venkatraman seek simplicity

Others have sought simpler views of the problem, and one frequently cited example is the Henderson and Venkatraman framework. It relates business and IT issues at the internal and external levels using a two-by-two matrix. It shows that there is a need for "functional integration" between the business and IT domains, and that there is a need for "strategic fit" between the internal and external worlds. Each of the four quadrants embodied in the framework are detailed in turn: *scope*, *competencies* and *governance* in the external portion and *processes*, *skills* and *infrastructure* or *architecture* in the internal portion.

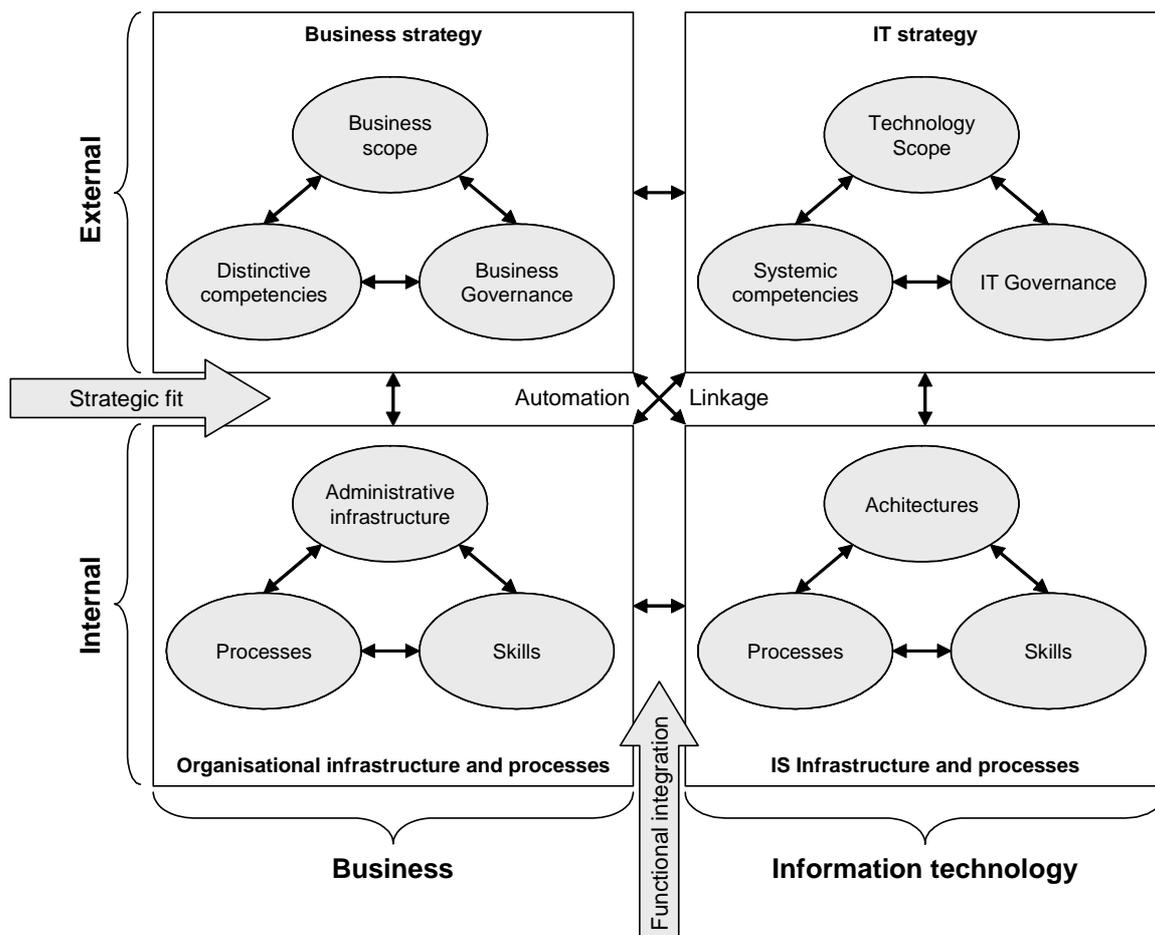


Figure 1: The Henderson and Venkatraman framework, linking business and IT from the internal and external viewpoints (Henderson & Venkatraman, 1993)

Questions arise from a close examination of this model. It is interesting to see that *competencies* and *skills* are included, but why are they in different parts of the framework? A skill can be seen as a low level thing ("I can work this computer") but a competency is something else ("I can use this computer to produce a useful econometric model"). The implication of "processes" being in both the internal business and internal IT quadrants is that business processes and IT processes must be functionally integrated, but how is that possible? A single IT process might contribute to a wide range of business processes; conversely a typical business process might depend on many information systems. Why do we have "administrative infrastructure" on the left, and "aichitectures" on the right?

The Henderson and Venkatraman model is simple at first sight, but it leads to a range of questions and lacks the sort of elegance and symmetry that makes these things memorable. It implies

dependencies and relationships between its conceptual components, but these are not immediately evident on a first reading.

2.3. The issue of alignment

Efforts to improve the return on information technology investments have focused on the ways in which business and technology strategies can be more effectively *aligned*. However, this high-level approach to the management of IT and IS related investments has found only limited success.

It has been argued (Yayla & Hu, 2009) that alignment is achieved by means of simple steps: strategising processes, increasing the level of communication, formalising policies, and so on. Easy to say, but is this taking us forwards? Where is the detail that tells us how to realise these worthy and somewhat obvious steps to success?

"Alignment" is an appealing word but it has to be judged by the *benefits* that are delivered. The management of benefits has been an issue from the very early days (Baets, 1992) right through to recent times; it is now dealt with in standard texts (Ward & Peppard, 2002; Ward & Daniel, 2005).

2.4. The concept of value from IT investments

"Alignment" is appealing, but "*value*" is more so, especially when talking to senior management. Venkatraman introduced the idea of "eras" (Venkatraman, 1994), his observations concerned the increasing scope and reach of information systems, the increasing degree of business change that was required to benefit from them, and the increasing value to be gained thereby.

Inevitably, practice takes time to adopt and adapt to new ideas and practical concerns continued to be reported at about that time (Uchitelle, 1996). But what Venkatraman had given us was a clear message that we are concerned with the management of *systems* and the *information* that comprises the essence of those systems, not just the technology.

Progressive organisations worked along these lines, and references to "IT management" were supplanted by references to "IS management", and then to "Information management", as in the case of BP Chemicals (Cross, 1995). There was academic attention to these ideas based on workshops with working managers (Bytheway, 1996), and one feature of the work at BP chemicals led ultimately to the framework that is presented here. John Cross dunned his idea "Jacob's ladder" - a management stairway to a strategic heaven?

2.5. Jacobs' ladder

The arrangement of the four steps in BP Chemical's "Jacob's ladder" is shown in the figure below: At the bottom is the technology that comprise infrastructure for systems and business activity, and at the top the business processes that serve the business strategy (Cross & Earl, 1997).

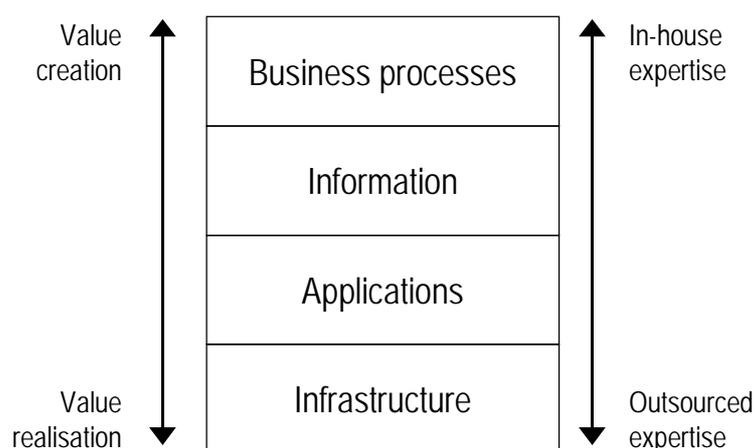


Figure 2: Jacob's ladder as promoted in BP Chemicals

It is interesting that the *creation* of value is seen at the top, with *in-house* expertise; the *realisation* of value is seen at the bottom, based on the use of *outsourced* expertise (outsourcing was one of the principal outcomes for BP Chemicals at this time).

However, this notion of value generation is seen in other work. Zachman had already articulated six "levels", from the *representation* of technology infrastructure (program code and data definitions), through *technology*, *systems*, *enterprise* and *context* of the enterprise (Zachman, 1987); Venkatraman was promoting the idea that *data*, *information*, *knowledge*, *action* and *result* were all related in a similar progressive way (Venkatraman, 1996), and Ward has promoted the idea that benefits from IT investments are achieved at different levels (Ward & Daniel, 2005).

These ideas are summarised in the table below.

Table 1: Linking information technology to business strategy

| | Zachman | Venkatraman | Ward |
|----------------|--------------------------|-------------|---------------------|
| Highest | Context | Result | Strategic objective |
| | Enterprise model | Action | Functional benefit |
| | | Knowledge | Business change |
| | System model | Information | Enabling change |
| | Technology | Data | Technology |
| Lowest | Representation of system | | |

Zachman's "representation of system" is really only of interest to technology management, but his other five levels show strong empathy with the other viewpoints. One can argue that there are actually five levels at which management must operate (from the lowest to the highest):

- *information technology* must be acquired, configured, and used to provide the requisite infrastructure so that a business can store its data and operate its ...
- *information systems*, some of which will necessitate changes to the way that the business operates its ...
- *business processes*, wherein knowledge is deployed in order to initiate the actions that are expected to deliver the desired ...
- *business benefits*, that will in turn realise the organisation's ...
- *business strategy*.

This arrangement of ideas strongly reflects the historical thinking that is available, and it has been adopted as the foundation of the Information Management Body of Knowledge (IMBOK), which currently comprises a knowledge base, a handbook, a developing survey instrument, and a supporting community web site (<http://www.imbok.org>).

3. The Information Management Body of Knowledge

Other threads of research have informed the development of the IMBOK. In its embryonic stages there was a very extensive review of the literature that established the validity of many of the ideas that have been used (Lambert & Peppard, 1993); the process value adding viewpoint was developed and published (Edwards & Peppard, 1997) and ideas about skills, competencies and capabilities were developed in conjunction with working business managers (Bytheway & Lambert, 1998). The concept of value came strongly into focus (Peppard et al., 2001) and is evident in standard works dealing with IS/IT strategy (Ward & Peppard, 2002).

In South Africa, these ideas were incorporated into a research project that provided new learning material and new learning opportunities appropriate to the South African context (HICTE, 2003), and the IMBOK handbook was the result (Bytheway, 2004). It has since been adopted as a standard course text in South Africa, Europe and North America.

3.1. The IMBOK framework

Pictorially, the IMBOK identifies five domains of management, and four two-way interfaces between them.

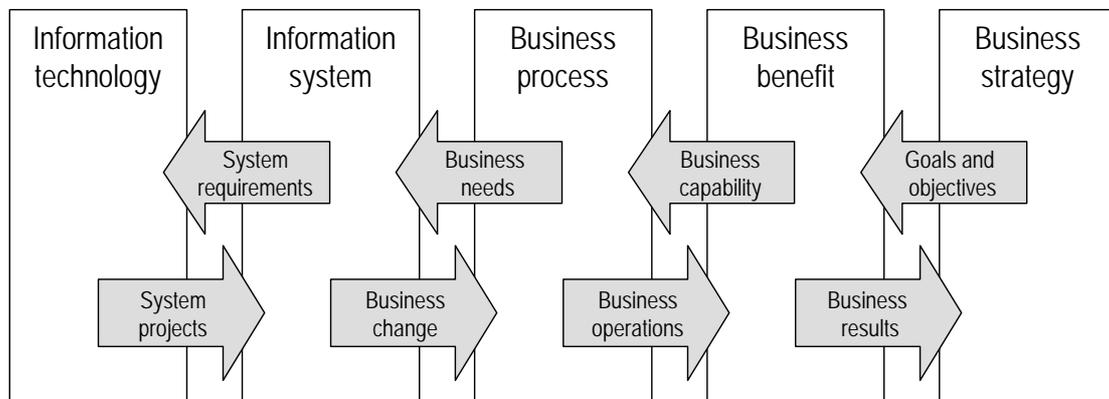


Figure 3: The Information Management Body of Knowledge

It is clear that one of the principal difficulties faced by management is the preservation of the quality and detail of thinking that passes *between* the five management domains, and that there is not just one point of alignment (as is so often argued) but *four*. If information systems projects do not deliver systems that are well supported by the technology, if systems do not support business processes, if business processes do not deliver the performance improvements that are expected, and if those improvements are not what strategy demanded, then all will be in vain. Hence, the interfaces between the management domains take on special significance.

The IMBOK framework is useful, because it allows assessment and analysis of the *competencies* that are needed to manage the successful delivery of benefits from information technology investments. From the preceding work, and in particular the review of a very wide range of literature (Lambert & Peppard, 1993), a set of 144 competencies have been identified that can be organized into nine groups that correspond to the five management domains in the IMBOK and the four gaps between them. These competencies are the substance of the survey instruments deployed in this work, and taken together they represent the *capability* of the organisation to achieve effective information management.

3.2. The survey instruments

The two survey instruments work at different levels:

- The first, with 144 statements each representing one of the 144 competencies; this is referred to as the "micro" level of working,
- The second, with a simplified form using just nine statements to represent each of the nine groups of competencies; this is referred to as the "macro" level of working.

They are based on Likert-scale worksheets with statements, each representing one competency; respondents are asked to agree/disagree with the statements in order to indicate their *perceptions* of the competency of the organization to do things well. All statements are phrased in a positive sense, so that "agreement" is good news and "disagreement" is bad news. The focus on perceptions, as opposed to any absolute measure (such as might be found in using COBIT or ITIL) helps to take more careful account of people's feelings and emotions. Most previous thinking has revolved around structured, rational, right-brained thinking, but management is as much concerned with perceptions as with absolutes.

3.3. The micro level

Working at the micro level is of course potentially difficult: no respondent can be expected to respond to 144 individual statements in what is hoped to be a quick but effective survey. Because a large number of respondents were expected to be involved, worksheets were prepared using randomly selected statements from the total set of 144, 20 statements at a time - enough worksheets would ensure that adequate coverage of the nine macro domains would be achieved.

A fragment of such a worksheet is shown below:

| Sel | ID | Statement | << Strongly agree Strongly disagree >> | | | | | | | No view |
|------|-----|---|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 2281 | 102 | Different kinds of business benefits are used to justify investment in IT and IS related change | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2282 | 76 | The purpose of business models is clearly understood | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2283 | 82 | Business models are properly reviewed by all stakeholders before decisions are made about them | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2284 | 41 | The decision to invest in a new system is always supported by a proper justification | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2285 | 42 | Systems with important future strategic potential are recognised and managed appropriately | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2286 | 108 | Risks and "disbenefits" are included in discussion and agreement about benefits management | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2287 | 2 | Different kinds of supplier relationships are recognised and managed appropriately | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2288 | 104 | Business benefits are generally seen through quantified measures, rather than by subjective observation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Figure 4: A sample worksheet from the survey instrument

The statements are in no particular order and the significance of each statement (in terms of its position in the framework) is not revealed, so that they appear completely random to the respondent. Experience at the micro level soon indicated that at the start of an assessment there was a need for a short, simple but compatible approach. This was undertaken at the macro level.

3.4. The macro level

The simplified macro-level worksheet has just nine statements, one for each of the five domains and one for each of the four interfaces. Two additions were made: an additional statement concerning culture for change was included, and a rating of importance of each of the statements (high to low) was included so as to gather data about the relative importance of the different domains.

Competencies

Business operations are well organised as well-understood business processes that deliver the required process outputs
 Business strategy is well developed and well delivered in operational terms
 Functional areas of the business understand the intended benefits of information technology investments
 Information systems projects are generally very successful in delivering new systems on time and to budget
 Key business performance indicators are in place and work well to improve business performance
 Relations with IT suppliers are well managed and we always get what we need at a good price
 The business operates well and achieves what its stakeholders expect of it
 The portfolio of working information systems is complete, it is well managed, and systems deliver what is expected of them
 We are able to undertake change management successfully when new systems are introduced that change the way we work

| Agreement ... | | | Its importance is .. | | | No view |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Agree | <> | Disagree | Hi | <> | Lo | |
| <input type="checkbox"/> |
| <input type="checkbox"/> |
| <input type="checkbox"/> |
| <input type="checkbox"/> |
| <input type="checkbox"/> |
| <input type="checkbox"/> |
| <input type="checkbox"/> |
| <input type="checkbox"/> |
| <input type="checkbox"/> |

Culture

There is a positive forward-looking culture in place that ensures the delivery of benefits from our IT investments

Figure 5: The short survey instrument used at the macro level

This short questionnaire proved to be an effective way of dealing with the hundreds of respondents involved with the financial services company.

3.5. Four cases assessed

The survey has been deployed in four cases, resulting (at the time of writing) in a total of almost 600 responses and some thousands of individual opinions:

- A random sample of different businesses (and other organizations) in Cape Town, undertaken at the micro level.
- A purposeful sample of South African Chief Information Officers, also at the micro level.
- A purposeful sample of staff in all departments of a real estate agent, also at the micro level.
- A representative sample of staff working in a large financial services company, this time at the macro level.

The results provide an interesting insight into the perceptions of different stakeholder groups: IT specialists, business specialists, administrative staff, management and others. For example, it is found that IT specialists often under-estimate their capability and fail to realise that their work is actually highly valued by others. In other cases senior management have a poor view of organisational ability to manage IT-specific issues such as technology acquisition, IT projects, and business change management.

The paragraphs that follow present selected findings to illustrate these observations, and to show how the data is collated and presented back to the respondents using an analysis package that has itself developed over the period of the work.

4. Results

The opinions were analysed using simple, descriptive statistical methods, directed at the production of "radar charts". It has been found that radar charts are an effective way of presenting complex data to managers, and because the arrangement of summary measures around the circle is fixed, the audience for the results becomes used to the shapes that arise, indicating problems and opportunities.

An analysis package has been developed, first to work with data at the micro level and later eanced to work at the macro level. It allows the selection of different datasets, sectors (of business), organizations within sector, and so on right down to the gender and education of the individual respondent, as will become evident. It automatically produces the radar charts (see below) that have ten spokes, or axes, as follows:

- IT The **information technology** management domain
- IT-IS* *The implementation of information systems*
- IS The **information systems** management domain
- IS-BP* *The implementation of business change arising from new systems*
- BP The **business process** management domain
- BP-BB* *The delivery of business benefits from improved business processes*
- BB The **business benefit** management domain
- BB-BS* *The fulfillment of business strategy through performance*
- BS The **business strategy** management domain

(The five principal domains of the IMBOK are written in **bold** text, the four interfaces in *italics*).

The tenth vertical "null" axis is reserved for "culture" measures - there was no data for that measure at this stage in the work.

4.1. The reference sample

The results for all received opinions (1391 in total) is shown in red (and bold); the results for the reference dataset (1076) are shown in blue (and feint); the standard deviation is shown in the centre in pale green.

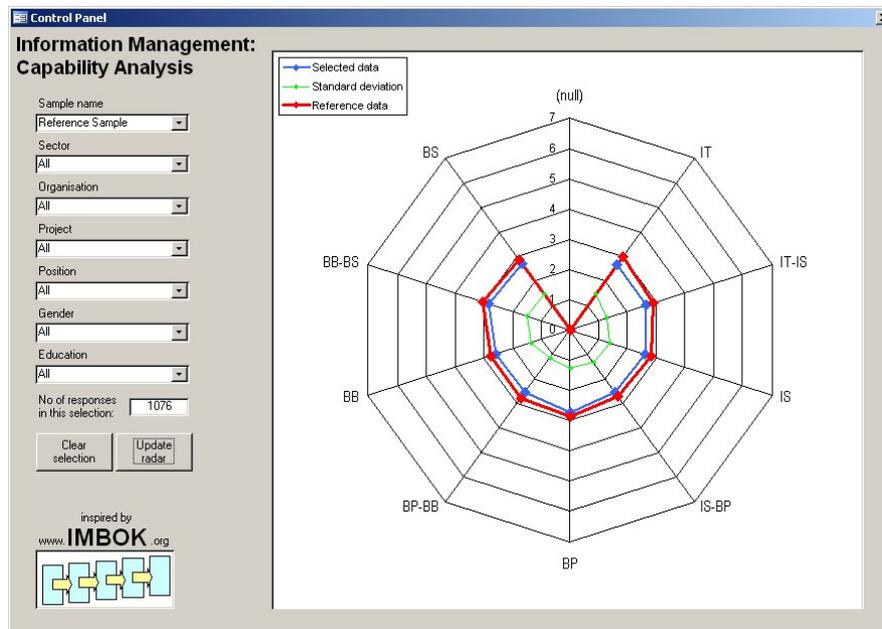


Figure 6: The results for the reference dataset.

The nine measures (from IT through to BS, clockwise) all result in an average assessment of a little less than "3". This indicates a tendency on the part of respondents to respond to the statements using the third box from the right (they were coded "7" to "1", left to right):

<< Strongly agree Strongly disagree >> No view

Because the overall result is based on 1391 opinions, it might be expected that the results would "level out" (if perceptions of capability are indeed measured in an equitable way by the survey) - it is therefore pleasing that there is no excessive variation around the nine axes. Also, it can be seen that the standard deviation of data (on all axes) is in the range 1.3 to 1.5, which suggests that there are no areas of strong disagreement. It follows that deviations from these broadly-based figures will probably be significant.

The figure below shows two selections that illustrate what is found in the detail:

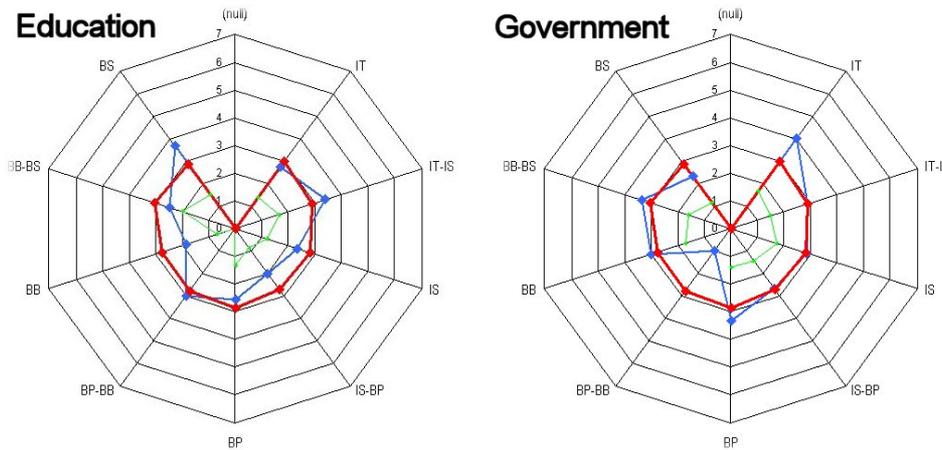


Figure 7: Results for "Education" and "Government" sectors selected from the reference dataset

There are significant differences between these results: education is strong on strategy, but government is very weak; government considers its IT management to be strong but education does not. The perceived benefits to education are extremely poor, perhaps because of the strength of the strategic vision and the weakness of the management of the technology that should assist in its realization; the ability of government to see benefits coming out of routine business activity (in the business processes) is extremely poor.

4.2. Chief Information Officers

At a workshop in Cape Town, about 20 CIOs were asked to assist by completing worksheets at the micro level.

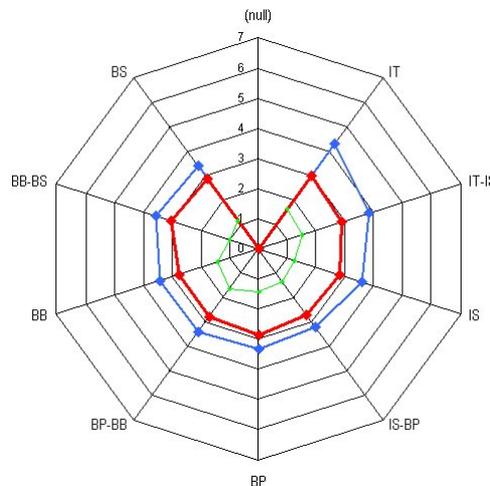


Figure 8: Results for Chief Information Officers

The results show a distinct optimism, especially when compared with some of the data from senior managers in the financial sector (see below). Perhaps this is not surprising, a CIO should feel optimistic about the merits of his work (but it would be a shock if this optimism was in distinct disagreement with the opinions of others in their organizations).

4.3. Real estate agent

The first in-company assessment concerned about 80 employees in a real estate agency, where the different views of the different groups proved to be interesting.



Figure 9: Results from a real estate business

Perhaps this is a typical result for a typical organisation, where overall there is a positive and optimistic view of information management (compared with the reference dataset). After all, this is an information intensive industry and it is critical to manage information well. This data was gathered at a time when there was a major upgrade taking place on the company web site, and therefore it is interesting to see more optimism in the IT department than in the Marketing department. When this analysis was made available to the management, it was possible to work to restore the balance. This is a marketing-led business, where it is essential that marketing staff share the general confidence in getting the technology to work well and deliver the benefits.

4.4. Financial services company

Because of the large number of potential respondents in this large financial services company, and because of the need to undertake the analysis quickly, this was the first application of the "simple" version of the survey instrument (the macro level). The analysis package being used was further developed, and so this data was more exhaustively analysed than before. The enhanced analyser allows for the selection of different departments and job levels, and it presents averages and standard deviations in detail for both capability and importance.

Just two analyses are presented below: in the main image are the results of the whole set of 224 responses (1906 opinions); overlaid at left-centre are the results for one senior manager who has quite different views than the overall average.

The overall results show that there is broad concern about the level of capability to deal with IT, systems, and systems development. The results are less levelled than in the reference dataset. Given the large number of responses, this is a result that needs further examination. The senior manager has deep concerns about technology and systems capabilities (this is typical of other senior managers in this survey) and it is probably time to make sure that something is done to redress this concern.

Having said all that, it is interesting that when compared with the reference dataset, the general results for this financial services business are good, averaging something between 4 and 5 (compared with less than 3 in the reference dataset).

When presented with this data, the CIO of the financial services business was pleased, and indicated that more detailed results would be needed in order to guide management actions intended to improve information management capability. Work on this case continues.

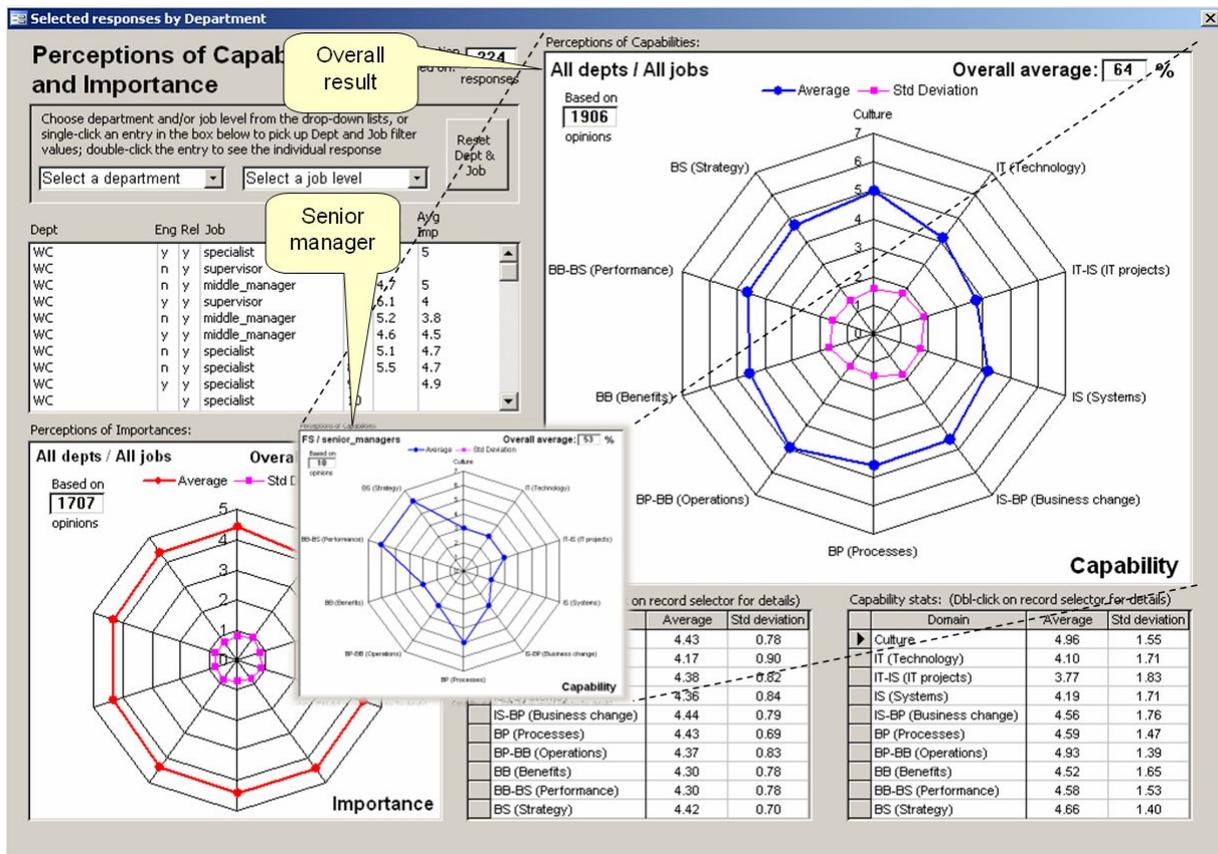


Figure 10: Analysis of macro data from a financial services business (overall result, with senior manager for comparison)

5. Conclusions

This paper has presented a review of the history of management thinking about information management issues, it has presented a framework that synthesizes the more interesting ideas, and has shown how this can be formalized as a new body of knowledge, a framework for thinking, and a capability assessment instrument.

At the start of the paper, questions were asked that provide a basis for our conclusions:

- How can the unavoidable complexities be dealt with?
- How can costs be justified in the board room?
- Exactly what does the "alignment" of IT and business strategies mean?

First, it is contended that the IMBOK deals with the complexities of information management in an effective and comprehensible way. It shows that there is no such thing as "alignment of IT and business strategies", it is necessary to align at *four critical interfaces* between five domains of management.

Second, the IMBOK provides a means to communicate effectively with senior management. There are no technical terms, just a clear indication of the dependencies that justify the cost drivers (principally the acquisition of information technology and services) in light of the systems needed, the improvements to business processes, and the fulfillment of organizational strategy through appropriate benefits.

Third, it is found that alignment needs a capability to effectively undertake all that is needed within the five domains of management, and at their interfaces. Space has precluded a detailed discussion of the 144 competencies, but herein lies the secret to success: if any one of these many things is not done well, then the whole investment - value chain is at risk. No wonder that managing information well is difficult, and risky.

It is still early days, but this research will continue. There must be more validation of the ideas and careful consideration of the merits of this kind of perceptions-based survey work. The analysis that is

undertaken here is merely descriptive, and the potential for full inferential analysis of the data (statistically) remains to be examined.

6. Acknowledgements

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7. References

- Anon (2010) Labour's computer blunders cost £26,326 bn. *The Independent*. Available from: <<http://www.independent.co.uk>> [Accessed 24 August 2010].
- Anon (2008) Making Sure Tech Is in Step. *Wall Street Journal - Eastern Edition*, 252 (59), p.B9.
- Baets, W. (1992) Aligning information systems with business strategy. *The Journal of Strategic Information Systems*, 1 (4), pp.205-213.
- Beaudry, A. & Pinsonneault, A. (2010) The other side of acceptance: Studying the direct and indirect effects of emotions on information technology use. *MIS Quarterly*, 34 (4), pp.689-A3.
- Bytheway, A. (1996) Strategic information modelling: some experiences with a new framework. *Journal of Applied Management Studies*, 5 (1), pp.17-45.
- Bytheway, A. (2004) *The Information Management Body of Knowledge*. 1st ed. World Wide Web. Available from: <<http://www.imbok.org>>.
- Bytheway, A. & Braganza, A. (1997) *Process based collaboration: strategies, tactics and benefits*. Cranfield UK, Cranfield School of Management.
- Bytheway, A. & Lambert, R. (1998) Organisational competencies for harnessing IS/IT. Available from: <<http://www.imbok.org/docs/CompetenciesGoodPracticeGuide.pdf>> [Accessed 7 May 2010].
- Chan, Y.E. & Reich, B.H. (2007) IT alignment: what have we learned? *Journal of Information Technology*, 22 (4), pp.297-315.
- Chatterji, S. (2007) Bridging business and IT strategies with Enterprise Architecture: Realising the real value of business-IT alignment. *Information Systems Control Journal*, 3, pp.1-2.
- Chen, D.Q., Mocker, M., Preston, D.S. & Teubner, A. (2010) Information Systems strategy: Reconceptualization, measurement and implications. *MIS Quarterly*, 34 (2), pp.233-A8.
- Cross, J. (1995) IT outsourcing : British Petroleum's competitive approach. *Harvard Business Review*, 73 (3), p.94.
- Cross, J. & Earl, M. (1997) Transformation of the IT function at British Petroleum. *MIS Quarterly*, 21 (4), pp.401-424.
- DeLone, W. & McLean, E. (1992) Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research*, 3 (1), pp.60-95.
- Edwards, C. & Peppard, J. (1997) Operationalizing strategy through process. *Long Range Planning*, 30 (5), pp.753-767.
- Frankel, D.S., Harmon, P., Mukerji, J., Odell, J., Owen, M., Rivett, P., Rosen, M. & Soley, R.M. (2003) *The Zachman Framework and the OMG's model driven architecture*. Business Process Trends (Whitepaper). Available from: <http://petros.omg.org/mda/mda_files/09-03-WP_Mapping_MDA_to_Zachman_Framework1.pdf> [Accessed 22 November 2010].
- Henderson, J.C. & Venkatraman, N. (1993) Strategic alignment: leveraging information technology for

- transforming organizations. *IBM Systems Journal*, 32 (1), pp.4-16.
- HICTE (2003) *ICT in Higher Education*. Cape Town, University of the Western Cape.
- Kearns, G.S. & Lederer, A.L. (2000) The effect of strategic alignment on the use of IS-based resources for competitive advantage. *The Journal of Strategic Information Systems*, 9 (4), pp.265-293.
- Lambert, R. & Peppard, J. (1993) IT and new organizational forms: destination but no road map? *Journal of Strategic Information Systems*, 2 (3), pp.180-206.
- Mingers, J. & Walsham, G. (2010) Toward ethical information systems: The contribution of discourse ethics. *MIS Quarterly*, 34 (4), pp.833-854.
- Peppard, J., Lambert, R. & Edwards, C. (2001) Whose job is it anyway? *Information Systems Journal*, 10 (4), pp.291-322.
- Sambamurthy, V., Bharadwaj, A. & Grover, V. (2003) Shaping agility through digital options: Reconceptualizing the role of IT in contemporary firms. *MIS Quarterly*, 27 (2), pp.237-264.
- Seddon, P.B., Calvert, C. & Yang, S. (2010) A multi-project model of key factors affecting organizational benefits from Enterprise Systems. *MIS Quarterly*, 34 (2), pp.305-311.
- Symons, C. (2005) *IT Governance Framework*. Forrester. Available from: <<http://cba.co.nz/download/Forr051103656300.pdf>> [Accessed 22 November 2010].
- Tallon, P.P., Kraemer, K.L. & Gurbaxani, V. (2000) Executives' perceptions of the business value of information technology: a process-oriented approach. *Journal of Management Information Systems*, 16 (4), pp.145-173.
- Uchitelle, L. (1996) What has the computer done for us lately? *New York Times*, p.21.
- Venkatraman, N. (1994) IT-enabled business transformation: from automation to business scope redefinition. *Sloan Management Review*, 35 (2), pp.73-87.
- Venkatraman, N. (1996) *Managing IT resources as a value center*. IS Executive Seminar Series, Cranfield School of Management.
- Ward, J. & Daniel, E. (2005) *Benefits Management: Delivering Value from IS and IT Investments*. Chichester, Wiley.
- Ward, J. & Peppard, J. (2002) *Strategic Planning for Information Systems (3rd Edition)*. Chichester, Wiley.
- Yayla, A. & Hu, Q. (2009) Antecedents and drivers of IT-Business Strategic Alignment: Empirical validation of a theoretical model. In: *Proc 17th European Conference on Information Systems*. Verona Italy.
- Zachman, J.A. (1987) A Framework for Information Systems Architecture. *IBM Systems Journal*, 26 (3), pp.590-616.