



## Linkages between manufacturing strategy, benchmarking, performance measurement and business process reengineering

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### ABSTRACT

An empirical analysis is presented for researching linkages between manufacturing strategy, benchmarking, performance measurement (PM) and business process reengineering (BPR). Although the importance of these linkages has been described in conceptual literature, it has not been widely demonstrated empirically. The survey research was carried out in 73 medium and large-sized Slovenian manufacturing companies within the mechanical, electro-mechanical and electronic industries. The resulting data were subjected to reliability and validity analyses. Canonical correlation analysis was used to test six hypotheses.

The results confirmed the need for a strategically-driven BPR approach and the positive impact of performance measurement on BPR performance.

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### 1. Introduction

Business process reengineering (BPR) remains a controversial approach. The current state of BPR could be best paraphrased by using the statement written by MacIntosh (2003, p. 329) that, “as the body of academic research on BPR has grown, a number of contentious issues have emerged”. The most critical articles on BPR were probably published in the organisational studies literature (e.g. Case, 1999; Grint & Case, 1998) but there are also a lot of articles which favour BPR as a management intervention tool, appearing as an answer to continuous changes, customers’ demands and competition (Davenport & Short, 1990; Goel & Chen, 2008a; Goel & Chen, 2008b; Grover & Malhotra, 1997; Gunasekaran & Kobu, 2002; Hammer, 1990; Hammer, 2004; Hammer & Champy, 1993; Han & Kang, 2007; Loewenthal, 1994; Motwani, Kumar, Jiang, & Youssef, 1998; O’Neil and Sohal, 1999; Short & Venkatraman, 1992). According to McCabe and Knights (2000) BPR has been continually adopted by the practitioner community.

A number of studies exist concerning what exactly constitutes BPR, such as through examination of BPR definitions, discussions about BPR tools and techniques, the importance of information technology, BPR and total quality management co-existence, understanding reengineering challenges and organisational processes, exploring critical success factors and many other issues on BPR. In addition, previous research has discussed the importance of linkages

between manufacturing strategy and BPR (Edwards & Peppard, 1994; Edwards & Peppard, 1998; O’Neil and Sohal, 1998; Sarkis, Presley, & Liles, 1997; Tinnilä, 1995; Zairi & Sinclair, 1995), benchmarking and BPR (Earl & Khan, 1994; Richman & Koontz, 1993) and performance measurement that was already determined as a part of BPR or, at least, closely correlated to BPR, by their initiators: Hammer (1990) and Davenport and Short (1990). However, no previous study attempts to empirically demonstrate the relationship between BPR, performance measurement, manufacturing strategy and benchmarking (Carr & Pearson, 1999) appear to be available.

As a consequence of the great success of the first survey research on BPR dimensions performed in Slovenian Companies, we decided to deepen our research and explore also the connections or linkages between the researched areas: BPR, manufacturing strategy, benchmarking and performance measurement.

We realize the word “linkages” in the presented BPR context sounds very narrow, since we know how many critical areas, success factors or dimensions should be considered to achieve effective process reengineering.

But performed survey research provided us with reliable and valid BPR, manufacturing strategy, benchmarking and performance measurement constructs, indicating the basic characteristics (with statistically based confirmation) of the particular areas, even if restricted to specific sectors and countries. The part of the above-mentioned survey, related to the development and validation of BPR variables, has already been published by International Journal of Production Research (Herzog, Polajnar, & Pizmoht, 2006; Herzog, Polajnar, & Tonchia, 2007).

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The deficiency of empirical research about BPR was also ascertained by the literature reviews for the period from 1999 to 2005, thus confirming the suitability and adequacy of the presented research.

This article has been developed over the following sections. Section 2 presents a developed research framework and the main issues of BPR, based on literature review. Hypotheses have been generated in advance of the study, to be tested against the data collected. Section 3 describes the methodology, including variable measurement and the sampling and data collection procedures. Section 4 presents variable construction using PCA for validity, and Cronbach's alpha for reliability. Newly developed variables are shown to be reliable and valid and, thus, adequate for canonical correlation analysis performance. Section 5 presents and discusses the results of descriptive statistics canonical correlation analysis. Finally, Section 6 the conclusions of this study are presented, along with suggestions for future research (Section 7).

## 2. Theoretical background and research framework

Several critical areas (also called success factors, predictors or dimensions) that must be practised to achieve effective process reengineering in a business unit were identified, based on a synthesis of existent literature and previously performed surveys (Guimaraes & Bond, 1996; Guimaraes, Yoon, & Clevenson, 1997; Maull, Tranfield, & Maull, 2003; Maull, Weaver, Childe, Smart, & Bennett, 1995; Terziovski, Fitzpatrick, & O'Neil, 2003). The following areas were considered, for the purposes of the presented research:

- manufacturing strategy: the questionnaire for the research was mainly formed following the work written by Skinner (1974), Schonberger (1986), Garvin (1993), Hudson, Smart, and Bourne (2001), Slack and Lewis (2002) and Pandza, Polajnar, and Buchmeister (2005),
- benchmarking: we mainly based on work written by Camp (1989), Richman and Koontz (1993), Earl and Khan (1994), Zairi and Leonard (1994),
- performance measurement: when selecting corresponding performance measures, we mainly consulted the work written by Buchmeister (2008), Garengo & Bititci (2007), Neely (1998, 1999), Neely and Al Najjar (2006), Neely, Bourne, and Kennerley (2000), Neely, Gregory, and Platts (1995), Neely, Richards, Mills, Platts, and Bourne (1997), Kuwaiti and Kay (2000), De Toni and Tonchia (2001) and Hudson et al. (2001), Slack (2002) and Franco-Santos et al. (2007),
- BPR: we based on work written by Carr and Johansson (1995), Davenport and Short (1990), Hammer and Champy (1993), MacIntosh (2003), Paper and Chang (2005), Reijers and Mansar (2005), Sarker and Lee (2006).

Although it is certainly true that performance measurement could or should be presented as part of BPR or manufacturing strategy, in this research we treated performance measurement as an independent area, because the focus regarding measurements has greatly changed over the last 10 years ([www.performanceportal.org](http://www.performanceportal.org)).

### 2.1. Research framework

The research framework (Fig. 1) presents the most important relationships between different points of BPR in regard to the literature review. As ascertained previously, the concept of BPR should be studied in connection with the logical supplementary areas: manufacturing strategy and, on the other hand, performance indicators, meant for selected manufacturing strategy and BPR performance verification. The linkage between BPR and performance measurement is well understood, and the connection between

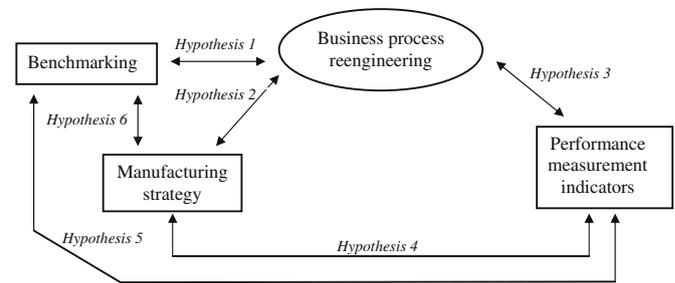


Fig. 1. Conceptual research framework.

manufacturing strategy and BPR is also frequently discussed in the literature. Benchmarking is also added to the framework as a powerful tool for BPR and, above all, as a trigger for many BPR projects. According to Richman and Koontz (1993) and Earl and Khan (1994), the value of benchmarking does not lie in what can be copied, but in its ability to identify goals.

For an effective survey research the first, and very important step, is a detailed literature review. Since the available literature on manufacturing strategy, BPR, performance measurement and benchmarking is numerous, we consulted mostly the available completed literature reviews on BPR (Kallio, Saarinen, Tinnilä, & Vepsäläinen, 1999; Motwani et al., 1998; O'Neil and Sohal, 1999) in order to design a reliable questionnaire, based on valid constructs. For manufacturing strategy we adopted the most diffused manufacturing strategy classification mode of competitive criteria.

Only the most important and representative topics from the four identified areas are presented below, due to space limitations.

### 2.2. Manufacturing strategy

The need for a strategically-driven BPR approach has been advocated by numerous authors (O'Neil and Sohal, 1998; Sarkis et al., 1997; Terziovski, Fitzpatrick, & O'Neil, 2003; Zairi & Sinclair, 1995). Tinnilä (1995) ascertained that BPR should start with strategies. The desired strategic position should be the starting point for redesign, rather than an improvement of existing operations. Edwards and Peppard (1994, 1998) proposed business reengineering as a natural connection with manufacturing strategy. They suggested that business reengineering can help bridge the gap between manufacturing strategy formulation and implementation. In this context, BPR is seen as an approach, which defines the business architecture, thus enabling the organization to focus more clearly on customers' requirements.

The first part of the questionnaire, concerning manufacturing strategy, resulted from the generally accepted competitive criteria. As shown on Fig. 1 we took into consideration four of the most important competitive criteria, already quoted by Skinner (1974) and Schonberger (1986): costs, quality, flexibility and dependability. Garvin (1993) also added delivery, which could be separated into speed and delivery reliability. We considered delivery separated into the dimensions of time (or speed) and dependability (as suggested by Slack, 2002). Customer satisfaction and employee satisfaction were also added to the five stated competitive criteria, as critical dimensions of performance (Hudson et al., 2001).

### 2.3. Benchmarking

One of the earliest books about benchmarking (Camp, 1989) states that, it is a continuous search for and application of significantly better practices that lead to superior competitive performance. Several authors have examined the link between benchmarking and business process changes, and the significance of benchmarking at a strategic level. If used well, benchmarking

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