KPMG

BUSINESS INTELLIGENCE

The new wave of business intelligence

Creating Management and Information Infrastructure

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Executive summary

In recent years the market for Business Intelligence has exploded. Prior to the crash AMR Research estimated that US$57 billion would be spent on Business Intelligence in 2008, US$25.5 billion of this in the US[1]. Gartner surveys repeatedly rate Business Intelligence as the number one issue for CFOs and CIOs[2].

Meanwhile Forrester reports that 5% of the queries it has received since 2007 have focussed on Business Intelligence specifically[3]. And evidence suggests that Business Intelligence will continue to thrive reasonably well in tough economic times, not least because of the potential Business Intelligence has to reduce organisational processing costs.

This report — which draws on a wide ranging review of some 3,000 separate pieces of published research — reviews the state of the art in Business Intelligence. It presents compelling empirical evidence that demonstrates the value of Business Intelligence, but also highlights the challenges of successfully executing Business Intelligence initiatives. A key theme in the report is the need to simultaneously create management as well as information infrastructures. The latest research suggests that the combined development of management and information infrastructures results in a 34% performance improvement, compared to the 8% improvement achieved when only the management or the information system is addressed[4].

At a more detailed level the key conclusions from this research are:

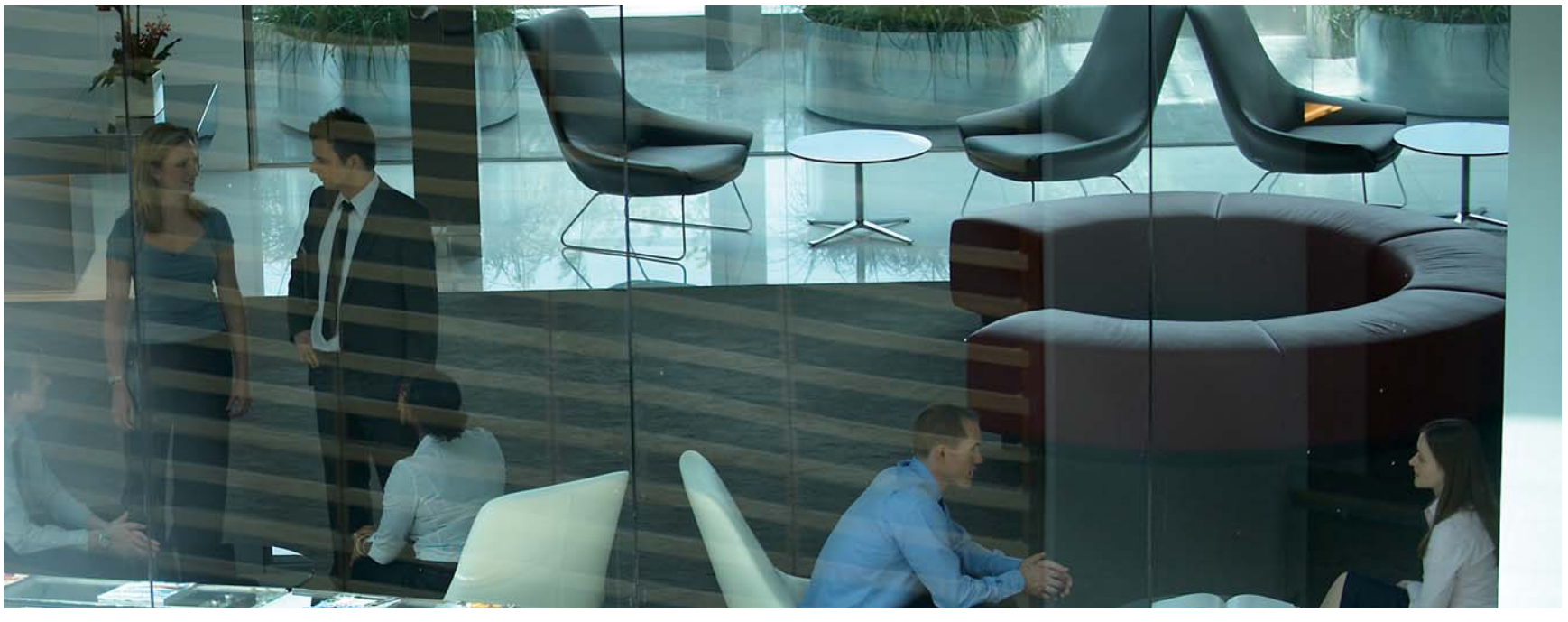
1. **Business Intelligence delivers value through three key pathways.** First, Business Intelligence systems reduce the cost and complexity of information processing. Second, with appropriate organisational infrastructure, Business Intelligence provides new performance insights that can enhance an organisation's efficiency and effectiveness. Third, Business Intelligence has the potential to set organisations free — offering them the opportunity of engaging everyone in the successful execution of strategy.

2. **The investment community recognises these three pathways to value.** While it is too early for large scale empirical results on the impact of Business Intelligence as an integrated package, there are numerous research studies on the performance impact of Business Intelligence's constituent elements — e.g. scorecards and dashboards; analytics infrastructure; and planning, budgeting and forecasting. These show that the investment community places a premium on Business Intelligence.

3. **A 2007 study, for example, shows that firms that have adopted the balanced scorecard outperform firms that have not** by "27% points in the market value of equity sample, by 30% points in the book-to-market sample, and by 27% points in the net assets sample"[5]. While advanced users of Business Intelligence, such as Continental Airlines, are reputed to claim returns on investment of 1000%[6].

4. **Despite the promise of Business Intelligence many implementations fail to live up to their potential.** The primary reason is that too often Business Intelligence projects are seen as technology projects. There is new empirical evidence — the theory of complementarities — which suggests that the best organisational performance arises

1 Maura McGreevy, M. (2008) *Spending on Business Intelligence and Performance Management to Top $57.1B in 2008*, AMR Research, May 13.
2 Richardson, J.; Schlegel, K.; Hostmann, B. and McMurchy, N. (2008) *Magic Quadrant for Business Intelligence Platforms*, 2008, Gartner Research, February 1.
3 Adrian, M. (2008) *Inquiry Insights: Business Intelligence, Q3 2008 What Customers Need To Hear About M&A, Text Mining, And Widespread Enterprise Utilization*, Forrester Research, August 12.
4 Bloom, N., Sadun, R. and Van Reenen, J. (2007) *Americans do I.T. Better*, CEP Discussion Paper 788, London School of Economics.
5 Crabtree, A. D. and DeBusk, G.K. (2008) The Effects of Adopting the Balanced Scorecard on Shareholder Returns, Advances in Accounting 24(1): 8-15.
6 Watson, H. J.; Goodhue, D. L. and Wixom, B. H. (2002) The Benefits of Data Warehousing: Why Some Organizations Realize Exceptional Payoffs, Information & Management, 39(6): 491–502.



when IT implementations are accompanied by appropriate organisational change. To unlock the potential of Business Intelligence, organisations have to simultaneously enhance their organisational and technological infrastructures. Recent research by Gartner and Cranfield School of Management suggests that fewer than 10% of organisations have made significant progress in this regard[7].

5. **The reasons for this lack of progress are clear.** First, there are pragmatic issues — many organisations suffer because of their existing legacy information systems. Multiple databases, in different locations, made more complex by the proliferation of mergers and acquisitions. Second, too often simplistic assumptions are made about the nature of strategy development and particularly strategy execution. Our desk research raises the question: are firms operating in the 21st century still trying to use models of management that were developed in the 1970s?

Third, even those organisations that are changing face an evolving environment. Global businesses are increasingly reliant on globally distributed value systems. Tasks and activities have been outsourced to partner organisations that might not share the same aims. New technologies and ways of working are changing the rules of the game — web 2.0 and the emergence of the gift economy (where experts give away knowledge for free) are changing the way that firms compete. All of these dynamics have implications for how firms should be managed and their activities co-ordinated. The management models of yesterday will not work tomorrow.

6. **So what do we do?** Well, KPMG's approach is to simultaneously improve the organisations management and technological infrastructures. In doing so, KPMG focuses on six key elements:
(i) business strategy alignment;
(ii) governance; (iii) performance management and process reporting;
(iv) integrated information management;
(v) business intelligence platform;
(vi) infrastructure.

7. Getting these six elements aligned will improve the organisations management and information infrastructures, which as this report demonstrates is the key to unlocking the value of Business Intelligence.

8. In 21st Century organisations, the challenge is how to design Business Intelligence (BI) systems that facilitate and enable, not simply command and control. No longer are executives simply looking for ways of controlling vast empires, instead they are looking for mechanisms that enable their people to perform. Globally organisations have recognised this transition — that's why there is such a high level of interest in BI. But don't be fooled into thinking BI is simply getting the right information to the right people at the right time so they can make the right decisions. Successfully deploying a BI solution involves much more. Research suggests that the stock market recognises the potential of Business Intelligence — hence the evidence showing a stock price premium following announcements about BI initiatives. BI can deliver significant returns to those that really capitalise on its potential. The question is, will you?

7 Rayner, N. (2008) Measuring and Managing Corporate Performance: The State of the Art, Gartner, August.

The new wave of Business Intelligence

Data is rife, insight is rare

Globally, organisations are developing increasingly sophisticated information infrastructures. Building on massive investments in technologies such as enterprise Resource Planning, Customer Relationship Management and Financial Reporting and Consolidation, firms are able to collect terabytes of data. Increasingly these enterprise level information systems are being integrated with operational and activity based systems — Electronic Data Interchange, Radio Frequency Identification tags and customer data collection schemes — e.g. loyalty cards in retail and leisure outlets and airline frequent flier schemes. The result is that today data is rife, but one could argue insight is rare! Study after study illustrates the point.

Drowning in data while thirsting for insight

- In 2007 Cranfield School of Management and Oracle surveyed executives from over 600 firms around the world. Their report, published in 2008, suggests that firms are failing to capitalise on the potential of Enterprise Performance Management, not least because managers are unable to extract insight from performance data. Only one third of Japanese firms and less than half of UK firms felt that their Enterprise Performance Management systems delivered useful insight[8].

- A survey of the US public sector, conducted by Wharton Professor Chris Ittner and colleagues, found that the "inability of existing information systems to provide timely, reliable and valid data in a cost effective manner" a major hindrance in the successful implementation of innovative performance management systems[9].

- A 2008 meta review of the information technology literature found 58 reasons why Business Intelligence initiatives failed. These 58 items clustered into 10 categories, the most frequently mentioned being "state of existing data management infrastructure (17%)". Other shortcomings included: effective communication (16%); management support (14%); clear link to business strategy (12%); champion (10% of cases); user support (10%); management of resistance (7%); sufficient resources (7%); team skills (3%); evolutionary development methodology (3%)[10].

8 Neely, A.D.; Yaghi, B. and Youell, N. (2008) *Enterprise Performance Management: The Global State of the Art*, Oracle and Cranfield School of Management.
9 Cavalluzzo, K.S. and Ittner, C.D. (2004) *Implementing Performance Measurement Innovations: Evidence from Government, Accounting Organizations and Society* 29(3-4): 243-267.
10 Ariyachandra, T.R. and Frolick, M.N. (2008) *Critical Success Factors in Business Performance Management — Striving for Success, Information Systems Management*, Taylor & Francis Ltd. 25: 113-120.

Clearly extracting insight from data is a significant challenge, but as the previous examples show there are many other challenges with successfully implementing Business Intelligence. Before reviewing these and exploring what can be done about them it is worth considering some fundamental questions about Business Intelligence — namely what is Business Intelligence and why is Business Intelligence so important?

Business intelligence: some fundamental questions

At one level Business Intelligence is not a new concept. Writing in 1958, Hans Peter Luhn, a computer scientist working at IBM, wrote: *"Business is a collection of activities carried on for whatever purpose, be it science, technology, commerce, industry, law, government, defense, etc. The communication facility serving the conduct of a business (in the broad sense) may be referred to as an intelligence system. The notion of intelligence is also defined here, in a more general sense, as the ability to apprehend the interrelationships of presented facts in such a way as to guide action towards a desired goal"*[11].

Since then Business Intelligence has been discussed in various guises: Business Intelligence, Business Performance Management, Enterprise Performance Management, Corporate Performance Management, Business Performance Measurement, Decision Support Systems, Executive Information Systems, etc.

Variations on the theme: definitions of Business Intelligence

- Business Intelligence: "a strategic approach for systematically targeting, tracking, communicating and transforming relevant weak signs' into actionable information on which strategic decision-making is based"[12].

- "Business Intelligence is now commonly understood to encompass all components of an integrated management support infrastructure"[13].

- A Business Intelligence platform is one that delivers 12 capabilities clustered under three headings: (1) integration: (i) BI infrastructure; (ii) metadata management; (iii) development; (iv) workflow and collaboration; (2) information delivery: (i) reporting; (ii) dashboards; (iii) ad hoc query; (iv) Microsoft Office integration; (3) analysis: (i) OLAP; (ii) advanced visualization; (iii) predictive modelling and data mining; (iv) scorecards[14].

- "Business Intelligence provides software tools that are customised for end business users, and deliver business insights in real time at the point of a decision"[15].

11 H. P. Luhn (1958) A Business Intelligence System, IBM Journal, October.
12 Rouibah, K. and Ould-ali, S. (2002) PUZZLE: A Concept and Prototype for Linking Business Intelligence to Business Strategy. Journal of Strategic Information Systems 11(2): 133-152.
13 Baars, H. and Kemper, H.-G. (2008) Management Support with Structured and Unstructured Data - An Integrated Business Intelligence Framework, Information Systems Management, Taylor & Francis Ltd. 25: 132-148.
14 Richardson, J.; Schlegel, K.; Hostmann, B. and McMurchy, N. (2008) Magic Quadrant for Business Intelligence Platforms 2008, Gartner Research, February 1.
15 Azvine, B., Cui, Z. et al. (2005) Towards Real-Time Business Intelligence, BT Technology Journal 23(3): 214-225.
16 Clayton, J. (2005). Ask the Expert. www.CIO.com

- "Business Intelligence is the technological solution that enables a company to consolidate and leverage the vast masses of data in organisations to improve decision making"[16].

- "Business Intelligence provides the IT infrastructure and applications required to implement Business Performance Management. Business Performance Management is a business process that leverages Business Intelligence"[17].

- Business Performance Management (or Corporate Performance Management or Enterprise Performance Management) can be "described as a series of business processes and applications designed to optimise both the development and the execution of business strategy"[18].

- The Business Performance Management Standards group (established in 2003) define Business Performance Management as "a set of integrated, closed-loop management and analytic processes, supported by technologies that address financial and operational activities. Business Performance Management helps businesses define strategic goals and measure and manage performance against those goals"[19].

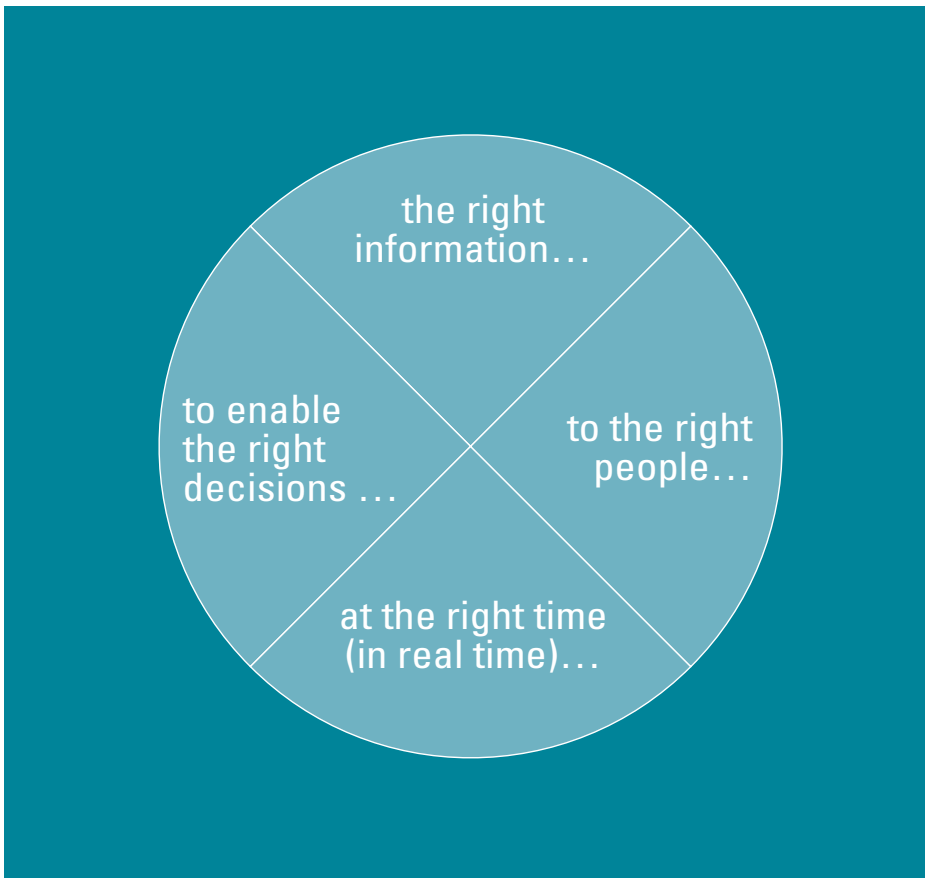
- A Performance Measurement system "enables informed decisions to be made and actions to be taken because it quantifies the efficiency and effectiveness of past actions through the acquisition, collation, sorting, analysis, interpretation, and dissemination of appropriate data. Organisations measure their performance in order to check their position (as a means to establish position, compare position or bench marking, monitor progress), communicate their position (as a means to communicate performance internally and with the regulator), confirm priorities (as a means to manage performance, cost and control, focus investment and actions), and compel progress (as a means of motivation and rewards)"[20].

- Decision support systems are defined as "an interactive computer-based system or subsystem intended to help decision makers use communications technologies, data, documents, knowledge, and/or models to identify and solve problems, complete decision process tasks, and make decisions"[21].

Fundamentally what unites these definitions is the requirement to get the right information to the right people at the right time (and increasingly in real time) so they can make the right decisions — see Figure 1.

17 Miranda, S. (2004) *Beyond BI: Benefiting from Corporate Performance Management Solutions*, Financial Executive, 20:2, 58–61.
18 Frolick, M.N. and Ariyachandra, T.R. (2006) *Business Performance Management: One Truth, Information Systems Management*, Taylor & Francis Ltd. 23: 41–48.
19 Whiting, R. (2004) *Structuring Business Performance Management*, ITNews, www.itnews.com
20 Neely, A.D. (1998) Business Performance Measurement: Why, What, How, Economist Books, London.
21 Power, D.J. (2008) *Understanding Data-Driven Decision Support Systems*, Information Systems Management, Taylor & Francis Ltd. 25: 149–154.

Figure 1: Fundamentals of Business Intelligence



Of course getting the information to the right people at the right time so they can make the right decisions remains a significant challenge for organisations. Our desk research shows that:

- Up to 50% of executive managers place no confidence in the numbers presented to them[22,23].

- One of the main reasons that executives have no confidence in the numbers presented to them is the vague nature of the objectives that many firms have, which in turn leads to companies measuring the wrong processes and activities[24]. Indeed, a common theme that emerges in our desk research is the question of whether firms really understand the true drivers of organisational value[25].

- Another reason that managers have little confidence in the numbers they are presented with is the multitude of fragmented and geographical dispersed legacy computer systems, made worse by generations of mergers and acquisitions. These different data sources often conflict with one another because they define specific dimensions of performance in different ways[26]. It is quite common to find half a dozen different definitions of what a sale is in a single organisation. Hence the debate that results — whose number is right?

22 Lingle, J.H. and Schiemann, W.A. (1996) *From Balanced Scorecard to Strategic Gauges: Is Measurement Worth It?* Management Review, 85(2), 56–61.
23 Neely, A.D.; Yaghi, B. and Youell, N. (2008) *Enterprise Performance Management: The Global State of the Art*, Oracle and Cranfield School of Management.
24 Frolick, M.N. and Ariyachandra, T.R. (2006) *Business Performance Management: One Truth. Information Systems Management*, Taylor & Francis Ltd. 23: 41-48.
25 Ittner, C. D. and D. F. Larcker (2003) *Coming Up Short on Nonfinancial Performance Measurement*, Harvard Business Review 81(11): 88-95.
26 Neely, A.D.; Richards, A.H.; Mills, J.F.; Platts, K.W. and Bourne, M.C.S. (1997) *Designing Performance Measures: A Structured Approach*, International Journal of Operations and Production Management, 17(11): 1131-1153.

- The third problem that our desk research highlights is the lack of integration between different organisational systems. A recent study by Gartner and Cranfield found that less than 10% of firms studied had made significant progress integrating their planning and budgeting systems with their strategic dashboards and scorecards or with their financial consolidation systems[27]. "Islands of automation" or "point solutions" remains an apt way of describing many firms' Business Intelligence systems.

- Given the limited progress that many organisations have made in implementing integrated Business Intelligence solutions it is no surprise (although it is rather depressing) that MS Excel remains the most prominent Business Intelligence software tool. Data collected in 2007 suggests that between 70% and 80% of organisations still see MS Excel as their primary software for supporting performance management[28].

One of the consequences of these four related problems — poor data because of poor measures, poor infrastructure and poor integration — is that executive teams spend remarkably little time using Business Intelligence to review their strategy — "research suggests that 85% of executive leadership teams spend less than one hour per month discussing their unit's strategy, with 50% spending no time at all"[29]. This becomes even more worrying when one bears in mind the wealth of data that suggests many firms simply fail to execute their strategies.

Overwhelming evidence of a strategy challenge

- Seven out of eight companies (in a global sample of 1,845 firms) failed to achieve profitable growth between 1988 and 1998 — profitable growth defined as 5.5% annual real growth in revenues and earnings while covering the cost of capital. Yet 90% of these companies had formal strategies with much more ambitious targets[30] .

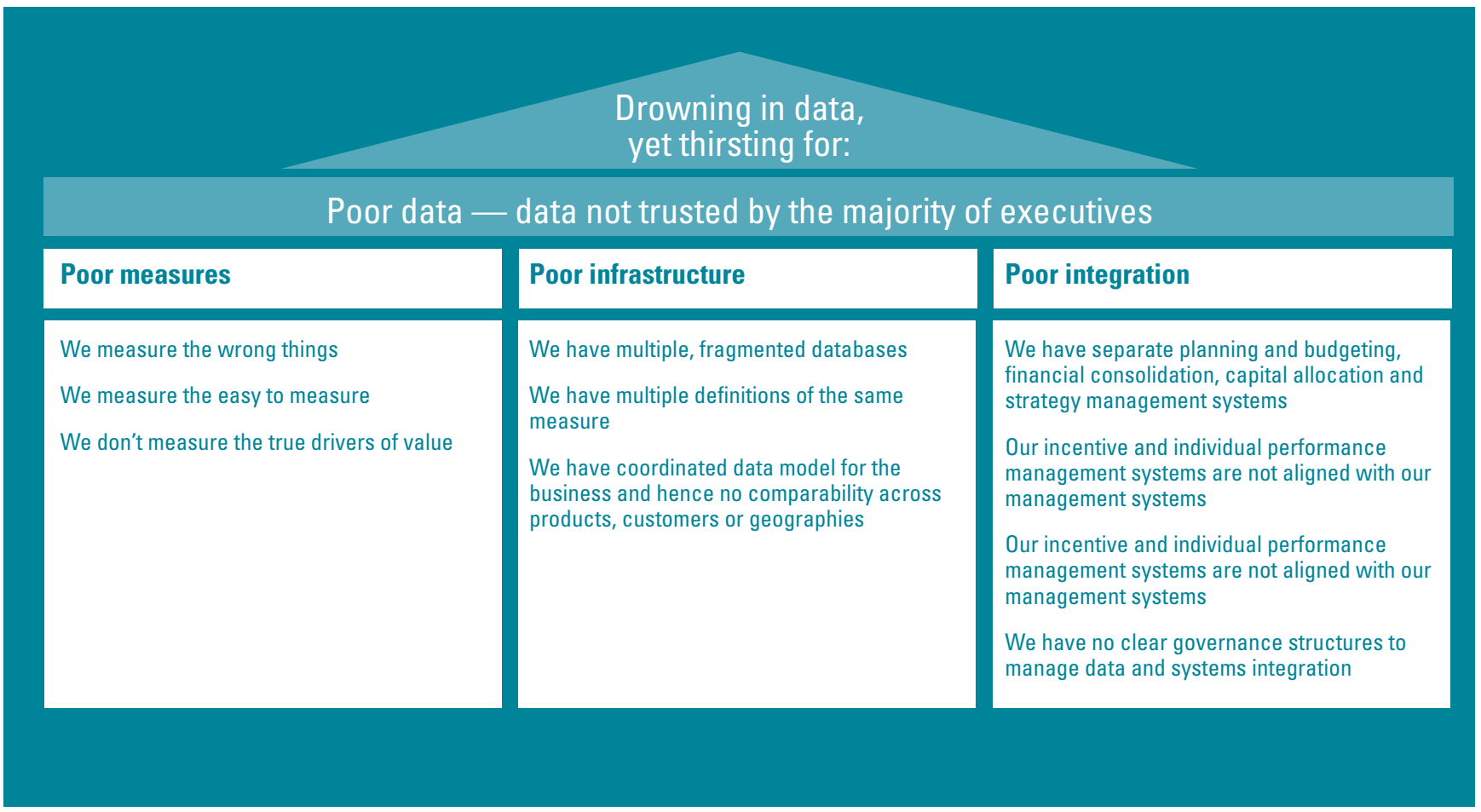
- Research by Professor Bob Kaplan and Dr David Norton suggests that "on average, 95% of a company's employees are unaware of, or do not understand, its strategy"[31].

- Other studies suggest that 60-80% of firms fail to execute their strategies[32], with fewer than 5% of employees aware of or understanding their firm's strategies[33].

27 Rayner, N. (2008) *Measuring and Managing Corporate Performance: The State of the Art*, Gartner, August.
28 Neely, A.D.; Yaghi, B. and Youell, N. (2008) *Enterprise Performance Management: The Global State of the Art*, Oracle and Cranfield School of Management.
29 Kaplan, R.S. and Norton, D.R. (2005) *The Office of Strategy Management*, Harvard Business Review 83(10): 72-80.
30 Zook, C. and Allen, J. (2001) *Profit from the Core, Harvard Business School Press*, Boston, Mass.
31 Kaplan, R.S. and Norton, D.P. (2007) *Using the Balanced Scorecard as a Strategic Management System*, Harvard Business Review 85(7-8): 150–161.
32 Neilson, G. L., Martin, K.L. et al. (2008) *The Secrets to Successful Strategy Execution*, Harvard Business Review 86(6): 60-70.
33 Kaplan, R. S. and Norton, D.P. (2007) *Using the Balanced Scorecard as a Strategic Management System*, Harvard Business Review 85(7-8): 150-161.

At its heart this problem can be described as the "information house of cards" — see Figure 2. Poor data, measures, infrastructure and integration leaves many organisations with information systems that are not trusted and in essence are no better than a 'house of cards'.

Figure 2: The Information House of Cards



Business Intelligence: a solution to the Information House of Cards?

So how do we solve the problems embedded in the Information House of Cards? Well at their most basic this is exactly what Business Intelligence systems seek to do. By integrating and aligning different management systems — planning and budgeting, forecasting, financial consolidation, scorecarding, etc — around the organisation's strategy and then creating a common data architecture, Business Intelligence systems seek to provide organisations with an information platform to address the problems embedded in the Information House of Cards.

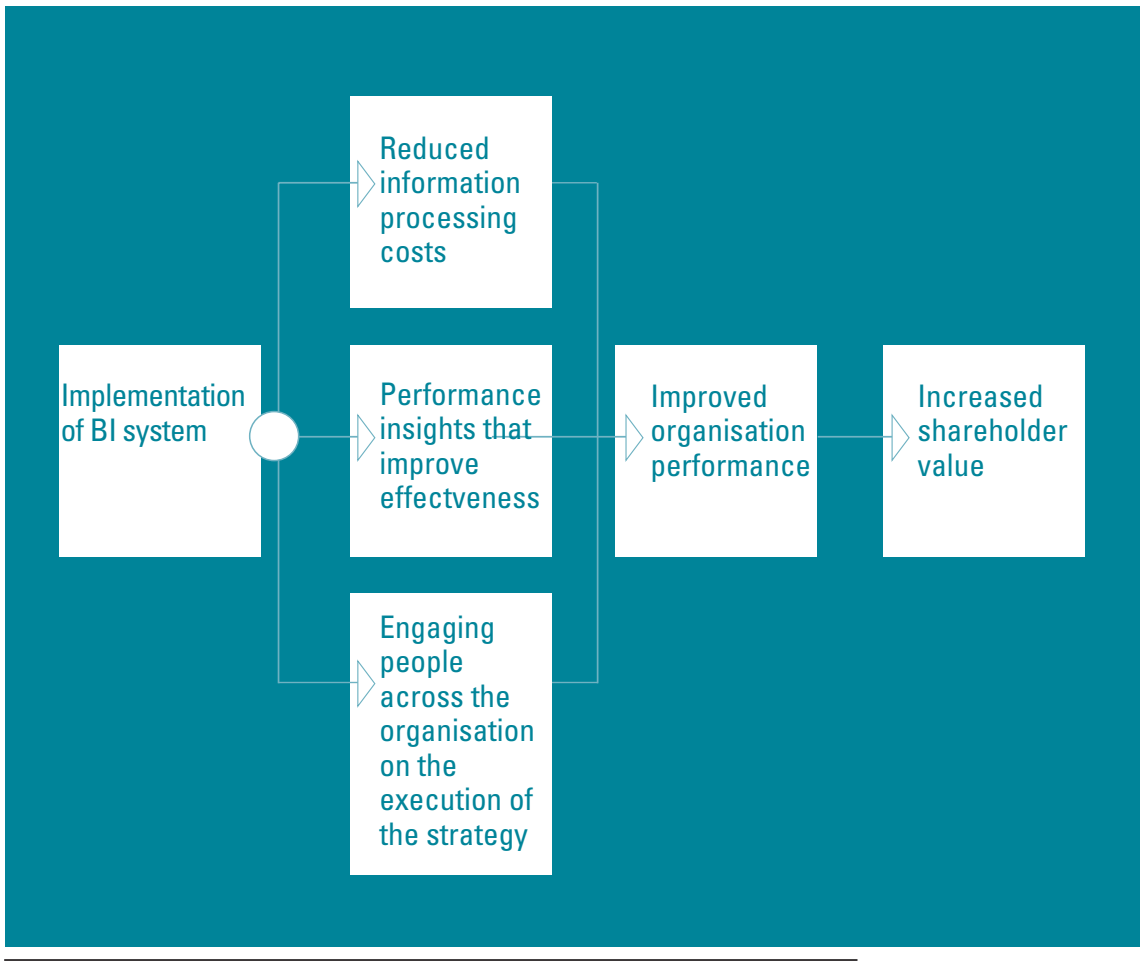
While it is still too early to expect much empirical data illustrating the performance impact of integrated Business Intelligence systems, there is good evidence that the constituent components of Business Intelligence systems can have a positive impact on organisational performance. A recent event analysis study, for example, suggests that firms that adopt the strategically aligned performance measures outperform firms that do not by "27% points in the market value of equity sample, by 30% points in the book-to-market sample, and by 28% points in the net assets sample"[34].

34 Crabtree, A. D. and DeBusk, G.K. (2008) *The Effects of Adopting the Balanced Scorecard on Shareholder Returns*, Advances in Accounting 24(1): 8-15.

While advanced users of Business Intelligence, such as Continental Airlines, are reputed to claim returns on investment of 1000%[35]. And Harrah Entertainment's CEO, Gary Loveman puts down the business' 16 straight quarters revenue growth to insights garnered from its customer data[36].

The empirical evidence suggesting the Business Intelligence systems can have a positive impact is wide ranging (see Table 1). Regardless of study methodology employed — case study, survey or events analysis (which look at stock market responses to firm announcements) — there is ample evidence that information and management system investments can improve organisational performance and deliver stock returns. The evidence base includes studies in sectors such as diverse as manufacturing, financial services, retailing, wholesaling and telecommunications, as well as countries such as Australia, the UK and the US. The results suggest that integrated Business Intelligence systems can have a positive impact on organisations — both in terms of their financial performance and stock returns. Perhaps this is best summed up by the results of a recent US survey of members of the IMA (Institute of Management Accountants) which found that 88% of regular users the balanced scorecard believed that it had led to improved operating performance and 66% reported an increase in profits[37]. Figure 3 summarises the data presented in Table 1, suggesting that Business Intelligence creates value through three key pathways — reduced information processing costs; performance insights that improve effectiveness and engaging people across the organisation in the execution of strategy.

Figure 3: Business Intelligence creates value



35 Watson, H. J.; Goodhue, D. L. and Wixom, B. H. (2002) The Benefits of Data Warehousing: Why Some Organizations Realize Exceptional Payoffs, Information & Management, 39(6): 491–502.
36 Loveman, G. (2003) Diamonds in the Data Mine, Harvard Business Review 81(5): 109-113.
37 DeBusk, G. K. and A. D. Crabtree (2006) Does the Balanced Scorecard Improve Performance? Management Accounting Quarterly, Institute of Management Accountants. 8: 44-48.

Table 1: The Evidence Base for the Impact of Business Intelligence

	Case study evidence	Survey evidence	Events studies
Impact of management systems	• A well-designed study of US banks reports that branches using the balanced scorecard achieved significantly higher levels of financial performance than banks not using the balanced scorecard. The strength of this study is that the two sets of banks are matched so there is a naturally occurring control group[38]. • A detailed case study in multiple divisions of a single North American firm found good evidence that balanced scorecards present a significant opportunities to develop, communicate and implement strategy. This study found that managers respond positively to "balanced scorecard measures by reorganising their resources and activities, in some cases dramatically, to improve their performance on those measures". The managers interviewed in this study reported that by improving their balanced scorecard performance they believed they were improving their business efficiency and profitability[39]. • Several studies have shown that non-financial performance measures – e.g. customer satisfaction — are drivers of future financial performance. The most notable of these studies cover financial services, hospitality, telecommunications and retail/ wholesale sectors[40,41].	• A survey of 297 US firms found that only 30% of firms sought to build causal models showing the links between the different measures of performance they use and only 23% sought to validate these links. Importantly the 23% that sought to validate the links between measures had 3% higher ROA and 5% higher ROE on average than companies that didn't use causal models[42]. • A survey of 66 Australian manufacturing firms found that overall balanced scorecard usage was significantly correlated with organizational performance, measured in terms of return on investment, margin on sales, capacity utilization, customer satisfaction and product quality[43]. • Another study of 200 Australian manufacturing firms found that performance measurement systems improve the strategic competitiveness of organizations "if they focus on how goals, strategies and operations are connected" and if they attempt to provide enhanced understanding of the "interdependencies across the value chain"[44]. A finding re-enforced by a Dutch survey which found that the balanced scorecard positively affects organizational performance only if the focus of the performance measurement initiative is on strategy and strategic alignment[45].	• A recent event analysis study, for example, suggests that firms that adopt the strategically aligned performance measures outperform firms that do not by "27% points in the market value of equity sample, by 30% points in the book-to-market sample, and by 28% points in the net assets sample[46]" .

38 Davis, S. and T. Albright (2004) An Investigation of the Effect of Balanced Scorecard Implementation on Financial Performance, Management Accounting Research 15(2): 135-153.
39 Malina, M. A. and F. H. Selto (2001) Communicating and Controlling Strategy: An Empirical Study of the Effectiveness of the Balanced Scorecard, Journal of Management Accounting Research, American Accounting Association. 13: 47-90.
40 Ittner, C. D. and D. F. Larcker (1998) Are Nonfinancial Measures Leading Indicators of Financial Performance? An Analysis of Customer Satisfaction, Journal of Accounting Research 36(3): 1-35.
41 Banker, R. D., G. Potter, et al. (2000) An Empirical Investigation of an Incentive Plan that Includes Nonfinancial Performance Measures, Accounting Review 75: 65-92.
42 Ittner, C. D. and D. F. Larcker (2003) Coming Up Short on Nonfinancial Performance Measurement, Harvard Business Review 81(11): 88-95.
43 Hoque, Z. and W. James (2000) Linking Balanced Scorecard Measures to Size and Market Factors: Impact on Organizational Performance, Journal of Management Accounting Research, American Accounting 43 Association 12: 1-17.
44 Chenhall, R. H. (2005) Integrative Strategic Performance Measurement Systems, Strategic Alignment of Manufacturing, Learning and Strategic Outcomes: An Exploratory Study, Accounting Organizations and Society 30(5): 395-422.
45 Braam, G. J. M. and E. J. Nijssen (2004) Performance Effects of Using the Balanced Scorecard: A Note on the Dutch Experience, Long Range Planning 37(4): 335-349.
46 Crabtree, A. D. and DeBusk, G.K. (2008) The Effects of Adopting the Balanced Scorecard on Shareholder Returns, Advances in Accounting 24(1): 8-15.

	Case study evidence	Survey evidence	Events studies
Impact of management systems		• Further evidence from Australia comes from a survey of 140 Australian manufacturing firms. This study reveals a positive association between a company's strategic priorities (e.g. low product price or differentiation), its management control practices (e.g. use of non-financial performance measures) and perceived organizational performance (i.e. the respondents' perception of organisational performance relative to their major competitors)[47]. • A second study, drawing on data from 140 US financial services firms, found that organisations using a greater range of financial and non-measures (often referred to as measurement diversity) achieved higher stock returns and increased management satisfaction with measurement. This study, however, provides a cautionary note because the researchers found no evidence of greater economic performance in firms using a wider range of financial and non-financial measures[48]. • In terms of incentives, studies have also shown that linking compensation to non-financial performance measures can both improve firm performance (measured in financial terms) and increase stock returns[49,50]. • A recent US survey of members of the IMA (Institute of Management Accountants) which found that 88% of regular users the balanced scorecard believed that it had led to improved operating performance and 66% reported an increase in profits[51].	

47 Chenhall, R. H. and Langfield-Smith, K. (1998) The Relationship Between Strategic Priorities, Management Techniques and Management Accounting: An Empirical Investigation Using A Systems Approach, Accounting, Organizations and Society 23(3): 243-264.
48 Ittner, C. D., D. F. Larcker, et al. (2003) Performance Implications of Strategic Performance Measurement in Financial Services Firms, Accounting Organizations and Society 28(7-8): 715-741.
49 Banker, R. D., G. Potter, et al. (2000) An Empirical Investigation of an Incentive Plan that Includes Nonfinancial Performance Measures, Accounting Review 75: 65-92.
50 Said, A. A., H. R. HassabElnaby, et al. (2003) An Empirical Investigation of the Performance Consequences of Nonfinancial Measures, Journal of Management Accounting Research, American Accounting Association. 15: 193-223.
51 DeBusk, G. K. and A. D. Crabtree (2006) Does the Balanced Scorecard Improve Performance? Management Accounting Quarterly, Institute of Management Accountants. 8: 44-48.

	Case study evidence	Survey evidence	Events studies
Impact of information systems	• Interviews with 30 executives suggest that information systems add value in organisations through four main mechanisms: (i) the EIS changes or enhances the way the executive views the business – i.e. it improves their understanding of the business model, (ii) the EIS provides the executive with better planning and control capabilities, (iii) the EIS leverages the executive's time, enabling the company to make better use of the executive, (iv) the EIS educates the executive about the potential of information technology[52].	• A survey of US manufacturing firms found that the primary benefits of ERP implementations accrue to firms that focus on improving operational efficiency in the short term. Only in the longer term, when a stable base has been established, do firms begin to accrue benefits from improved market performance[53]. • A survey of 111 US manufacturing firms found that ERP systems deliver limited business benefits until after the implementation and shake-out phases have occurred. The survey hypotheses that ERP systems deliver financial results through three intermediary benefits – "better information (data quality), more efficient internal business processes (task efficiency), and better coordination between different units of the firm (coordination improvements)". Two important findings from the survey are – the benefits of ERP implementation are only felt one year after implementation and that these benefits continue to grow (at a reducing rate) for the next three years. Second, that plant interdependence has an impact on the level of benefits realised. When there are greater interdependencies between plants then the levels of benefits tend to be higher[54].	• Research suggests that the market reacts well to announcements about ICT investments. A study of stock market reactions to 112 infrastructural IT investment announcements, for example, finds statistically significant abnormal stock market returns ranging anywhere from 0.5% to 0.84%[55] . • Another recent events analysis study explored the impact of investments in Enterprise Resource Planning (ERP), Supply Chain Management (SCM) and Customer Relationship Management (CRM) systems on a firm's long-term stock price performance and its profitability (measured in terms of return on assets and return on sales). Data are drawn from 186 announcements of ERP implementations, 140 SCM implementations and 80 CRM implementations.

52 Rockart, J.F. and DeLong, D.W. (1998) Executive Support Systems: The Emergence of Top Management Computer Use", Homewood, Il: Dow Jones-Irwin.
53 Stratman, J. K. (2007) Realizing Benefits from Enterprise Resource Planning: Does Strategic Focus Matter? Production and Operations Management 16(2): 203-216.
55 Chatterjee, D., Pacini, C., Sambamurthy, V., (2002) Stock Market Reactions to IT Infrastructure Investments: An Event Study Analysis, Journal of Management Information Systems 19 (2), 7–42.

	Case study evidence	Survey evidence	Events studies
Impact of information systems		• A large scale survey of 612 executives in 18 organisations suggests that executive information systems have their greatest impact on competitiveness when they are used to focus organisational attention, followed by legitimising decisions, followed by improving understanding. A negative relationship between score keeping and improved competitiveness is also reported[56]. • Another study, which examined the financial benefits achieved by 123 firms through their supply chain management systems found that these systems generally are associated with improved financial performance[57].	• The analysis suggests mixed financial results. In the case of ERP systems, the authors observe some evidence of improvements in profitability but not in stock returns. The results for improvements in profitability are stronger in the case of early adopters of ERP systems. On average, adopters of SCM system experience positive stock returns as well as improvements in profitability. There is no evidence of improvements in stock returns or profitability for firms that have invested in CRM. The authors suggest that while their results are mixed they are encouraging because it is clear that some firms are able to derive value from ERP and SCM initiatives[58]. • A methodologically interesting study using data on SAP implementations (the SAP sales records) matched with firm's financial performance data finds that firms "that invest in ERP tend to show higher performance across a wide variety of financial metrics. Even though there is a slowdown in business performance and productivity shortly after the implementation, financial markets consistently reward the adopters with higher market valuation (as measured by Tobin's q)"[59].

Gattiker, T. F. and D. L. Goodhue (2005) What Happens after ERP Implementation: Understanding the Impact of Interdependence and Differentiation on Plant-Level Outcomes, MIS Quarterly 29(3): 559-585.
Vandenbosch, B. (1999) An Empirical Analysis of the Association Between the Use of Executive Support Systems and Perceived Organizational Competitiveness. Accounting Organizations and Society 24(1): 77-92.
Dehning, B., Richardson, V.J., Zmud, R.W., (2004) The Financial Performance Effects of IT-Based Supply Chain Management Systems in Manufacturing Firms, Working Paper, Argyros School of Business and Economics, Chapman University, California.
Elbashir, M.Z., P.A. Collier, and M.J. Davern (2008). Measuring the Effects of Business Intelligence Systems: The Relationship Between Business Process and Organizational Performance. International Journal of Accounting Information Systems 9(3): 135-153.
Chatterjee, D., Pacini, C., Sambamurthy, V., (2002) Stock Market Reactions to IT Infrastructure Investments: An Event Study Analysis, Journal of Management Information Systems 19 (2), 7–42.
Hendricks, K. B., V. R. Singhal, et al. (2007) The Impact of Enterprise Systems on Corporate Performance: A Study of ERP, SCM, and CRM System Implementations, Journal of Operations Management 25(1): 65-82.
Hitt, L. M., D. J. Wu, et al. (2002) Investment in Enterprise Resource Planning: Business Impact and Productivity Measures, Journal of Management Information Systems 19(1): 71-98.

	Case study evidence	Survey evidence	Events studies
Impact of information systems		• One of the broadest studies exploring the impact of Business Intelligence includes data from a survey of 436 people from 229 organisations. The researchers conducted a factor analysis which identifies four categories of benefit from Business Intelligence: (i) organizational benefits — increased revenues; reduction of lost sales; increased geographic distribution of sales; enhanced profit margin; increased return on investment (ROI) and improved competitive advantage; (ii) business supplier/partners relation benefits — improved coordination with business partners/suppliers; reduction in the cost of transactions with business partners/suppliers; improved responsiveness to/from suppliers; increased inventory turnover' reduced inventory levels; (iii) internal processes efficiency benefits — improved efficiency of internal processes; increase staff productivity; reduction in the cost of effective decision-making reduced operational cost and (iv) customer intelligence benefits — reduced customer return handling costs; reduced marketing costs; reduced time-to-market products/services[60].	

The other side of the story

While the majority of evidence presented in Table 1 is positive, not all studies find positive results for management and information system innovations. A common theme is that many of the management practices that exist in high performance firms also exist in firms that do not perform so well[61]. Interestingly there is evidence that managers prefer commonly used performance measures when making performance evaluations. Research suggests that when comparing performance of multiple divisions, for example, managers tended to downplay the importance of unique measures. This is particularly problematic when one bears in mind that the unique measures are likely to be those that reflect future drivers of performance in the division, while the common measures are likely to be the lagging financial indicators[62]. Hence the tendency of managers to rely on common measures for performance evaluation undermines the need to have measures aligned to an individual division's strategy.

Even more worrying is the series of studies that call into question the efficacy of non-financial performance measures. A survey of 200 Australian manufacturing firms, for example, finds that while firms that pursue customer-focused manufacturing strategies tend also to use non-financial measures, there is no relationship between the use of non-financial performance measures and organisational performance[63]. While more recent work illustrates that the performance impact of non-financial measures can vary significantly, even within an individual firm[64].

Commentators suggest that 70% of Balanced Scorecard initiatives do not deliver value because many organisations do no more than repackage their existing measures into a Balanced Scorecard[65]. Data reported in the Harvard Business Review, categorises the Balanced Scorecard as a "blunt instrument" — high on use, but low on value delivered[66]. Other elements of Business Intelligence systems have also come under fire. One particular target in recent years has been the organisational budgeting processes. Authors have commented on their perverse consequences — indeed Jack Welch famously described budgeting as "a zero sum game", in which everybody negotiates to minimise organisational performance. The most vocal critics of budgeting have called for its abolition, through a movement called the Beyond Budgeting Roundtable[67]. Although, as with many areas of work related to Business Intelligence, budgets are contested, with some people proclaiming that the critics have overstepped their mark, especially when it comes to firms that operate in situations of high uncertainty[68].

61 Chenhall, R. H. and K. Langfield-Smith (1998) The Relationship Between Strategic Priorities, Management Techniques and Management Accounting: An Empirical Investigation Using A Systems Approach, Accounting, Organizations and Society 23(3): 243-264.
62 Lipe, M. G. and S. E. Salterio (2000) The Balanced Scorecard: Judgmental Effects of Common and Unique Performance Measures, Accounting Review, American Accounting Association. 75: 283-298.
63 Perera, S., G. Harrison, et al. (1997) Customer-Focused Manufacturing Strategy and the Use of Operations-Based Non-Financial 64 Performance Measures: A Research Note, Accounting, Organizations and Society 22(6): 557-572.
64 Griffiths, R. and Neely, A.D. (2008) Incentives and Managerial Experience in Multi-Task Teams: Evidence from within a Firm, SSRN Working Papers.
65 Griffiths, R. and Neely, A.D. (2008) Incentives and Managerial Experience in Multi-Task Teams: Evidence from within a Firm, SSRN Working Papers.
66 Rigby, D. and B. Bilodeau (2007) Selecting Management Tools Wisely, Harvard Business Review 85(12): 20-22.
67 Hope, J. and R. Fraser (2003) Who Needs Budgets? Harvard Business Review 81(2): 108-115.
68 Marginson, D. and S. Ogden (2005) Coping with Ambiguity Through the Budget: The Positive Effects of Budgetary Targets on Managers' Budgeting Behaviours, Accounting Organizations and Society 30(5): 435-456.

Of course, it is not just the management innovations associated with Business Intelligence that are called into question by the empirical evidence. In fact there is an even larger evidence base which questions the impact of information system innovations. First, even when implementations are ultimately deemed to have been successful there is clearly a shake-out phase, where performance dips after implementation, before picking up again[69].

Second, there is evidence that not all information system innovations deliver results in terms of stock returns, financial or even operational performance. A recent events analysis study, for example, found mixed effects, with some evidence that Enterprise Resource Planning systems improve profitability, but not stock returns, while adopters of Supply Chain Management systems achieve both positive stock returns and improvements in profitability[70]. A study of 21 SAP customers found that 57% of these firms had not achieved a positive return on investment (ROI) for an average of 2.8 years after implementing Enterprise Resource Planning systems[71]. Other research found that 63% of 215 firms gained "real benefits" from adopting ERP, but only 40% of these firms could claim a hard ROI[72]. While yet more survey research finds that few manufacturing firms saw improvements in operational metrics following implementation of Enterprise Resource Planning systems[73].

Away from transactional and operational systems similar questions are being asked. Gartner suggests that 55% of CRM projects don't produce results and according to Bain's 2001 survey of management tools, CRM was ranked in the bottom three (out of 25 popular tools) for user satisfaction. "In fact, according to the 2001 survey of 451 senior executives, one in every five users reported that their CRM initiatives not only had failed to deliver profitable growth but also had damaged long-standing customer relationships. One manufacturer retailer, for instance, invested $30 million in a CRM solution in 1999 only to scrap the entire project in early 2001. The company abandoned the project because customers had become increasingly irritated instead of loyal, as did the employees trying to deal with them"[74].

Studies such as these mean it is not surprising that a recent Harvard Business School study that found that 65% of executives believed that Enterprise Resource Systems had a moderate chance of hurting their business because of implementation problems[75]. While other authors comment "despite the growth in Enterprise Resource Planning system implementation, previous research shows a growing dissatisfaction with Enterprise Resource Planning systems; [in short] that they have failed to deliver the anticipated benefits"[76].

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69 Gattiker, T. F. and D. L. Goodhue (2005) What Happens after ERP Implementation: Understanding the Impact of Interdependence and Differentiation on Plant-Level Outcomes, MIS Quarterly 29(3): 559-585.

70 Hendricks, K. B., V. R. Singhal, et al. (2007) The Impact of Enterprise Systems on Corporate Performance: A Study of ERP, SCM, and CRM System Implementations, Journal of Operations Management 25(1): 65-82.
Nucleus Research (2003) The Real ROI From SAP, Nucleus Research Note D23, Wellesley, MA.

71 Stratman, J. K. (2007) Realizing Benefits from Enterprise Resource Planning: Does Strategic Focus Matter? Production and Operations Management 16(2): 203-216.

72 Stratman, J. K. (2007) Realizing Benefits from Enterprise Resource Planning: Does Strategic Focus Matter? Production and Operations Management 16(2): 203-216.

73 Rigby, D. K., F. F. Reichheld, et al. (2002) Avoid the Four Perils of CRM, Harvard Business Review 80(2): 101-109.

74 Verville, J., R. Palanisamy, et al. (2007) ERP Acquisition Planning: A Critical Dimension for Making the Right Choice, Long Range Planning 40(1): 45-63.

75 Lin, H. Y., P. Y. Hsu, et al. (2006) ERP Systems Success: An Integration of IS Success Model and Balanced Scorecard, Journal of Research and Practice in Information Technology 38(3): 215-228.

The Business Intelligence conundrum

All of this empirical work leads to an interesting conundrum. There is good empirical evidence to suggest that Business Intelligence and its constituent components can deliver value and equalling compelling evidence to suggest that Business Intelligence does not always deliver value. Why? What is it about Business Intelligence that makes it succeed in some contexts and not in others?

To answer this question it is worth thinking about the management innovations and information system innovations associated with Business Intelligence separately, before bringing them together. In terms of management innovations a major shortcoming appears to be an excessive focus on performance measurement at the expense of performance management. As one study, quoting a Dutch CFO, states "because we experienced problems measuring 'soft information' elements, we shifted our attention towards searching for valid measures and reliable data but we lost sight of their strategic links"[77]. In essence the organisation concerned became too obsessed with performance measurement, at the expense of strategic performance management.

Others have raised similar concerns when faced with data that calls into question the impact of non-financial measures. Professor Chris Ittner of Wharton Business School, for example, questions "whether firms claiming to have balanced scorecards are actually using the information, or have merely implemented measurement systems that capture information corresponding to the scorecard categories without making changes in the information used for decision-making and performance evaluation"[78]. And one could argue that this is one of the reasons why we have seen a shift in the writings of Bob Kaplan and David Norton over the years — away from the "measures that drive performance" towards "the strategy management system"[79].

The research evidence is clear: it suggests that non-financial measures can have a positive impact on organisational performance, but only when the focus on the initiative is on strategy and its execution, not on measurement[80].

77 Braam, G. J. M. and E. J. Nijssen (2004) Performance Effects of Using the Balanced Scorecard: A Note on the Dutch Experience, Long Range Planning 37(4): 335-349.
78 Ittner, C. D., D. F. Larcker, et al. (2003). Performance Implications of Strategic Performance Measurement in Financial Services Firms, Accounting Organizations and Society 28(7-8): 715-741
79 The original balanced scorecard article talk about supplementing financial measures with non-financial measures. More recently Kaplan and Norton have written much more about the Office of Strategy Management and the Strategic Management System.
80 Braam, G. J. M. and E. J. Nijssen (2004) Performance Effects of Using the Balanced Scorecard: A Note on the Dutch Experience, Long Range Planning 37(4): 335-349.

What about the information systems innovations associated with Business Intelligence? Why do these sometimes fail to deliver value? There is a wealth of research on why information systems fail, but a useful summary study identifies three broad categories of variable — planning variables, implementation management variables and implementation decision variables. Planning variables include: (i) development of a business case; (ii) defined very clear desired outcomes; (iii) defined performance metrics; (iv) strong executive sponsorship; (v) strong executive involvement; (vi) an empowered steering committee; (vii) an implementation team; (viii) clear organizational change strategies; (ix) clear education and training strategies; (x) communicated plan to the enterprise; (xi) addressed data conversion and integrity; (xii) technology infrastructure in place. Implementation management variables include: (i) strong executive involvement; (ii) strong executive support; (iii) communicated progress regularly; (iv) benchmarked implementation progress; (v) committee able to make key decisions; (vi) communicated with personnel impact; (vii) created "Super-Users" and "Trouble-Shooters"; (viii) trained all users; (ix) kept suppliers/customers informed. Implementation decision variables include: (i) single package versus multiple packages; (ii) Big-Bang or mini Big-Bang versus a phased-in approach; (iii) number of modules implemented; (iv) order of implementation; (v) modifications to system; (vi) major reengineering upfront versus limited reengineering; (vii) an accelerated implementation strategy[81].

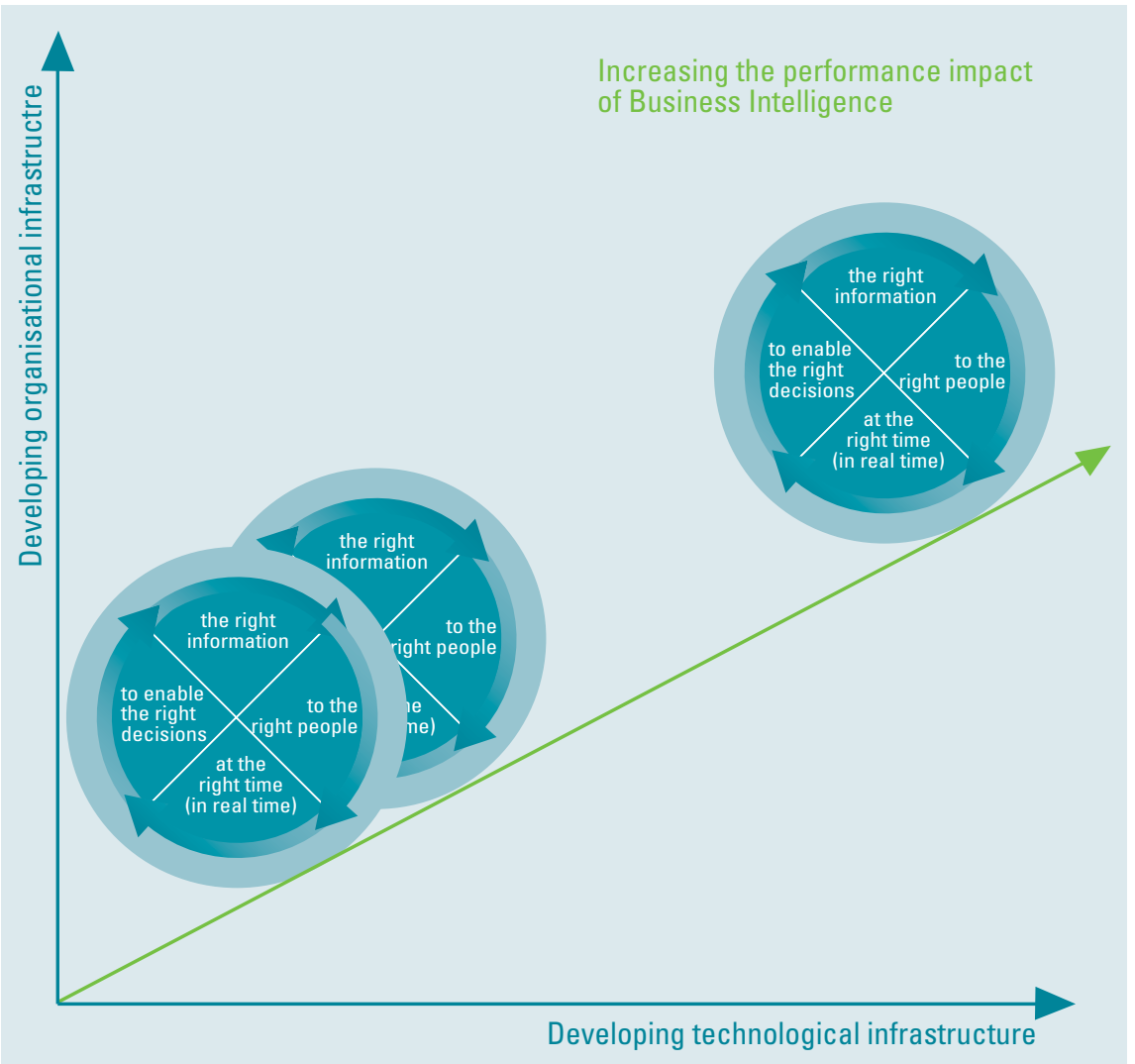
The integrated picture: the importance of complementarities

Clearly Business Intelligence systems will not succeed based either on information system innovation or management innovations alone. Indeed there is a long history of research that illustrates how information systems shortcomings affect the implementation of measurement systems. A survey by Towers Perrin found that under-developed information systems were a problem or major problem in the implementation of many performance measurement systems[82]. While a conference board survey found that most company's ability to deliver rapid and consolidated information for use in strategic performance measurement is limited by their IT systems[83]. This problem is exacerbated when IT is seen as the solution rather than an enabler. Take, for example, CRM which is a way of "aligning business processes with customer strategies to enhance loyalty and hence profitability". Too often executives see CRM software as the solution, rather than the enabler[84].

81 Mabert, V. A., A. Soni, et al. (2003) Enterprise Resource Planning: Managing the Implementation Process, European Journal of Operational Research 146(2): 302-314.
82 Ittner, C. D. and D. F. Larcker (1998) Are Nonfinancial Measures Leading Indicators of Financial Performance? An Analysis of Customer Satisfaction, Journal of Accounting Research 36(3): 1-35.
83 Gates, S. (1999). Aligning Strategic Performance Measures and Results, NewYork, NY: The Conference Board.
84 Rigby, D. K., F. F. Reichheld, et al. (2002) Avoid the Four Perils of CRM, Harvard Business Review 80(2): 101-109.

A particularly interesting stream of research that highlights the inter-dependences between management system innovation and information system innovation is that concerned with complementarities. In essence complementarity theory argues that while some business benefits accrue from information systems innovation and some benefits accrue from management system innovation, benefits are maximised when information system innovation occurs in parallel with management system innovation. Recent research suggests that the uplift in performance through parallel innovation can be as much as 34%, compared with 8% for the either/or approach[85]. This emerging literature has significant implications for Business Intelligence as it suggests that the real performance impact of Business Intelligence will only be felt when organisations simultaneously improve their information systems and their management systems (see Figure 4).

Figure 4: The Importance of Complementarities



85 Bloom, N., Sadun, R. and Van Reenen, J. (2007) *Americans do I.T. Better*, CEP Discussion Paper 788, London School of Economics.

A startling lack of progress

So how bad is the problem? How limited is the progress that organisations have made in simultaneously enhancing their information systems and their management systems? Recent research, published by Gartner and carried out by Cranfield School of Management, paints a depressing picture. This research found that only 10% of firms had made significant progressing in developing an integrated Business Intelligence system[86]. Even more concerning the sample selected in this study was deliberately biased towards firms that should be good. The 20 case study companies studied were all nominated by software vendors as being lead users – some of the most advanced users of their Business Intelligence software suites. The research team concluded that 90% of the firms nominated had made good progress with islands of activity. Some had improved their planning and budgeting systems. Others had improved their financial consolidation and report systems. Others had concentrated of their strategic measurement and scorecarding applications. Only 10% had made significant progress on integrated Business Intelligence suites.

So what do we do: the KPMG perspective

KPMG recognise that organisations have to improve simultaneously the management and information infrastructures if they are to unlock the value of Business Intelligence. Experience suggests that there are six key building blocks – strategy alignment; governance; performance management process and reporting; business information architecture; business intelligence platform and infrastructure (see Figure 5).

Figure 5: KPMG's Perspective on Business Intelligence

To unlock the true value of Business Intelligence, organisations need to make progress on all six of these issues simultaneously. Only then will they build the management and information infrastructures necessary for the 21st Century.

86 Rayner, N. (2008) *Measuring and Managing Corporate Performance: The State of the Art*, Gartner, August.

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