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State of the art literature review on performance measurement

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ABSTRACT

The performance measurement revolution started in the late 1970s with the dissatisfaction of traditional backward looking accounting systems. Since then the literature in this field is emerging. Most of the focus was on designing performance measurement system (PMS), with few studies illustrating the issues in implementing and using PMS. Although Management Information Systems (MIS) and change management are important enablers of PMS, their role is not very well understood. Hence the objective of this paper is to review literature on the role of MIS and change management throughout the lifecycle of performance measurement, i.e. design, implementation and use stages. This paper not only discusses the role of MIS and change management throughout PMS lifecycle but also discusses PMS in the context of emerging business environment such as globalization, servitization, and networking in the context of multi-cultural environment. Finally it identifies research challenges for PMS in the emerging business environment.

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1. Introduction

Businesses are facing tough challenges to succeed in a global competitive market. Customer demand is changing rapidly in terms of sophistication of the products and services they require. As a result, companies need to become more responsive to customers and market needs, with a greater number of customer specific products and/or services, more flexible processes, suppliers and resources co-ordinated through a number of organisations along the supply chain, whilst reducing costs. In order to proactively respond to these challenges, management requires up-to-date and accurate performance information on its business. This performance information needs to be integrated, dynamic, accessible and visible to aid fast decision-making to promote a pro-active management style leading to agility and responsiveness. Many companies are using information technology to provide the required performance information on-line. Managers in these companies need predictive measures that indicate what may happen next week, next month or next year (Neely, 1999). However, in most of these companies, managers suffer from data overload. Managers need up-to-date performance figures on production, quality, markets, customers, amongst others, through which they

can proactively act on controlling several processes to achieve overall performance targets.

Through experience with a number of organisations, it was identified that: Despite the amount of research and development in performance measurement, systems that are properly integrated, dynamic, accurate, accessible and visible to facilitate responsive manufacturing and services are still not common (Bititci & Carrie, 1998). This is because the technical and people issues concerning the dynamics of performance measurement systems are not completely understood. The main reasons behind the absence of performance measurement systems (PMSs) that would facilitate responsiveness and agility are:

- Today most PMSs are historical and static. That is, they are not dynamic and sensitive to changes in the internal and external environment of the firm (Nudurupati and Bititci, 2000; Kueng, 2001; Marchand & Raymond, 2008). As a result, the information presented is not relevant, up-to-date or accurate.
- Few PMSs have an integrated Management Information Systems (MIS) infrastructure. Hence, lack of MIS support results in cumbersome and time-consuming data collection, sorting, maintenance and reporting (Marchand & Raymond, 2008; Marr & Neely, 2002; Nudurupati & Bititci, 2005).
- PMSs were seldom implemented and supported by senior management commitment. Hence there are change management issues such as resistance from people as they often do not understand the objectives and potential benefits (Bourne & Neely, 2000; Nudurupati & Bititci, 2005) or the management

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tend to use the PMS as a command and control mechanism disengaging people (Davenport, Harris, & Morison, 2010; Harrison & McKinnon, 1999; Lebas & Weigenstein, 1986).

It is demonstrated that MIS could play a major role in implementing performance measurement. In order to implement the MIS supported performance measurement system and make people use the system, it is necessary that the commitment should come from senior management during design, implementation and use (Bourne, Mills, Wilcox, Neely, & Platts, 2000). Franco-Santos et al. (2007) identified that influencing behaviour as one of the important aspects of performance measurement. Although, the importance of MIS and change management is widely recognised for successful and sustainable PMS implementations (Bititci, Mendibil, Nudurupati, Turner, & Garengo, 2006; Bourne & Neely, 2000; Marchand & Raymond, 2008; Marr & Neely, 2002), there is little focused research exploring the interplay between PMS, change management and MIS capabilities. Hence this paper sets out to study the literature in MIS and change management issues from a PMS lifecycle lens, i.e. the design, implementation, use and review of performance measurement systems, with a view to identifying gaps in knowledge and setting a research agenda for future research.

In order to achieve this objective, it was necessary to cover a wide range of literature, including performance measurement, MIS and change management. However, with numerous papers in each field (i.e. performance measurement, change management and MIS) it would be unrealistic and indeed of little value to conduct a comprehensive literature review across the entirety of the three fields. Thus the boundaries of the literature review were set as follows:

- Evolution of PMS – as it was thought critical to develop a deep understanding of the origins, definitions and purpose of contemporary performance measurement systems.
- Lifecycle of PMS – as it was thought important to understand the lifecycle of PMS systems from initial design, through implementation and use, as this understanding would enable us to surface change management and MIS implications associated with each stage of the PMS lifecycle.
- MIS implications of performance measurement – in order to understand how MIS is being used to support PMS projects, and associated problems, including practices associated with PMS information, collection, reporting and organisations behaviour with information (i.e. how information is used within the organisation and why?).
- Change management implications of performance measurement – to identify change management techniques used and the key issues associated with PMS implementations (with or without MIS support).

The following sections describe the literature that was reviewed corresponding to each one of the above sections. This literature is then critically discussed in Section 6 leading to identification of a number of gaps in knowledge and development of a research agenda.

2. Evolution of performance measurement

In the 1940s and 1950s there was a big industrial assault by a number of Japanese companies facing a number of quality issues such as lot sizes, defects, inventory wastes, and processing wastes (Suzaki, 1987). The Japanese have then translated their solutions into a collection of tools, techniques, procedures, now commonly known as Total Quality Control (TQC), just-in-time (JIT), Kaizen,

etc. which gave a competitive edge in global markets (Schonberger, 1982).

In contrast to Japan, the Western World had plenty of resources. Most of the industries operated based on consumer demand for variety and change. The industries held the goods and parts in inventory in order to be responsive in the changing demand of the consumer. Prior to the 1970s, industries in the Western World based their management paradigm on its manufacturing and service capacity and sales (Neely & Austin, 2002). Much of the emphasis was kept on financial indicators for controlling the business such as sales, productivity, efficiency, and ROI. Hence, the cost accounting and management control systems were designed based on these measures.

Western countries put much of their emphasis in innovation and competed with major advances in Computer Aided Design (CAD), Computer Aided Manufacture (CAM), Materials Requirements Planning (MRP), etc. (Abdel-Moty & Khalil, 1986; Daboub, Trevino, Liao, & Wang, 1989; Imai, 1986). The traditional cost accounting models developed for mass production and few standardised products were up-dated to accommodate the business environment in the 1970s (Kaplan, 1983). Much of the Japanese techniques have not been recognised until World War II. Added to this, the fivefold rise in the price of crude oil between 1970 and 1974 led to the worldwide economic travail (Schonberger, 1982).

In the 1980s the West recognised that Japanese economic success (with limited resources) was the result of operational efficiency and effectiveness (Hayes & Abernathy, 1980). Japanese techniques and practices started to gain wide acceptance throughout the world. The cost accounting models described the production processes using extremely simplified models such as Economic Order Quantity (EOQ) (Kaplan, 1984). New dimensions of business performance such as quality, time, cost and flexibility came into the picture (Slack, 1983). Hence a number of academics and practitioners recognised the need to change traditional accounting measurement systems to accommodate the new manufacturing philosophies and dimensions (Dixon, Nanni, & Vollmann, 1990). From the quality management and process improvement fields we have seen approaches, such as Lean Enterprise and Six Sigma, make extensive use of performance measurement to manage and improve performance of processes and organisations (Banuelas, Tennant, Tuersley, & Tang, 2006). However, despite this recognition, the accounting systems in most of the companies included only financial information in their management reports.

Towards the late 1980s and 90s many academics have criticised the problems with the traditional financial measures, which are internal and historical based (Dixon et al., 1990; Goldratt & Cox, 1986; Hayes & Abernathy, 1980; Johnson & Kaplan, 1987; Kaplan & Norton, 1992; Keegan, Eiler, & Jones, 1989; Neely, Mills, Gregory, & Platts, 1995; Skinner, 1974). Since then a number of frameworks and models for performance measurement emerged. Neely (1999) reports that from 1994 to 1996, there were more than 3600 articles published on performance measurement, which was described as a revolution. According to Neely et al. (1995), performance measurement is defined as "The process of quantifying effectiveness and efficiency of actions".

Waggoner, Neely, and Kennerley (1999) argued that performance measurement in business serves the purposes of monitoring performance, identifying the areas that need attention, enhancing motivation, improving communications and strengthening accountability. Neely et al. (1995) defines performance measurement system as "The set of metrics used to quantify both the efficiency and effectiveness of actions".

Lebas (1995) characterises performance management system as the philosophy supported by performance measurement. It is the organisation-wide shared vision, teamwork, training, incentives, etc. that surround the performance measurement activity. It is

the application of information and knowledge arising from performance measurement system (Adair et al., 2003).

Holloway (2001) reports that much of the literature exists on particular models and frameworks for performance measurement but they do not include the many evidences of failed systems describing and analysing of problems of performance measurement. However, a state of art review in "business performance measurement" done by Adair et al. (2003) has demonstrated that empirical research is comprised mostly case studies and survey methods, with very few progressive research methods. Recently, Herzog, Tonchia, and Polajnar (2009) presented an empirical analysis looking at the linkages between manufacturing strategy, benchmarking, BPR and performance measurement. Methods such as action research have been used by handful of investigators (Bourne & Neely, 2000; Bourne et al., 2000; Neely et al., 2000; Nudurupati & Bititci, 2005). Despite the research progress in the field, Franco-Santos et al. (2007) has reported that there are several definitions for PMS with no consensus between them indicating the obscurity in this research field.

A group of independent researchers, having examined and explored performance measurement from a SME perspective, concluded that majority of performance measurement work, although theoretically valid, do not take into consideration the fundamental differences between SMEs and larger organisations, thus resulting in poor take up of performance measurement practices in SMEs (Garengo, Biazzo, & Bititci, 2005; Garengo & Bititci, 2007; Hudson-Smith & Smith, 2007; Wiesner, McDonald, & Banham, 2007).

Those works exploring performance measurement in supply chains consider heterogeneous dimensions and propose process-based systematic perspectives to measure the performance of supply chains (Acar, Kadipasaoglu, & Schipperijn, 2010; Chan & Qi, 2003; Gunasekaran, Patel, & McGaughey, 2004; Huang, Sheoran, & Keskar, 2005; Kleijnen & Smits, 2003; Kroes & Ghosh, 2010; Lockamy & McCormack, 2004; Shepherd & Gunter, 2006; Vachon & Klassen, 2008). However, the majority of these works seem to focus on operational aspects of supply chain management, including the use of information systems for performance measurement, reporting and management amongst suppliers and customers along the supply chain.

With the global economic power base shifting towards emerging economies such as Brazil, Russia, India and China (Goldman Sachs., 2009; Yamakawa, Ahmed, & Kelston, 2009) certain trends that were embryonic just a few years ago seem to be accelerating. These trends include: Emergences of the need for organisations to collaborate across global multi-cultural networks (Chesbrough & Garman, 2009; Hansen & Birkinshaw, 2007; Pisano & Verganti, 2008) as well as increasing emphasis on servitization and the trend towards service-dominant logic (Lovelock & Gummesson, 2004; Neely, 2007; White, Stoughton, & Feng, 1999). However, performance measurement is embryonic in both these contexts and more empirical research is required to explore these fields.

According to Bourne et al's (2000) three-stage model as the life-cycle of performance measurement systems, there has been a constant progress in designing performance measurement systems. However, implementation as well as using and updating PMS has received attention only in recent years (Bititci et al., 2006; Bourne & Neely, 2000; Kennerley & Neely, 2003; Nudurupati & Bititci, 2005). These three stages are discussed in the following sections.

3. Lifecycle of PMS

3.1. Designing PMS

The performance measurement revolution started in the late 1970s and early 1980s with the dissatisfaction of traditional back-

ward looking accounting systems (Dixon et al., 1990; Johnson & Kaplan, 1987; Kaplan & Norton, 1992; Skinner, 1974). These models are based on lagging indicators (financial). Since then, a number of frameworks as well as tools and techniques have been developed for designing performance measurement. In many companies, non-financial indicators such as quality, customer satisfaction, cycle time, and innovation were recognised. They acted as the leading indicators for the financial performance (Ittner & Larcker, 1998; Suwingnjo, Bititci, & Carrie, 1997).

Some of the models and frameworks, which made significant impact in designing performance measures in practise, are Strategic Measurement and Reporting Technique (SMART) (Cross & Lynch, 1988–1989), The Performance Measurement Matrix (Keegan et al., 1989), Results and Determinants Framework (Fitzgerald, Johnston, Brignall, Silvestro, & Voss, 1991), Balanced Scorecard (BSC) (Bhagwat & Sharma, 2007; Kaplan & Norton, 1992; Kaplan & Norton, 1996 and Kaplan & Norton, 2001), Cambridge Performance Measurement Systems (CPMS) Design Process, (Neely et al., 1996), Integrated Performance Measurement Systems (IPMS), reference model (Bititci & Carrie, 1998), Performance Prism (PP) (Neely & Adams, 2001), FFQM Business Excellence Model (EFQM, 1999), etc.

All these models and frameworks were concerned with what to measure and how to structure the PMS, i.e. they try to answer the question "how to design the PMS?".

3.2. Implementing PMS

Most of the literature in performance measurement includes defining performance measures, or aligning performance measures to the strategy or organisational goals as demonstrated in previous section. From these approaches, managers will know what to measure. There is little evidence of systematic empirical research on the implementation of PMS (Bourne et al., 2000; Neely et al., 2000).

In many companies, performance measures are too poorly defined (Schneiderman, 1999), which creates a lot of misunderstanding by different people. Hence, for each indicator, Bourne and Wilcox (1998) and Neely et al. (1996) advised that a performance measure record sheet is used to record the definition of the performance measure. According to Bourne et al. (2000), Kennerley and Neely (2003), Marr and Neely (2002), Nudurupati and Bititci (2005), once the information is captured about each measure, they are implemented with the following four tasks which are, data creation, data collection, data analysis and information distribution.

According to White (1996), data exist in two types within and outside the organisation, which is objective and subjective. Although objective measures are based on independently observable facts, subjective measures are based on opinions and perceptions. While objective measures are easily quantifiable and establishing benchmarks is straight forward, subjective measures are judgemental and establishing benchmarks is complex and often difficult. Nemetz (1990) identified in her research that it is always not possible to gather accurate, standard and objective performance data and hence it is necessary to rely on subjective or perceptual performance data. A survey done by Van Der Stede, Chow, and Lin (2006) concluded that organisations with extensive performance measurement systems that included both subjective and objective non-financial measures will achieve higher performance. Despite a lot of interest in subjective measures, performance measurement could fail due to the difficulty of objectively establishing benchmarks to subjective measures or poor implementation of subjective measures due to the complexity in its measurement.

A 5-year action study on the implementation of performance measurement systems by Bourne (2001) concluded that there

were two main drivers and four blockers that influence successful implementation as shown in Fig. 1.

3.3. Using and updating PMS

Providing performance information is not sufficient to improve business performance results. The real success lies in peoples' behaviour in using this performance information (Davenport, 1997; Eccles, 1991; Hill, Koelling, & Kurstedt, 1993; Prahalad & Krishnan, 2002). Many executives and academics believe that the main reason, why performance measurement is short-lived is because of people's behaviour with the information (Bititci, Nudurupati, Turner, & Creighton, 2002; Marchand, Davenport, & Dickson, 2000). Meekings (1995) argues that making people use measures properly not only delivers performance improvement but also becomes a vehicle for a cultural change, which helps in liberating the power of the organisation.

In this ever-changing business environment companies are becoming more dependent on sharing (Aedo, Diaz, Carroll, Convertino, & Rosson, 2010) and using performance information dynamically and hence becoming more knowledgeable and pro-active. However, the performance information behaviour (Johnson, 2009) of the business lies in one or more of the factors such as senior management commitment (Bititci et al., 2002; Bourne & Neely, 2000; Feeny & Plant, 2000; Hudson, Bennet, Smart, & Bourne, 1999; Marchand, Davenport et al., 2000), drive from senior management to make people use performance measurement at all levels in their decision making (Chuu, 2009; Donovan, 1999; Feeny & Plant, 2000; IFAC Information Technology Committee, 1999; Kennerley & Neely, 2002; Orlikowski, 1996), mitigating the resistance from people by educating and training them (Battista & Verhun, 2000; Macrosson, 1998; Marchand, Davenport et al., 2000; Markus, 2000; Orlikowski, 1996; Waddell & Sohal, 1998).

Just as the strategy for the company changes dynamically based on external fluctuations, the relevant performance measures/indicators should also be reviewed to sustain their relevance with the strategy (Bourne et al., 2000; Dixon et al., 1990). Hence a performance measurement system should include an effective mechanism for reviewing targets (Ghalayini & Noble, 1996) and a

process for developing measures or indicators as circumstances change (Dixon et al., 1990; Kennerley & Neely, 2002; Maskell, 1989; Meekings, 1995). Many people also developed audit tools to find out the relevance of performance indicators defined for the business (Bititci & Carrie, 1998; Neely et al., 1996).

Although performance measurement is discussed throughout its lifecycle, the PMS domain has developed outside the Management Information Systems (MIS) research field (Marchand & Raymond, 2008). A number of researches have established links between PMS and MIS, however the research presented is isolated (Garengo, 2009; Nudurupati & Bititci, 2005). Hence our emphasis on including literature on the role of MIS in performance measurement and management.

4. Role of MIS in performance measurement

4.1. Problems encountered with MIS to support PM

Management Information Systems (MIS) in many companies play a vital role in the upward flow of information, i.e. information gathered as part of everyday operations is consolidated and passed upwards to decision makers. Strategies, goals and directives are passed downwards to the lower levels. It also ensures that information flows horizontally across the various departments within the organisation as well as suppliers and customers outside the organisation. According to Haag, Cummings, and McCubrey (2002) MIS is defined as a system that "deals with the planning, development, management, and use of information technology tools to help people perform all tasks related to information processing and management".

Traditionally, enterprises measured only financial indicators and, hence, the MIS traditionally supported only financial indicators. Accounting systems implicitly defined the information practices embedded in MIS. Thus, many of the MIS reported only on financial performance and did not provide adequate, up-to-date information on non-financial performance (Eccles, 1991; Hayes & Clark, 1986). There is an abundance of evidence from numerous surveys, done both in the UK and USA, that existing MIS often have very little success (Lucey, 1997; Prahalad & Krishnan, 2002) in

Drivers	Barriers
<ul style="list-style-type: none"> • <i>Top management commitment:</i> The senior managers should be responsible to change the way they are managing the business (Coch and French, 1948; Eccles, 1991; Hope and Fraser, 1998; Meekings, 1995). • <i>The perceived benefits arising from designing, implementing and using the performance measures</i> 	<ul style="list-style-type: none"> • <i>The time and effort required:</i> Managers are always busy with many conflicting demands on their time (Simons and Davila, 1998). Performance measurement is just another demand and, hence, the benefits have to be worth the effort required. • <i>The difficulty of implementing the measures caused by inappropriate information being available from the MIS.</i> • <i>Resistance to performance measurement:</i> Resistance is prevalent when the employees are uncertain about the outcome of implementing new technology (Macrosson, 1998; Meekings, 1995; Sayles and Straus., 1966; Waddell and Sohal, 1998). • <i>New parent company initiatives:</i> In many subsidiary companies the performance measurement fails because of the parent company removing the resources necessary for performance measurement, assigning new higher priority projects, and other unintentional fluctuations, such as restructuring the company, changing the strategy quite often, will make the existing measures obsolete.

Fig. 1. Drivers and barriers to implementation of PMS.

providing management with the right information they need, because management were often not involved in MIS design and implementation as well as information system specialists with adequate knowledge or awareness on the requirements of business.

In addition to the above strategic non-alignment, most of today's MIS store information in different sources (Garnett, 2001; McNurlin & Sprague, 2002; Prahalad & Krishnan, 2002), such as legacy systems, ERP systems, spreadsheets, databases and even on paper-based sources. In order to get applications up and running quickly, MIS system designers have sought the necessary data either from the cheapest source or from a politically expedient source (McNurlin & Sprague, 2002), resulting, in inconsistent MIS deployment throughout the organisation. Hence the problems encountered with these systems are:

- Difficulties associated with gathering information from different sources. As a result, enterprises need to invest much of their time in data gathering (Garnett, 2001; Prahalad & Krishnan, 2002).
- As the data is stored in different formats in different departments, some of the data is hidden, duplicated (Garnett, 2001; McNurlin & Sprague, 2002) and updated by different people. Hence, questions always arise on the validity of data.
- As some of the data collected especially outside the organisation is subjective it is often not consistent with the objective data available within the company (Van der Stede et al., 2006; White, 1996).
- As information sources are not linked properly, information is not available dynamically (i.e. near real-time), which does not allow managers to make fast and confident decisions (Garnett, 2001; Prahalad & Krishnan, 2002).
- Lack of effective communication of the right information to the right people at the right time (McNurlin & Sprague, 2002).
- As information is not shared or communicated throughout the organisation, managers cannot work as a team and changes occurring in one source are not transparent to everyone. This often leads to a reactive and closed management style, pointing fingers at one another rather than focusing on the issue in hand (Bititci et al., 2002).

Performance measurement supported by this type of MIS, when implemented, often results in a failure, as the management and people will not have enough confidence in information. The limitations of existing MIS supported performance measurement systems are also relevant in the context of collaboration between customers and suppliers.

4.2. Using MIS for PM

In this ever-changing complex, volatile and turbulent business environment, MIS has become a critical success factor for many organisations (Blili & Raymond, 1993). Many different products have been developed in the last few decades to exploit the features of MIS to automate, capture, store, process, use and communicate data and information (Eccles, 1991). According to many veterans, MIS is designed to deliver many results and benefits. However, in the context of performance measurement, MIS is required (Bourne & Neely, 2000) to deliver one or more of the following:

- Data collection, analysis and storage (Blackler & Brown, 1987; Haag et al., 2002).
- Improving operational control, speed and flexibility and hence improve efficiencies of business operations (Blackler & Brown, 1987; Marchand, Davenport et al., 2000; Marchand, Kettinger, & Rollins, 2000).

- Improving communications, supporting the efficient and effective running of business processes (Haag et al., 2002; Marchand, Davenport et al., 2000).

MIS has played a critical role in making performance measurement revolution possible (Eccles, 1991). According to Meekings (1995), successful implementation of performance measurement depends less on selecting the right measures and more on the way the measures are implemented and used by the people in the business. With the evolution of information technologies including web technologies, the PMS can be enriched with new functionalities which allow enhanced support for decision making within the organisation (Marchand & Raymond, 2008).

However, many senior managers and researchers contend that good MIS systems and appropriate business measures are not just sufficient for implementing performance measurement and management. In fact, many companies have failed to manage the most critical determinant of MIS, i.e. how people use it for performance measurement and management. Marchand and Raymond (2008) has proposed a research model by combining the theories of PMS and MIS in understanding the use and impacts of Performance Management Information Systems (PMIS) in organisations. According to Davenport (1997), Eccles (1991), Haag et al. (2002), Marchand, Kettinger et al. (2000), Neely (1999) and Orlikowski (2000) in addition to providing hard aspects of MIS, such as creating databases, installing servers, and automating data collection systems, the companies are also required to provide soft aspects of MIS such as performance information practices and performance information behaviour.

4.2.1. Performance information practice

Once the performance indicators are decided and MIS is made available in the company, the next step is to find the ways of implementing these measures. Performance information practices are required "to convert data from internal and external sources into performance information and to communicate it, in an appropriate form, to managers at all levels in all functions to enable them to make timely and effective decisions" (Bourne & Neely, 2000; Davenport, 1997; Lucey, 1997; Marchand, Davenport et al., 2000; Marchand & Raymond, 2008). According to Tsakonas and Paptheodorou (2008), providing open access to information will be beneficial to the business in terms of usefulness and usability. If MIS automates the collection of data and maintenance, PIPs delivers this data in the required formats (such as statistical charts, statistical analysis, summary reports) ready for decision-making (Brancheau & Wetherbe, 1987; Bullers & Reid, 1991; Cash & McLeod, 1985). These information practices have to consider ways in which data and information are processed (Battista & Verhun, 2000; Booth, 1998; Donovan, 1999; Franco-Santos et al., 2007; Kueng, 2001; Marchand, Davenport et al., 2000; Marchand & Raymond, 2008; Orlikowski, 1996; Prahalad & Krishnan, 2002; Roland & Frances, 1999).

4.2.2. Performance information behaviour

Once the performance measures are implemented using performance information practices, the next step is the exploitation of the information by the people. Performance information behaviour is defined as the people's behaviour with performance information. It can be positive behaviour, such as pro-active and confident decision-making, continuous improvement, etc. or negative behaviour, such as resistance, wrong interpretation of information, and so on. The real success lies in peoples' behaviour in using this MIS and performance information practices (Davenport, 1997; Eccles, 1991; Marchand, Davenport et al., 2000; Orlikowski, 2000; Prahalad & Krishnan, 2002).

Many executives and academics believe that the main reason why MIS based Performance measurement is short-lived is because

of the employees' behaviour with the information (Bititci et al., 2002; Marchand, Davenport et al., 2000). Kraaijenbrink (2007) demonstrated that there are wide range of gaps in people identifying, acquiring and using the information. Meekings (1995) argue that making people use measures properly not only delivers performance improvement but also becomes a vehicle for a cultural change, which helps liberating the power of the organisation. Franco-Santos et al. (2007) has identified influencing behaviour as one of the categories of PMS. They argue that PMS should encompass the roles of rewarding or compensating behaviour, managing relationships and control. Thus in implementing performance measurement systems, management of people and organisational change becomes a critical consideration which is discussed in the following sections.

5. Role of change management in PM

PMS is a prominent example of bringing fundamental change in organisations. The benefits can be derived by successfully implementing PMS through success factors (such as senior management commitment, employee buy-in, and MIS support) which were already discussed in the previous sections (Bourne, 2001; McAdam & Bannister, 2001; Nudurupati & Bititci, 2005). However, these success factors can be introduced in organisations with a careful selection of change management strategies that are suitable to the context. According to Hiatt and Creasey (2002) change management is "*the process, tools and techniques to effectively manage the people-side of the business change within the social infrastructure of the workplace*".

Many researchers and practitioners incorporate change management techniques with business improvement techniques. The above definition allows researchers and practitioners to separate change management as a practice area from business improvement techniques, such as performance measurement, Six Sigma, BPR, TQM or some other techniques to improve business performance.

Organisational Development (OD) models are included in management theory and practice to a large extent focus on people side of change. Depending on the type of organisational change intended, initiatives may be designed directly at individuals in order to secure specific behavioural change, or they may be directed at a group or organisational level. The OD models are defined as "*A set of behavioural science-based theories, values, strategies, and techniques aimed at the planned change of organisational work setting for the purpose of enhancing individual development and improving organisational performance, through the alteration of organisational members' on-the-job behaviours.*" (Porras & Robertson, 1992).

There is proliferation of literature existing in the change management theory. Hence as a starting point, it is necessary to indicate useful theories in organisational change management literature that are favourable for implementing and using performance measurement. A change may refer to any alteration in activities, tasks or events in an organisation. The literature contains many change management approaches with many classifications (Dawson, 1994; Garvin, 2000; Kotter & Cohen, 2002; Lewin, 1951; Mento, Jones, & Dirndorfer, 2002; Pettigrew, 1990), one such and well known classification is proposed by Dawson (1994) as discussed in the following sections.

5.1. Orthodoxy approach

These approaches are used in organisations operating under stable environment. They are traditional or conventional approaches to a planned change. It includes a range of external factors, such as government laws and regulations, technology, social and economic change, as well as internal factors that are generally

characterised as comprising technology, people task and administrative structures (Dawson, 1994). A change in organisation's techniques, for instance, can involve implementation of a performance measurement system. This entirely changes the way people interacted with information before and after implementing the system. This new technique will/might change the administrative procedures, which in turn modify other aspects, such as communication and human aspects involving attitudes, beliefs, values, skills, and behaviours.

In Lewin's (1947) theory of force field analysis, there will be two sets of forces in operation within a social system, one driving the force to operate for a change and the other trying to increase the resisting forces. In order to maintain a successful change, the implementation team either should increase the driving forces or decrease the resisting forces. If the forces are equal there will be an equilibrium (or stability) in the organisational change, hence Lewin (1951, 1952) identified unfreezing, moving and re-freezing stages for implementing successful management of change. However, orthodoxy approaches and Lewin's model are most suitable in an organisation, which implements performance measurement and operates under a stable environment. These approaches are questionable to implement performance measurement in organisations that are operating in a continuously and rapidly changing environment.

5.2. Contingency approach

For the organisations to adapt to this turbulent environment, a number of contingency based approaches have evolved (Burns & Stalker, 1961; Dunphy & Stace, 1990; Galbraith, 1973). These are planned change models for the organisations operating under a turbulent environment. It is an understanding of a decision criterion or rules and relationships between different contingents, such as technology, and environment and its contextual variation under different circumstances. They will also make an implicit assumption that situations are predictable and change agents could diagnose the problem and solve it.

Dunphy and Stace (1990) proposed a two dimensional model based on the scale of change on x-axis and the style of leadership on y-axis, as shown in Fig. 2. Appropriate management style can be selected based on the scale of change. According to Bititci et al., 2006, the implementation of PMS requires an appropriate leadership style (collaborative or coercive) that suits the culture of the organisation. The amount of change required depends on the maturity of performance measurement in the organisation. Appropriate contingency approach can be used in implementing PMS depending on the culture of the organisation as well as the amount of change required. The two major weaknesses of this approach are, firstly, the model does not tackle the political dimensions of

	Incremental Change Strategies	Transformational Change Strategies
Collaborative Modes	Participative Evolution	Charismatic Change Strategies
Coercive Modes	Forced Evolution	Dictatorial Transformation

Fig. 2. Dunphy and Stace (1990) model for contingency theory.

change and secondly, no attempt is made to provide a typology of change strategies and conditions for their use during actual process of organisational change (Dawson, 1994).

5.3. Contextualist approach

Orthodoxy and contingent approaches do not contextualise research by examining the content and process of change (Child & Smith, 1987; Pettigrew, 1987). Hence, there is a requirement for an alternative approach called contextualist approach to manage change. This approach encompasses knowledge of the whole organisation in order to explain the process by which managers mobilize and reconstruct contexts in order to legitimate the decision of change (Whipp, Rosenfeld, & Pettigrew, 1987). It is the relationship between the content of change, the context in which change occurs and the process which takes it through the change as shown in Fig. 3 (Child & Smith, 1987; Pettigrew, 1987, 1990). Outer context refers to the social, economic, political, and competitive environment in which the organisation operates. Inner context refers to the structure, corporate culture, and political context within the organisation through which ideas for change have to proceed.

Both Child and Smith (1987) and Pettigrew's (1990) studies are based on longitudinal case studies and the collection of in-depth qualitative data. Pettigrew's (1987) analysis also identified a need for both vertical and horizontal level of analysis. Vertical level of analysis includes outer and inner environmental contextual factors. The horizontal level refers to the interpretation between historical events, present events and future expected events. As a part of her research programme, using Toulmin's model, Holloway (2001) claimed that both context and process influenced performance measurement effectiveness. There is one significant drawback for contextualist approach for its richness and complexity of multi-level analysis. However, the approach is accepted and adopted by many researchers in UK (Dawson, 1994). Depending on the conditions and the context within which an organisation manages change by implementing PMS, an appropriate change management approach can be selected by prioritising its advantages and disadvantages and its suitability.

5.4. Technology based change management approaches

Although the approaches presented above tackle general change management issues (thus resulting from implementing PMS), it does not specifically discuss technology based change management (thus resulting from implementing MIS supported PMS). Hence this section presents literature that includes studies on technology based change management approaches and techniques. According

to Orlikowski (1996), there are three perspectives that have influenced studies of technology-based organisational transformation:

- Planned change, as discussed in the above sections, includes Lewin's (1951) force field analysis, contingency frameworks, innovation theories and practitioner-oriented prescriptions for organisational effectiveness. These models are criticised for taking change as a discrete event by the managers and separating it from the organisation ongoing processes (Child & Smith, 1987; Pettigrew, 1987).
- Technological imperative, in which technology is seen as a primary autonomous driver for the organisational change. It emphasises that adoption of a new technology will bring in changes in the organisation's practices, structures, work routines, information flows and performance (Leavitt & Whistler, 1958).
- Punctuated equilibrium models assume change to be rapid, episodic and radical. When a technology is implemented, the large periods of stability (so called equilibrium) are punctuated by compact periods of qualitative metamorphic change (Child & Smith, 1987; Miller & Friesen, 1984).

All three perspectives are criticised for neglecting the so-called distinction between deliberate and emergent changes (Mintzberg, 1987). Deliberate refers to the new pattern of organising change as intended, whereas emergent change refers to the new pattern of organising change in the absence of prior intentions. However, this emergent change can only be realised in action and cannot be anticipated or planned (Mintzberg, 1987; Orlikowski, 1996).

Orlikowski (1996) proposed a situation change perspective, in which organisation transformation is grounded in the ongoing practices of organisational actors and emerges out as experiments with every day contingencies, breakdowns, exceptions, opportunities, and unintended consequences that they encounter. This transformation is seen as an ongoing improvisation endorsed by organizational actors trying to make sense of and act logically in the world. This ongoing improvisation is nothing but focusing on a particular situated action (context) taken by action researchers.

Hence, through a series of ongoing improvisations, alterations or adaptations, sufficient modifications are performed over time that fundamental changes (metamorphosis) are achieved (Orlikowski, 1996). The MIS supported performance measurement when implemented, as Mintzberg (1987) suggested can either be deliberate or emergent. In either of the cases the specific change management technique or model selected depends on the context.

6. Discussion

From the literature review, it is evident that MIS and change management plays a significant role in making the performance measurement interventions successful. These implementations require a considerable amount of investment. The value of performance measurement will depend on the organisation readiness and culture throughout its lifecycle. However, many organisations find it difficult to produce a persuasive business justification for investment on PMS through its lifecycle because there is often high uncertainty about the scale of impact and the scale of costs likely to be incurred. Little or almost no research has been done in correlating the amount of investment spent in implementing MIS and change management supported PMSs with the benefits.

Based on the review presented in the previous sections, performance measurement was developed in response to the global trends (from industrial age to current period) and in parallel to the developments of information technology. Performance measurement was always studied and researched in isolation to the developments on information technology (Marchand & Raymond,

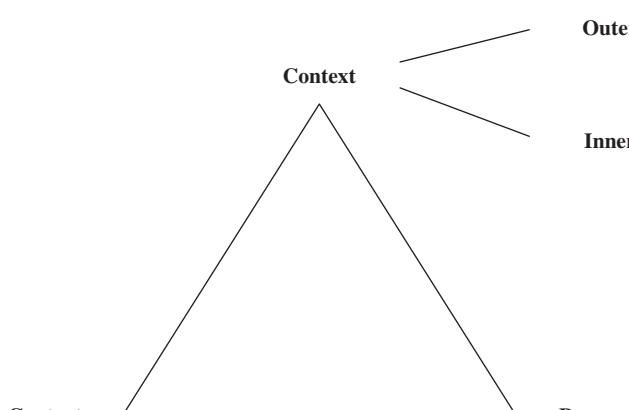


Fig. 3. The broad framework for Contextualist Approach (Pettigrew, 1987).

2008). PMSs in organisations change the way people interact with information before and after implementing the system. This will change the administrative procedures, which in turn modify other aspects, such as communication and human aspects involving attitudes, beliefs, values, skills and behaviours (Franco & Bourne, 2003; Nudurupati, 2003; Ukko, Tenhunen, & Rantanen, 2007). Hence it is evident from the literature that senior management commitment should come in the form of drive to manage the change and influence behaviours in these organisations (Bititci et al., 2006; Franco-Santos et al., 2007). Having seen the importance of MIS and change management to PMSs, the following sections are organised to discuss their importance at the three stages of performance measurement as shown in Figs. 4 and 5.

6.1. Role of MIS and change management in “design” stage of PMS

From the extant literature of frameworks, tools, techniques for designing PMS, two independent studies, Bititci, Turner, and Begeleman (2000) and Hudson et al. (1999) has summarised the following as the requirements for designing performance measures:

- Identify Stakeholder Requirements.
- Perform External Monitoring.
- Develop Objectives.
- Aligned Deployment System (performance indicators).
- Causal Relationships (between leading and lagging indicators).
- Quantify the Causal Relationships.
- Identify Capabilities.

From this it is evident that most of these requirements would be fulfilled through discussions amongst management (Nudurupati, 2003). Hence the authors state that *the role of MIS is limited (or minimum) in designing PMS* as shown in Fig. 4. However, this is the stage where there can be resistance for change due to PMS according to Lewin's (1947) theory. As the PMS is at its initial stage (design), the resistance tends to be at dormant stage. However, in order to fulfill the above requirements at design stage, there should be commitment from senior management in mitigating and overcoming the resistance from people. They should communicate potential benefits of PMS to gain the people's buy-in for the system. (Bititci et al., 2002). Hence the authors state that *the change management moderately influences design stage* as shown in Fig. 5.

Although role of MIS is limited at this stage, there is a huge potential for businesses to use MIS to build a trial version of PMS with

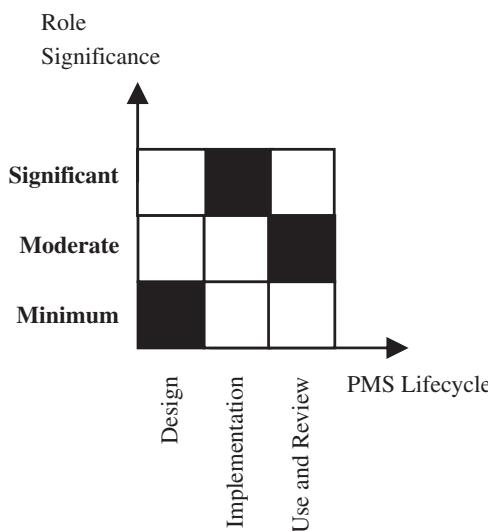


Fig. 4. Role of MIS in performance measurement.

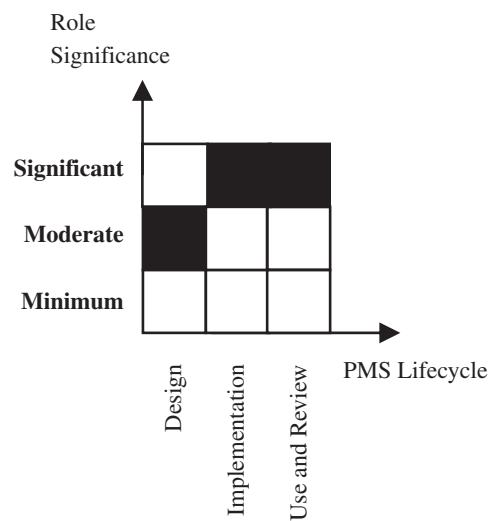


Fig. 5. Role of change management in performance measurement.

various measures and demonstrate people that PMS is not going to mean a lot of additional work load as MIS will do majority of work. This will not only mitigate resistance from people but also keep their focus on knowledge based work. This not only builds confidence in the system but also reduces change management effort required to overcome resistance at later stages of implementation, use and update.

6.2. Role of MIS and change management in “implementation” stage of PMS

In most of the productivity-focused industrial engineering and service companies in addition to PMSs, continuous improvement approaches such as Lean and Six Sigma, are increasingly being used to measure and improve performance of business and administrative processes of industrial, service and public sector organisations (Baker, Beitsch, Landrum, & Rebecca, 2007; Greiling, 2006; Kanji & Sá, 2007; Pursey, Mukherjee, & Bhar, 2007; Swinehart & Smith, 2005). Emphasis of the PMS in the continuous improvement approaches results in (Bititci & Nudurupati, 2002):

- Few measures at higher levels for senior management, easy to manage as they are measured on a monthly and annual basis and there are only a few of these.
- A lot of measures at lower levels for operational teams, difficult to manage as they are measured on an hourly and daily basis and potentially there are a lot of these.

As demonstrated in the literature review (Bierbusse & Siesfeld, 1998; Bourne & Neely, 2000; Hudson et al., 1999; Neely, 1999), the implementation of these performance measures fail in many companies for the following reasons:

- A lot of time and investment is required for data collection, analysis and reporting.
- Historical measures with out-of-date and irrelevant information.
- The large number of measures, which are difficult to be managed on a paper-based PMS.
- The difficulty of implementing measures cause inappropriate information being available from the PMS.
- Resistance to PMS.

From these reasons it is evident that lack of MIS support plays a major role directly or indirectly in influencing the failure of

performance measurement implementation. According to Simon (1965), Bullers and Reid (1991), people have basic limitation in their information processing capabilities. As reported in literature implementation of PMS involves data creation, collection, analysis and distribution activities. Latest development in MIS including web technologies have a significant influence on these activities (Marchand & Raymond, 2008). Hence the authors state that *the role of MIS is significant in implementation stage of PMS* as shown in Fig. 4.

While implementing these measures, considerable effort and commitment are required at all levels to capture, collect, analyse and report performance measurement information. This is the stage where there will be a potential for negative forces such as resistance, other project priorities, and lack of awareness to build-up to an extent that holds the PMS implementation (Bourne & Neely, 2000; Lewin, 1947). People who are hiding behind the information are vulnerable and begin to strengthen the resistance to PMS implementation (Bititci et al., 2002). According to Meekings (1995) there will always be some resistance to performance measurement in most companies due to the fear of personal risk. In organisations that are highly politicised or have a strong 'blame culture' or show 'favouritism' the resistance can be severe (Ansoff, 1988; Orlikowski, 1996; Waddell & Sohal, 1998) preventing the implementation of the performance measures. Senior management should manage the situation and influence the people's behaviour in mitigating such resisting forces with different management style depending on the culture of their organisation as suggested by Dunphy and Stace (1990) in their contingency approach (Bititci et al., 2006). When a rapid and radical change is required in implementing MIS supported PMS, then large periods of stability (so called equilibrium) are required by compact periods of qualitative metamorphic change (Orlikowski, 1996). Hence the authors state that *the change management influences the implementation of PMS to a significant extent* as shown in Fig. 5.

6.3. Role of MIS and change management in "use" and "update" stages of PMS

Once PMS is implemented and the information is distributed, using the system in day-to-day decision making is in the hands of people and the MIS support at this stage is limited. However, MIS support is required to some extent in reviewing and updating the measures. Hence the authors state that *the MIS support is moderately required in the use and update stage of PMS* as shown in Fig. 4.

Using performance measures is the stage where resistance keeps on building in people. This build-up of resistance will depend on how well the senior management tackled with it at previous stages (Lewin, 1947, 1951). Even though resistance to performance measurement is initially found in most companies, it can be gradually overcome through senior management taking initiative in the project, as well as using open and non-threatening management style (Bititci et al., 2006). Performance measurement should be projected to all the employees as a learning process rather than a control over the business, in order to overcome resistance (Kotter, Schlesinger, & Sathe, 1979; Meekings, 1995; White & Bednar, 1991).

The senior managers should be responsible for changing the way they are managing the business. They have to attend the workshops and become deeply involved in shaping the objectives and the measurement system. The commitment from senior managers should come in the form of a drive, in making people use MIS supported PMS and for their business. To do this, they should start using the system and ask questions in the management briefings with a non-threatening management style. Davenport suggests that the ultimate goal of performance measurement should be learning rather than control (Davenport, 2006; Davenport et al.,

2010). This drive makes the next level of management realise the interest shown by senior management and they will start using the system and look into the performance information before going to the management briefings. In this way, MIS supported PM and will be rolled out (deployed) throughout the organisation to the lower levels. Hence the authors believe that *the change management plays a significant role in making people use and update the PMS* as shown in Fig. 5.

6.4. Feasibility of PMS in the current development trends

It seems that as the maturity of our understanding in the field of performance measurement grew the development of models offering guidance in what to measure (design) and how to measure (implement) gave way to a concern on how to make best use of these measures (use and update) to manage the performance of the organisation (Adair et al., 2003; Bititci et al. 1998; Lebas, 1995). With the recognition of dynamic nature of the organisations we need to understand how PMSs can be adapted to the changing operating environment. Hence the availability of the empirical data on the application and use of PMSs started emerging with people, behavioural and cultural issues relating to how these measurement systems were used to manage the performance of an organisation (Bititci et al., 2006; Franco & Bourne, 2003; Ukko et al., 2007). However, there is need for longitudinal studies that explore and explain how PMS within an organisation evolves in response to changes in the organisations inner and outer operating environment.

Performance measurement recognises the trends towards inter-organisational working and regularly calls for research into performance measurement in supply chains and collaborative organisations covering issues such as inter-organisational agreement on performance measurement, and managing the entire supply chain beyond the single dyadic relationship. Performance measurement literature on inter-organisational collaboration identifies an additional degree of complexity that is associated with collaborative organisations (Busi & Bititci, 2006; Folan & Browne, 2005). That is for example, the collaboration between three separate organisations by its very nature creates a fourth virtual enterprise that needs to be managed separately. As of yet we do not truly understand (theoretical or practical) whether the PMS lifecycle with the MIS support discussed in the literature is sufficient to manage the collaborative organisation whilst also managing the performance of the participating organisations as a complete system.

As the level of globalization deepens beyond supply chain and inter-organisation collaborations, organisations and individuals across multiple cultures are likely to be networking across multiple and diverse national and organisational cultures. We have already identified separate research challenges of PMS in the context of dynamic organisational environment, inter-firm collaboration, organisational culture. The notion of multi-cultural collaborations or multi-cultural networks raises a new research challenge to find the suitability of existing PMS lifecycle, MIS support and management practices to be effective in the multi-cultural environment.

With the advent of servitization the need for creating new value through provision of services to complement traditional products has emerged (Lovelock & Gummesson, 2004; Neely, 2007; White et al., 1999). The main belief that underpins the notion of servitization is the shift from value-in-exchange towards value-in-use (Ng, Nudurupati, & Nudurupati, 2010; Woodruff, 1997). This suggests that regardless of whether the value to the customer is delivered through products or services, the value chain should be viewed from the customer's perspective, i.e. how the customer uses the product and/or service throughout its life (Vargo and Lusch, 1994; Wise & Baumgartner, 1999). This transition from product-dominant thinking to service-dominant thinking is challenging both researchers and practitioners requiring fresh and innovating

thinking as to how organisations need to be configured, measured and managed (Ng & Nudurupati, 2010). According to Ostrom et al. (2010) performance measurement should transform the business strategy and service design to deliver value-in-use. Today, the majority of customer facing measures, such as on-time delivery, flexibility, responsiveness, accuracy of documentation and even customer satisfaction, tend to focus on value-in-exchange rather than value-in-use. However, it is not yet understood whether the PMS lifecycle in literature with the latest developments in MIS is sufficient for measuring and managing organisation to deliver value-in-use to its customers.

7. Conclusion and future research

In this paper, having reviewed and tackled the evolution of the performance measurement field in the context of MIS and change management, we can conclude that MIS and change management plays a significant role in the success of PMS as demonstrated in Figs. 4 and 5. The researchers studied and described issues faced in practice when implementing PMS in organisations throughout its lifecycle, which led to better understanding and explanation of the challenges.

In conducting this review, we have also identified some newly but rapidly emerging trends that are likely to present practical and theoretical challenges for performance measurement. Through this paper we have predicted and identified performance measurement challenges of the future, thus presenting the community with an opportunity to proactively develop research programmes in anticipation of these challenges. The principle limitation of the paper is that it covers a broad base reviewing and discussing literature from different aspects of performance measurement including MIS and change management. However, we believe that this weakness is also the strength of the paper as it provided us an opportunity to identify a number of diversified key research challenges:

- To find a standard approach in justifying the efforts invested throughout the lifecycle of PMS.
- To demonstrate the usefulness of PMS by building and launching a trial version that includes some of the performance measures developed at the design stage.
- To build a framework for using different leadership styles to manage change throughout the lifecycle of MIS supported PMS under various cultural backgrounds.
- To explore and explain how PMS within an organisation evolves in response to changes in the organisations inner and outer operating environment.
- To investigate whether PMS, MIS and change management practices need to change to be effective in multi-cultural collaborations and networks.
- To identify PMS that is required for measuring and managing organisations in delivering value-in-use to its customers.

In order to address the above challenges there is a need for multidisciplinary research that brings together performance measurement, change management and MIS specialists in the context of emerging business environment such as globalization, servitization, and networking in the context of multi-cultural environment.

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