The current issue and full text archive of this journal is available at
www.emeraldinsight.com/1741-0401.htm

REFLECTIVE PRACTICE

A framework for business analytics in performance management

Marten Schläfke
Chair of Controlling/Performance Management, University of St. Gallen, St. Gallen, Switzerland
Riccardo Silvi
Faculty of Economics, University of Bologna, Forli, Italy, and
Klaus Möller
Chair of Controlling/Performance Management, University of St. Gallen, St. Gallen, Switzerland

Abstract

Purpose – Increased business competition requires even more rapid and sophisticated information and data analysis. These requirements challenge performance management to effectively support the decision making process. Business analytics is an emerging field that can potentially extend the domain of performance management to provide an improved understanding of business dynamics and lead to a better decision making. The purpose of this positional paper is to introduce performance management analytics as a potential extension of performance management research and practice. The paper clarifies the possible application areas of business analytics and their advantages within the context of performance management.

Design/methodology/approach – The paper employs a literature based analysis and from this a conceptual argument is established. Finally, a business analytical model is presented to be used to undertake future research.

Findings – The paper clarifies the possible application areas of business analytics and their advantages within the context of organizational performance management.

Originality/value – The main implication is that the paper provides evidence of the use of business analytics for understanding organizational performance. Several insights are provided for management accounting research and education.

Keywords Business analytics, Performance management systems, Performance measurement, Management control systems, Performance management, Decision making

Paper type Conceptual paper

1. Introduction

In recent years, companies have been developing more sophisticated performance management systems (PMSs) to support decision makers with relevant information. These systems are used to capture and evaluate performance data and to identify key success factors within an organization. A PSM is therefore commonly used to illustrate an organization's essential means and ends (Bourne *et al.*, 2002; Garengo *et al.*, 2005; Broadbent and Laughlin, 2009).

Performance management has expanded its view; rather than just looking at financial performance drivers, it now includes non-financial performance drivers as well. The effects and impacts of the new and innovative non-financial metrics and approaches that have been added to the set of tools are still being studied. Noticeable

International Journal of Productivity and Performance Management
Vol. 62 No. 1, 2013
pp. 110-122

1741-0401
DOI 10.1108/17410401311285327

progress has therefore been made in the field of PMSs – not only with the balanced scorecard approach – but also in the development of other tools, techniques, and academic contributions.

Many companies and markets operate in a highly competitive environment and acknowledge that their competitive advantages are no longer sustainable. Therefore, new sources of competitive advantage are created, while others rapidly erode (D'Aveni, 1994). Novel business opportunities, timing, and know-how, as well as the need to provide fast and effective service, require more sophisticated and analytical decision-making tools at both the operational and strategic levels. The challenge for performance management is to supplement this area with useful tools. However, sometimes these tools – and the skills needed to execute them – lie outside the domain of traditional PMSs. The last years' considerable business analytics developments have provided performance management with promising instruments for dealing with current challenges such as mathematics, statistics, econometrics, IT, and tools for data gathering and analysis. If these approaches are included in PMSs, they provide new insights into business dynamics and their related performance that can be explored and exploited, which might in turn result in increased management effectiveness.

In this paper, we introduce performance management analytics (PMAs) as the extensive use of data and analytical methods to understand relevant business dynamics, to effectively control key performance drivers, and to actively increase organizational performance. As a consequence of increased competition, PMA can be a potential success factor of PMSs' use and design in the future. Conventional PMSs focus their attention on controlling strategy execution, while they are less interested in understanding business dynamics for strategy formulation and decision making. PMA might provide a possible explanation for the missing link between highly sophisticated PMSs (from a technical or instrumental view) and their effective implementation. So far, the relationship between the distribution of such systems and organizational success is inconclusive (Micheli and Manzoni, 2010). Our aim is to contribute to the debate on the reasons for these systems still not being widely implemented, for their effectiveness being regarded as controversial, and for them continuing "to disappoint their advocates" (Innes *et al.*, 2000). Furthermore, in the context of performance management, we propose a framework for business analytics that merges the theoretically derived and practically elaborated challenges in order to produce an appropriate and useful design for implementation in research and practice. In addition, we try to reveal where business analytics could be helpful within PMSs and formulate recommendations on how to integrate business analytics into companies' PMSs.

We start by emphasizing the need for PMAs by providing a few examples (Section 2). In Section 3, we define PMAs and discuss the context of performance management in Section 4. In Section 5, we base PMAs in performance management research and provide a possible framework for analytical performance management. Thereafter, we discuss the value added of PMAs (Section 6), and provide some ideas for future research (Section 7).

2. The need for a more analytical performance management

The following three anecdotes are part of an on-going preliminary exploratory survey of performance management effectiveness and business analytics' use and potential.

At this point, they underline our motivation for doing research on PMAs and point out the practical relevance for decision makers:

"In our business [food industry] profitability is very low and is impacted by the way we set prices. Prices are based on the expected purchasing cost of the raw material [olives]. […] If I had a method to predict this cost, the bottom line, and – in turn – the whole organization, would benefit" (Example 1, Head of Controlling, July 2009).

"We often submit quotes to our customers that reflect electronic components' higher cost at the time of submission than at the time of production [of digital devices]. It is not dumping, because this practice is based on the cost of components decreasing over time. If we could support these cost reduction forecasts with detailed analyses, we might increase our margins" (Example 2, CFO, May 2010).

"I would like to have an estimation of the relationship between marketing and advertising costs, and related revenues in terms of when they are effective, and when they no longer generate adequate revenues" (Example 3, CEO, November 2007).

The three examples specifically highlight the need for more advanced data analyses, scenario planning, and even predictive capabilities. In this context, business analytics are believed to be useful to forecast the dynamics that have an impact on costs (such as crop yield, quality, weather conditions, and regulation), while a backward-oriented report on costs and related variances, or a supplier's cost analysis, would be less useful. Business analytics could also be of assistance to understand price dynamics, as well as the already mentioned relationship between marketing investments and related returns.

These examples might not unveil anything new, but they clearly show that PMSs should consider the inclusion of analytical tools, especially when data are potentially available and can be converted into business signals. Decision makers might, however, need to acquire new skills (e.g. mathematical, statistical, econometrics, and IT) to develop the ability to use business analytics (IBM, 2010). These skills and abilities could add value to organizations and to performance management's role in organizations.

3. PMAs

Advanced data analysis, scenario planning, and predictive capabilities are a way to cope with increasing complexity, uncertainty, and volatility. This is supported by a continuously grown amount of data, which are available for firms (IBM, 2010). As a result, organizations have started to focus on analytical approaches to deal with the data.

PMAs could potentially increase PMSs' effectiveness. Specifically, they claim to support the selective capturing, control, and communication of tangible and/or intangible elements in a causality-based coupling of inputs, processes, outputs, and outcomes. Different methods can be used to identify and verify the mentioned causal couplings within performance management. Specific examples include visual maps and performance tree diagrams (Kaplan and Norton, 2004; Lynch and Cross, 1991). These methods can be qualitative, but they can also be adopted with a more scientific (analytical) level of design. The analytical approach can potentially discover new or hidden business dynamics at a strategic or an executional level. A "scientific" search for these causal couplings and business dynamics is a possible feature of PMAs.

In general, PMAs could be used in all functional management areas, including R&D, human resources, and marketing. Hence, as shown in Figure 1, analytics could, for

example, be categorized as external analytics, supplier analytics, internal analytics, and customer analytics.

Demand forecasting, price setting, customer value calculation and prediction, marketing effectiveness evaluation, as well as monitoring competitors or supply-chain management intelligence are examples of business analytics. This list of approaches is only a selection of the possible areas in which PMAs are believed to be of reasonable use. At this stage, Figure 1 demonstrates the wide range of aspects with which business analytics could deal.

PMA use multiple sources ranging from "drill down" accounting data (i.e. revenue and cost breakdowns) to more sophisticated mathematical, statistical, and econometric methods that can provide insights into the dynamics of performance drivers. A more analytical performance management uses business analytics systematically to identify, use, and prove the quantitative relationships between the context factors, inputs, processes, outputs, and outcomes. In this way, analytics support business value creation in the long run. Consequently, analytical performance management deals exclusively with the deployment of performance analytics and delivers crucial information to drive decisions and actions within performance management (Davenport and Harris, 2007). Analytical performance management's ultimate role is to effectively support the understanding, exploration, and exploitation of business dynamics and opportunities. In our view, business analytics could support PMSs to identify potential strategies and/or to execute them effectively.

In order to effectively use these business analytics, certain requirements need to be fulfilled first. Effective business analytics underlie many aspects, such as data availability, IT infrastructure, and related competencies, including business data analysis skills. An analytical management system's potential is potent in an organization that already has an advanced IT infrastructure such as an enterprise resource planning (ERP) system, an extended ERP, data warehouse, data mining systems, or customer relationship management.

Nevertheless, the gathering of the required data for business analytics' effective use can be a problem for an organization. Some performance drivers are hard to measure, especially intangible values. Therefore, companies that generate their value with intangibles might not have as much data as others and are thus not in a position to start using business analytics right away. Furthermore, business analytics use past data, which can be very misleading because such data are not always a good predictor of current and future performance. These potential problems indicate that business analytics should be the first rather than the last step in the decision-making process (Davenport *et al.*, 2010).

Analytical approaches that support performance management are always based on information systems. Hence, PMAs evolve when different areas of expertise merge – especially management accounting and IT – and are combined with analytical methods (see Figure 2). Furthermore, there are two different maturity levels, namely

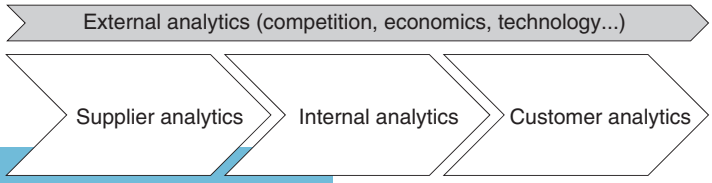

Figure 1.
Categories of business analytics

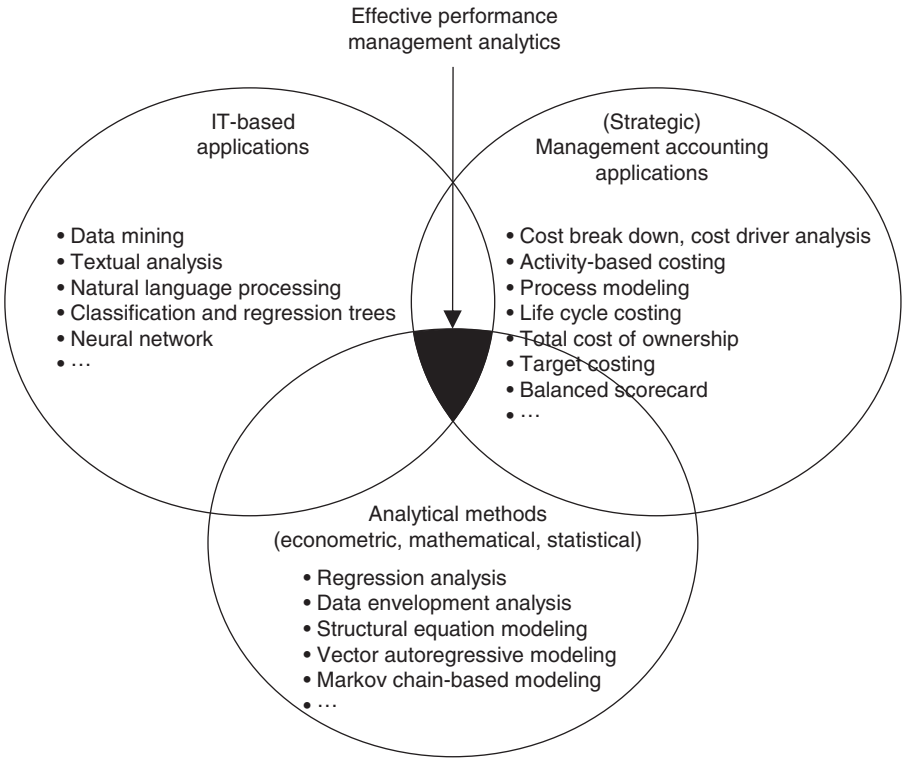

Figure 2.
Application of PMAs

(see Figure 2): applications that focus on the identification and use of cause-and-effect relations for performance optimization on a logical level (management accounting applications); and techniques that combine logical reasoning with more complex and sophisticated mathematical, statistical, or econometric models (analytical methods). Effective PMAs occur where the IT-based applications, management accounting applications, and the analytical methods, intersect.

When used together, data and analysis tools have the potential to provide useful support for decision making. Decisions based on data and made with the use of analytical tools are normally better than those made without (Klatt *et al.*, 2011). Therefore, their obvious advantages and their increasing importance within performance management make PMAs a subject destined for further empirical research.

4. The performance management context

PMAs could be seen as a refinement of PMSs: different streams of research provide definitions of the characteristics that constitute a PMS (Bourne *et al.*, 2003; Bititci *et al.*, 2000; Berry *et al.*, 2009; Broadbent and Laughlin, 2009; Flapper *et al.*, 1996). Strategic performance management focusses on the link between organizational objectives/strategy and performance measurement systems (Kaplan and Norton, 2008; Kloot and Martin, 2000; Chenhall, 2005). A well-known example of a strategic PSM is the balanced scorecard by Kaplan and Norton (1996, 2004, 2008). The main feature of these strategic PMSs is that they link strategy to performance measures, as well as to other

systems, including operations, human resources, performance evaluations, information technologies, customer and supplier networks, and the value chain (Chenhall, 2005). From an organizational perspective, the levers of control framework by Simons (1995) contributes to an understanding of the role that a PSM could play in an organization. Therefore, Simons distinguishes four levers of control: interactive, diagnostic, belief, and boundary systems. A PSM must not only be designed in an instrumental and functional way, its use must also be specified explicitly and communicated to the different user groups (Simons, 1995; Tucker *et al.*, 2009). The most recent approach by Ferreira and Otley describes a comprehensive PSM framework that outlines the possible key aspects of the performance management process (Ferreira and Otley, 2009; Berry *et al.*, 2009; O'Grady *et al.*, 2010). According to Ferreira and Otley (2009), a comprehensive PMS consists of multiple packages. It should:

- identify and communicate the vision and mission of an organization, and show how the attention of managers and employees can be focussed on that vision and mission;
- identify the key success factors and illustrate how they can be brought to the attention of managers and employees;
- illustrate the organizational structure and uncover how this structure affects a PMS's design and use;
- highlight an organization's strategies and plans and show which processes and activities are required for their implementation;
- identify and illustrate the key performance measures;
- identify the appropriate performance targets for the key performance measures and show how they should be chosen;
- identify the already existing performance evaluation processes within an organization;
- set the rewards for target achievement; and
- illustrate the information flows that can support the performance management activities.

However, so far, the variety of approaches has produced a lack of consensus regarding the definition of PMSs (Brudan, 2010; Dumond, 1994). In the field of performance management, there is also no link to the use of PMAs. Fortunately, the current suggestion that PMSs should be used, is a good starting point for a systematic discussion of the potential links to business analytics. Furthermore, many organizations collect a great deal of data on their performance in different business areas. This trend is due to the perception in business that you can only manage what you can measure. It is obvious, however, that businesses do not obtain a competitive advantage by merely measuring their performances. In a competitive market, they need to understand business dynamics, value creation, possible opportunities, as well as potential threats to create competitive advantages. Moreover, companies need to ensure that the right data are available and that the data quality is good before they try to find ways to make sense of it in order to transform the data into information that can effectively support the management and control of performance, and thereby implement the PMS's proposed features (Ittner and Larcker, 2003; Taticchi *et al.*, 2010;

Mouritsen, 2004). Therefore, we focus on business analytics that may help build such a connection and provide decision makers with additional information.

With regard to the five processes of business performance measurement by Franco-Santos *et al.* (2007), the processes that need to be examined in greater detail are data capturing/analysis and the resulting information management in terms of information provision, interpretation, and decision making. For this purpose, a performance management framework needs to be developed that acknowledges the challenges that the new data situation causes and the PMSs' features that the literature proposes. Such a framework should therefore capture, elaborate on, and analyze the existing information, while recognizing the important means and ends within an organization (Neely *et al.*, 2002; Garengo *et al.*, 2005; Broadbent and Laughlin, 2009). The framework should also control and manage the achievement of outcomes. Furthermore, it should show how performance is measured, and display the links between the different performance measurement systems and the tools (Lebas, 1995; Sousa *et al.*, 2005; Andersen *et al.*, 2006). Thus, it should identify the key success factors within an organization. Feedback and feedforward loops from various levels of the organization and the impact of the external environment should also be considered in the framework (Bititci *et al.*, 1997). The theoretical requirements will be used to design a research framework in the next section.

5. A research framework for business analytics in performance management

While the distinction between management accounting, IT-based application, and analytical methods is not new, their effective exploitation is a critical issue. Specifically, the recognition and selection of analytical methods is a complex task. The data, performance measures, and analytical objects that have to be framed, as well as how, when, or where they should be used are relevant matters. Keeping these potential requirements in mind, we introduce a framework that provides guidelines for the systematic coupling of all analytical performance management's elements in a comprehensive and application-oriented way. This framework could help managers decide on the kind of analytics they should use when they want to test and map the causality-based couplings of context factors, inputs, processes, outputs, and outcomes in order to highlight their value creation. Such an approach could be the starting point for the standardized use of business analytics. Therefore, this approach could result in the improvement of performance management, as well as the application of PMSs.

The multilayer performance management framework in Figure 3 shows what such a framework might look like. It consists of four layers that comprise the features needed to overcome performance management's current challenges with regard to using analytics: the context contains the internal and external factors that influence the organization. It also considers the factors which occur in the business model. The layers are as follows.

Layer A: capture

This layer comprises the capturing of performance drivers in inputs, processes, as well as in output and outcomes categories. The capturing can be done with the help of already implemented performance measurement systems or other data sources. The characteristics of the indicators (e.g. whether they are tangible or intangible) can also be captured.

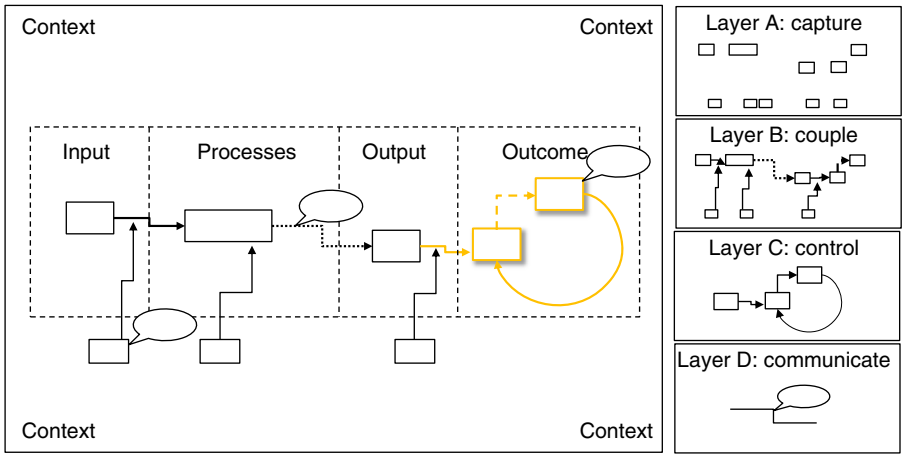

Figure 3.
The multilayer performance management framework

Layer B: couple
This layer comprises the coupling of performance drivers and thus shows their proposed connections. The coupling can be affected by proposing cause-and-effect relationships between the different indicators. When proposing cause-and-effect relationships, time lags also need to be considered. Business analytics can be used to verify the proposed causal relationships.

Layer C: control
Once the cause-and-effect relationships are known, the crucial levers of control can be identified. Management actions and the design of management control systems can be deduced from the information on these causal relations. Since feedback loops are used, the coupling of the performance drivers has to be revised regularly. Consequently, organization-wide, continuous learning is stimulated. Feedforward loops can also be used for planning aspect purposes. Furthermore, scenarios can be tested with what-if analyses within the layer.

Layer D: communicate
This layer comprises the internal and external communication of the performance drivers. The control actions and ideas for the reconfiguration of the existing PSM are passed on.

With regard to the potential performance analytics tasks mentioned in the examples in Section 2, the framework can be used to position these tasks and to highlight where the value added by the analytical approach would lie (see Figure 4).

Within the input, process, output, and outcome categories, the actual analytical task of forecasting raw material prices can be set in relation to an effective pricing as a possible outcome of acting analytically in the input category. A company can use the framework to discuss the elements that influence the desired outcome. Furthermore, the company can automatically see where analytical tools can be useful in achieving the outcome it wants. The framework creates a standardized way of discussing causal relationships between performance drivers and gives decision makers the opportunity to adopt analytics to prove or investigate assumed causal relationships.

In practice, many causal relationships within organizations are only assumed and not proved (Norreklit, 2000). A lack of care concerning the assumption of causal relationships can lead to PMSs with limited effectiveness and thus not delivering the anticipated use (Ittner and Larcker, 2003; Davenport and Harris, 2007). Business analytics claim to fill the gap between assumed but not proven causal relationships by offering a way to ensure that these really exist and point out that organizations can rely on certain effects.

6. PMAs in a hypercompetitive environment

The increasing relevance of performance analytics is undoubtedly due to the fast-growing "hypercompetition" effect (D'Aveni, 1994). According to this effect, companies more rapidly and increasingly compete to provide lower costs and better quality with better know-how, and thus affect companies' "strongholds and deep pockets." Therefore, markets rapidly create and erode competitive advantages.

PMAs claim to quickly provide evidence of potential competitive dynamics. These analytics might signal opportunities and threats, changes in markets and competitors' behavior, in internal processes, customers, and the supply-chain drivers of profitability. Another potential feature of business analytics is the identification of key success factors by revealing causal relationships. Therefore, they could highlight what truly drives financial performance. As part of PMSs, performance analytics create a basis for these systems' effective application. To this end, performance analytics deliver crucial information by capturing, combining, and analyzing multiple sources of data (operational, financial, internal, external, qualitative, and quantitative).

Owing to this function as an information generator, performance analytics are essential for fact-based decision making within PMSs. PMAs could therefore be a tool to create a competitive advantage within hypercompetition (Davenport *et al.*, 2010; Silvi *et al.*, 2012).

Moreover, business analytics could create multiple advantages for managers. They aim to support managers in understanding and structuring the dynamics of their business, including the disclosure of tacitly assumed interactions, for example, between the business and economic shifts, as well as disproving subjective assumptions. Furthermore, they can be used to test the strategy's impact. Based on proven assumptions and key environmental impact factors, performance analytics enable the testing of the strategy's strength. Consequently, they reveal whether desired results can be traced back to strategic action, or whether mere random changes can provide valuable insights into the future strategic orientation. Analytics could create

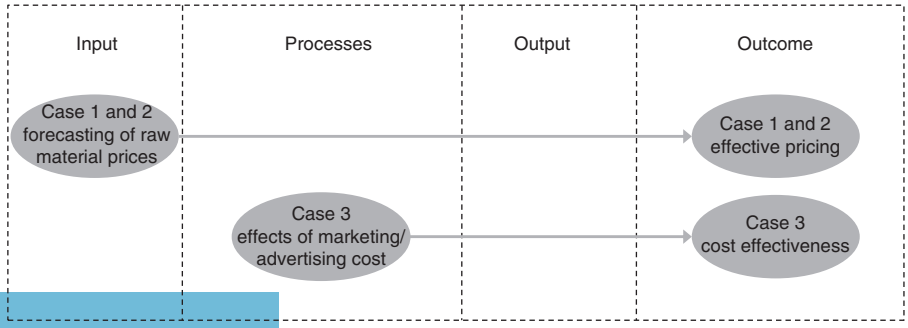

Figure 4.
Application areas of business analytics (examples)

a basis for improving decisions over time. If a manager uses logic and explicit supporting data to make a decision, the decision-making process can be followed and improvement made. Analytics could also be used to objectify decisions by allowing a more formal reporting in the decision-making process. Currently, this advantage does not seem to be fully exploited, since many companies do not even make use of strategic process reporting. In addition, analytics can leverage efficiency. An investment in performance analytics in order to analyze critical interfaces or operations can contribute to accelerating the execution of tasks and reduce the risk of time-consuming mistakes by identifying previous causes of errors. Accordingly, operative efficiency is improved by cutting costs caused by spending unnecessary time on poorly managed tasks. Moreover, analytics can help managers see and learn from changes. The application of performance analytics can thus improve management understanding of markets' and customers' behavior. Using a longer timeframe can reveal critical reactions to these targets due to external changes, legislative amendments, or social trends, which can in turn be used to anticipate future changes.

Although these advantages are undeniable, the design and the use of an analytical PSM require a thorough comprehension of the company's business model, as well as its performance factors, key success processes, information, data sources, and the definition/formulation of the algorithms that convert data, transactions, and events into management actions.

Despite all the potential advantages of using business analytics, the majority of companies do not as yet use them. The challenges that prevent them from doing so are manifold. Some managers might not have the skills needed to implement and understand them. Others rely on their experience and have not as yet faced a situation that has convinced them that they should do otherwise. But as our society becomes more digital, it is just a matter of time before the majority of competitors will be using business analytics. Companies doing pioneering work in this area might create an important competitive advantage for themselves (Davenport *et al.*, 2010).

7. Outlook

In this paper, we introduced performance analytics as the understanding and control of relevant business dynamics through the extensive use of data and analytical methods. Analytics could provide additional competitive advantages not fully considered in conventional or advanced PMSs.

We have shown that business analytics could be used to validate causal relationships within traditional input, process, output, and outcome categories. Instead of only assuming causal relationships within strategy maps – as is often done – business analytics can deliver hard facts about the effects of relationships between different indicators. Existing data on key performance indicators could, therefore, be brought into the organization's bigger picture.

Using these advantages is, however, a complex challenge for performance management. In order to create a basis for the effective application of PMA, PMA need to relate to key processes' information needs. In addition, they have to be implemented at the executional level to empower management effectiveness and efficiency.

Extending the domain of performance management to PMAs might require new data analysis skills, and could improve management effectiveness. Analytics' obvious advantages, like their validation of causal relationships and their increasing

importance within performance management, make them an excellent subject for further empirical research into their functionality.

Performance analytics could fill the existing gap between PMSs and their effective adoption. Therefore, research should focus on the "what, why, how and when" (Busco *et al.*, 2007) of analytics within PMSs. Specifically, future research should emphasize the relevance of analytical performance management and its effective application context. In addition, an answer is required to the question whether analytics could have a positive impact on information quality and decision-making effectiveness. On an instrumental level, the potential combinations and couplings between analytical methods and tools should be revealed. If PMAs' relevance and effectiveness increase, this will have consequences for teaching and training. Specifically, performance management education would have to be redesigned and integrated into analytical topics. Furthermore, decision makers will require new IT and analysis skills.

References

Andersen, B., Henriksen, B. and Aarseth, W. (2006), "Holistic performance management: an integrated framework", *International Journal of Productivity and Performance Management*, Vol. 55 No. 1, pp. 67-78.

Berry, A.J., Coad, A.F., Harris, E.P., Otley, D.T. and Stringer, C. (2009), "Emerging themes in management control: a review of recent literature", *The British Accounting Review*, Vol. 41 No. 1, pp. 2-20.

Bititci, U.S., Carrie, A.S. and McDevitt, L. (1997), "Integrated performance measurement systems: a development guide", *International Journal of Operations & Production Management*, Vol. 17 No. 5, pp. 522-34.

Bititci, U.S., Turner, T. and Begemann, C. (2000), "Dynamics of performance measurement systems", *International Journal of Operations & Production Management*, Vol. 20 No. 6, pp. 692-704.

Bourne, M., Neely, A., Platts, K. and Mills, J. (2002), "The success and failure of performance measurement initiatives", *International Journal of Operations & Production Management*, Vol. 22 No. 11, pp. 1288-310.

Bourne, M., Neely, A., Mills, J. and Platts, K. (2003), "Implementing performance measurement systems: a literature review", *International Journal of Business Performance Management*, Vol. 5 No. 1, pp. 1-24.

Broadbent, J. and Laughlin, R. (2009), "Performance management systems: a conceptual model", *Management Accounting Research*, Vol. 20 No. 4, pp 283-95.

Brudan, A. (2010), "Rediscovering performance management: systems, learning and integration", *Measuring Business Excellence*, Vol. 14 No. 1, pp. 109-23.

Busco, C., Quattrone, P. and Riccaboni, A. (2007), "Management accounting issues in interpreting its nature and change", *Management Accounting Research*, Vol. 18 No. 2, pp. 125-49.

Chenhall, R. (2005), "Integrative strategic performance measurement systems, strategic alignment of manufacturing, learning and strategic outcomes: an exploratory study", *Accounting, Organizations and Society*, Vol. 30 No. 5, pp. 395-422.

D'Aveni, R. (1994), *Hypercompetition*, Free Press, New York, NY.

Davenport, T. and Harris, J.G. (2007), *Competing on Analytics*, Harvard Business School Publishing, Boston, MA.

Davenport, T.H., Harris, J.G. and Morison, R. (2010), *Analytics at Work: Smarter Decisions, Better Results*, Harvard Business School Publishing, Boston, MA.

Dumond, E.J. (1994), "Making best use of performance measures and information", *International Journal of Operations & Production Management*, Vol. 14 No. 9, pp. 16-31.

Ferreira, A. and Otley, D. (2009), "The design and use of performance management systems: an extended framework for analysis", *Management Accounting Research*, Vol. 20 No. 4, pp. 263-82.

Flapper, S.D.P., Fortuin, L. and Stoop, P.P.M. (1996), "Towards consistent performance management systems", *International Journal of Operations & Production Management*, Vol. 16 No. 7, pp. 27-37.

Franco-Santos, M., Kennerley, M., Micheli, P., Martinez, V., Mason, S., Marr, B., Gray, D. and Neely, A. (2007), "Towards a definition of a business performance measurement system", *International Journal of Operations & Production Management*, Vol. 27 No. 8, pp. 784-801.

Garengo, P., Biazzo, S. and Bititci, U.S. (2005), "Performance measurement systems in SMEs: a review for a research agenda", *International Journal of Management Reviews*, Vol. 7 No. 1, pp. 25-47.

IBM (2010), "Global CEO study 2010", Ehningen, available at: www.ibm.com (accessed 4 April 2012).

Innes, J., Mitchell, F. and Sinclair, D. (2000), "Activity-based costing in the UK's largest companies: a comparison of 1994 and 1999 survey results", *Management Accounting Research*, Vol. 11 No. 3, pp. 349-62.

Ittner, C.D. and Larcker, D.F. (2003), "Coming up short on nonfinancial performance measures", *Harvard Business Review*, Vol. 81 No. 11, pp. 88-98.

Kaplan, R.S. and Norton, D.P. (1996), *Translating Strategy into Action – The Balanced Scorecard*, Harvard Business School Publishing, Boston, MA.

Kaplan, R.S. and Norton, D.P. (2004), *Strategy Maps: Converting Intangible Assets into Tangible Outcomes*, Harvard Business School Publishing, Boston, MA.

Kaplan, R.S. and Norton, D.P. (2008), "Mastering the management system", *Harvard Business Review*, Vol. 86 No. 1, pp. 63-77.

Klatt, T., Schläfke, M. and Möller, K. (2011), "Integrating business analytics into strategic planning for better performance", *Journal of business strategy*, Vol. 32 No. 6, pp. 30-9.

Kloot, L. and Martin, J. (2000), "Strategic performance management: a balanced approach to performance management issues in local government", *Management Accounting Research*, Vol. 11 No. 2, pp. 231-51.

Lebas, M.J. (1995), "Performance measurement and management", *International Journal of Production Economics*, Vol. 41 Nos 1-3, pp. 23-35.

Lynch, R.L. and Cross, K.F. (1991), *Measure Up – The Essential Guide to Measuring Business Performance*, Wiley, London.

Micheli, P. and Manzoni, J.-F. (2010), "Strategic performance measurement: benefits, limitations and paradoxes", *Long Range Planning*, Vol. 43 No. 4, pp. 465-76.

Mouritsen, J. (2004), "Measuring and intervening: how do we theorise intellectual capital management?", *Journal of Intellectual Capital*, Vol. 5 No. 2, pp. 257-67.

Norreklit, H. (2000), "The balance on the balanced scorecard: a critical analysis of some of its assumptions", *Management Accounting Research*, Vol. 11 No. 1, pp. 65-88.

Neely, A., Adams, C. and Kennerley, M. (2002), *The Performance Prism: The Scorecard for Measuring and Managing Stakeholder Relationship*, Financial times Prentice Hall, London.

O'Grady, W., Rouse, P. and Gunn, C. (2010), "Synthesizing management control frameworks", *Measuring Business Excellence*, Vol. 14 No. 1, pp. 96-108.

Silvi, R., Bartolini, M., Raffoni, A. and Visani, F. (2012), "Business performance analytics: level of adoption and support provided to performance measurement systems", *Management Control*, Special Issue, No. 1, Franco Angeli, Milan (forthcoming).

Simons, R. (1995), *Levers of Control, How Managers Use Innovative Control Systems to Drive Strategic Renewal*, Harvard Business Review Press, Boston, MA.

Sousa, G.W.L., Carpinetti, L.C.R., Groesbeck, R.L. and Van Aken, E. (2005), "Conceptual design of performance measurement and management systems using a structured engineering approach", *International Journal of Productivity and Performance Management*, Vol. 54 Nos 5-6, pp. 385-99.

Taticchi, P., Tonelli, F. and Cagnazzo, L. (2010), "Performance measurement and management: a literature review and a research agenda", *Measuring Business Excellence*, Vol. 14 No. 1, pp. 4-18.

Tucker, B., Thorne, H. and Gurd, B. (2009), "Management control systems and strategy: whats been happening", *Journal of Accounting Literature*, Vol. 28 No. 1, pp. 123-63.

About the authors

Marten Schläfke is Research Assistant at the Chair of Performance Management at the University of St. Gallen, Institute of Accounting, Control and Auditing, University of St. Gallen. Marten Schläfke is the corresponding author and can be contacted at: Marten.Schlaefke@unisg.ch

Riccardo Silvi is Professor of Management Accounting at the Faculty of Economics at the University of Bologna, Department of Management, University of Bologna

Klaus Möller holds the Chair of Performance Management and is Director of the Institute of Accounting, Control and Auditing at the University of St. Gallen as well as Director of CEPRA – Center for Performance Research and Analytics, Augsburg.