



The role of performance measurement in business process re-engineering

The role of
performance
measurement

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Keywords BPR, Performance measurement, Empowerment, Integration, Strategy

Abstract *This paper argues that a performance measurement system (PMS) is a prerequisite to the introduction of business process re-engineering (BPR) based on the role it plays in the phases of introducing change. This hypothesis was tested by examining the relationship between the congruence of PMS and the concepts of empowerment, integration and strategic alignment. Data were collected from 301 respondents in 19 manufacturing and 30 financial companies in Bahrain. Analysis indicated that PMS and strategic alignment are strongly related, empowerment is moderately related and integration showed a weak relationship.*

Introduction: concepts and objectives

Since the 1980s two factors have dominated organizational thinking and how people thought and felt about management. The first is the phenomenal success of Japanese manufacturing and the second was the information technology (IT) revolution. A number of studies were initiated to understand the effect of these two factors on western organizations. Of particular relevance is the study sponsored by MIT School of Management in 1984. The study concluded that organizations need to change from hierarchical to a more flexible process-based structure using IT as the main enabler (Morton, 1991).

Another study conducted by Thomas Davenport of Ernst and Young, and James Short of MIT sought to understand the great opportunity afforded by IT to the redesign of business processes. They studied some pioneering firms who are experimenting and applying process innovation using IT to improve efficiency and effectiveness in the face of intense competition and a demanding customer. The research reached a similar conclusion, namely, that organizations need to be more flexible through the adoption of process innovation and redesign (Davenport and Short, 1990).

The study that brought the concept to the forefront of the management press is the one conducted by Michael Hammer and James Champy which culminated in the publication of the article by Hammer in the *Harvard Business Review* "Re-engineering work: don't automate, obliterate" (Hammer, 1990). The object of this study was to understand the commonalities between companies that have chosen radical change to improve performance and those companies that succeeded in achieving dramatic results. The conclusion of the study again pointed to the need for organizations to rethink the way work is being done,

and to redesign the processes, which deliver value to the customer and use IT as the main enabler to achieve order of magnitude improvement in a number of measures (Hammer and Champy, 1993). The publication of this work made the business world aware of the potential of re-engineering in planning and designing process and organizations based on the principles of business process re-engineering (BPR).

This paper will discuss some of the main concepts in BPR with the aim of investigating their association with performance measurement systems (PMS). The research objectives are stated followed by the research methodology and hypothesis, the results and finally a summary and conclusions are given.

BPR

During the development of BPR, a number of definitions have appeared in the literature to mark the stages of the development. Michael Hammer, the creator of the term, has defined it as the “fundamental rethinking and radical redesign of business processes to achieve dramatic improvement in critical contemporary measures of performance, such as cost, quality, service, and speed,” (Hammer, 1990, p. 32). The emphasis is on the total redesign of multi-functional processes that deliver goods or services to the customer and the system of measurement used to evaluate the performance.

There are many other definitions, which are variations of the above, emphasizing different aspects of BPR depending on the application and need. (e.g. Pearson and Skinner, 1993; Watkins *et al.*, 1993, p. 43).

Consistent with the holistic, socio-technical approach and the human factors approach to re-engineering upon which the concept of empowerment is based, the following definition will be adopted (Peppard, 1995):

The conscious reshaping of an organization behind new corporate vision and strategy based on the environmental and competitive conditions using a holistic fresh start approach which can result in fundamental re-thinking and re-design of business and management processes and systems in such a way that yields sustainable improvement in strategic contemporary measures of performance that considers the interest of all the stakeholders.

All of these definitions clearly recognize that the measurement of performance plays a prominent role in the design and implementation of BPR.

PMS

Performance measurement until recently, particularly in the manufacturing sector, has been dominated by outdated costing systems and financial reporting that is required by the legislature and the shareholders (Maskell, 1991; Kaplan and Norton, 1996a; 1996b). These measures do not reflect the need for customer satisfaction (Cooper and Kaplan, 1988). To mesh the two concepts together (BPR and PMS) and for PMS to play its role in the change process, a different approach to measurement is needed. Measures are needed that are able to motivate the individual who is suddenly required to be more involved, to have more skills and to participate in the achievement of customer-focused, result-oriented operations (Morris and Brandon, 1993; The Economist

Intelligence Unit, 1994; Wholey and Hatry, 1992). A relevant PMS in the BPR context is one that takes into account the fact that people work in teams, and actually produce final output, for a customer. This means that the PMS has to balance a number of dimensions and to play a number of roles to enable BPR to succeed (Stonich, 1984; Vitale *et al.*, 1994; Williamson, 1994; Bavon, 1995).

Process orientation

Re-engineering is not totally new (Galliers and Baker, 1995). However, its main contribution is the consolidation of many management concepts that have been used by previous disciplines (Harrington, 1991). One of the main concepts is process orientation. Organizing around the process does not mean that function will not have a role to play. The new role of these functions is to provide advice and training for the professionals manning these processes (Womack, 1994). In other words they will be responsible for skill development and advancement in the organisation.

This process orientation presents a number of issues. This research is concerned with the issue of integrating the self-managed processes that are run by empowered owners and the new functions into a coherent organisation capable of translating strategy into action and aligning these processes and functions to support strategy. It is, therefore, proposed that there is a direct relationship between a congruent and a well-designed PMS and the concepts of empowerment, integration and strategic alignment. Thus PMS play a major role in the design and implementation of re-engineering.

Empowerment

The central concept of re-engineering is that the process is run by a self-managed team and led by a process owner. Based on this principle, a process owner should enjoy a greater degree of control over the whole process and most of the resources needed. The process owner and the team should also be in a position to make decisions that will improve their effectiveness and allow them to deliver on the agreed targets. Therefore, for the team to be effective, it needs to be empowered.

Empowerment is defined as the extent to which managers perceive themselves as having the authority to make decisions to improve quality and customer satisfaction (Hayes, 1994). This definition is consistent with the total quality management (TQM) concept of quality with which many managers are familiar. It is also consistent with the BPR definition of customer-centred empowerment.

The definition of empowerment implies the use of techniques to provide efficacy information to the subordinate of his or her self worth (Conger and Kanungo, 1988). It also implies that performance feedback is one of the main factors influencing empowerment, thus enhancing the sense of achievement by clearly defining what is to be accomplished and to what performance standard. It also provides information on the initial success or failure.

From the above it is clear that a PMS and the information it provides on performance is essential for empowered self-managed teams to operate.

However, there is no empirical evidence to support the existence of this relationship. One of the objectives of this research is to test the relationship between empowerment and PMSs.

Integration

Integration is defined as the degree to which an individual manager's action is harmonious and consistent with the other departments, so that the combined action is contributing to the added value to the customer and enhancing the overall performance. This definition is based on the work of Roger Plant, *Managing Change and Making it Stick* (Plant, 1987).

A re-engineered organisation consists of processes producing values to the customer and operated by self-managed teams and functions supporting the processes and developing the skill required to operating these processes. For the organisation to operate as a coherent system, all of its components (processes and functions) need to be integrated. Many factors can influence the extent of this integration. The literature identified many such mechanisms. Among the most important are shared vision, culture, goal setting and strategy formulation.

For the vision to be realized it needs to be converted into a process involving the planning and evaluation of performance. Both of these management systems rely on performance information (Sink and Tuttle, 1989; Kaplan and Norton, 1996a; 1996b).

Culture has been identified as another integrating mechanism that needs to be modified and adapted to reflect organizational context (Kotter and Heskett, 1992). The adaptation process relies on data to show early results to encourage people to embrace new behavior. If data is not available, a new measurement system is created to provide it (Hammer and Champy, 1993).

The goal setting process is another important integrating mechanism (Simon, 1995) in which the PMS plays three important roles:

- (1) it determines the performance criteria on which goals are set;
- (2) it provides the monitoring of the progress towards the achievement of the goals; and
- (3) it provides the feedback on the results.

PMSs contribute to the interactive process of formulating strategy by collecting and generating information that relates to the effects of strategic uncertainties on the strategy of the business. It also contributes to the implementation of strategy by translating it into a measurement system. According to Kaplan and Norton, (1996a; 1996b), there are three ways in which a PMS translates strategy:

- (1) by describing the organization's vision of the future to the entire organisation, thus creating a shared understanding;
- (2) by creating a holistic model of strategy; and
- (3) by focusing on change efforts.

From the above it can be seen that PMS plays a major role in the concept of integration. Thus the second objective of this study is to investigate the nature of this relationship.

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Strategic alignment

Strategy in its wider context is a mixture of knowledge and assumptions about the organisation, its goals, objectives, action, milestones, budgets and plans that are based on the knowledge of customer, suppliers, the general environment, actions of the competitors and a number of other organisational factors.

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Strategic alignment is based on two fundamental assumptions:

- (1) economic performance is directly related to the ability of management to create a strategic fit between the position of an organisation in the competitive product-market, and the design of an appropriate structure and systems to support it; and
- (2) that this strategic fit is inherently dynamic.

In this research, strategic alignment is defined as the extent to which the PMS is supporting or hindering aspects that are of great importance to the health of the organisation. The implication is that strategic alignment often demands a more responsive organisational structure, i.e. one that permits people close to the product and services to make decisions that keep the customer happy and that the action of one team is not in conflict with the objectives of another team.

Re-engineered organisations attempt to achieve this responsiveness through self-managed teams conducting the actual work that delivers value to the customer. The effectiveness of these teams is a function of the decisions and the extent of power to act. The quality of these decisions is a function of the knowledge and the information available to the teams. For teams to be effective they need to be indirectly managed by training and education, by setting goals and boundaries, by measuring performance and managing the interface between the teams.

Strategic alignment is, therefore, dependent on the strategic fit between the various elements of the organisation (Miles *et al*, 1995; Kotter, 1978). This research measures the fit between:

- (1) the areas of improvement that are important to the long-term health of the organisation and the competitive conditions; and
- (2) the extent of agreement between the individual manager's perception and the general perception in the organisation (as reported by the managers) on the importance of these improvement areas.

The two concepts of empowerment and integration are both central elements of the re-engineering philosophy. Empowerment is by definition a differentiating mechanism. It relies on a number of people (process owners and departmental heads) making decisions in terms of goal setting, decision making and problem solving. Integration is another important element in the philosophy. It seeks to

weld the organisation into a coherent and harmonious entity. These two conflicting concepts call for an instrument to reconcile them. This research argues that PMS can play this role and hence the hypothesis:

H1: That a relevant and congruent performance measurement system is a prerequisite for the successful design and implementation of BPR.

Methodology

The data used to test the hypothesis are from the two major sectors of the Bahrain economy, namely the manufacturing and financial sectors. Because of the need to approach a representative sample and because of the limitation on time, a questionnaire method was adopted. All companies within these two sectors were included. A total of 301 valid individual responses from 19 manufacturing and 30 financial companies were returned. The companies vary in terms of age, number of people employed, revenue and range of products or services. The individual respondents are from a range of managerial positions, experience, age and length of service in the organization. The markets in which these organizations operate also vary in terms of stability, level of competition and strategic focus.

The questionnaire was designed so that a reasonably sizable number of managers from the same organization would respond to it. Companies with less than three responses were excluded. This improved the reliability of the responses. The questionnaire included five instruments to measure the five variables. Respondents were required to respond to each of the five groups of questions.

The first of these variables is the congruence of the PMS. The instrument used is a modified version of the one developed by Dixon *et al.* (1990). On the left-hand side of Table I, respondents were asked to rate their assessment of the degree of importance of the selected performance factors. On the right-hand side respondents indicate the extent of emphasis the organisation places on these factors. The scale used is from 1 to 5, where 1 indicates low importance or emphasis and 5 denotes high emphasis.

The index is calculated by subtracting the right-hand score from the left-hand score. The maximum absolute difference that can be scored is $(23 \times 4) 92$ (poor congruence), and the minimum (perfect congruence) is zero (no difference between the left-hand score and the right-hand score).

An instrument designed by Hayes (1994), was used to measure the construct of empowerment. The instrument consists of 14 statements as shown in Table II. Respondents were asked to rate the extent to which they agree with each of the statements on a scale from 1 (disagree) to 5 (agree). High level of empowerment is generally indicated by a high value; for items 5, 7, 13 and 14 it was indicated by a low value and therefore their recording was reversed before the analysis.

Integration, the third variable, is a construct that is represented by 20 statements (Table III), which were developed and refined by the authors during piloting of the instrument. Respondents were asked to rate their agreement or disagreement with each statement on a scale from 1 (disagree) to 5 (agree). Adding the score of each of the statements creates an individual index. A lack

How important is this performance factor to the company?					Performance factors	How much emphasis is currently placed on this measure?					The role of performance measurement
None	-----			Great		None	-----			Major	
1	2	3	4	5	Quality yield (output with no defect)	1	2	3	4	5	1417
1	2	3	4	5	Plant efficiency or Resource efficiency	1	2	3	4	5	
1	2	3	4	5	New product development time	1	2	3	4	5	
1	2	3	4	5	Number of new products developed	1	2	3	4	5	
1	2	3	4	5	Lead time or service time	1	2	3	4	5	
1	2	3	4	5	Direct cost	1	2	3	4	5	
1	2	3	4	5	Overhead cost	1	2	3	4	5	
1	2	3	4	5	Labour utilization or Resource utilization	1	2	3	4	5	
1	2	3	4	5	Customer complaints	1	2	3	4	5	
1	2	3	4	5	Customer retention	1	2	3	4	5	
1	2	3	4	5	Employee absenteeism	1	2	3	4	5	
1	2	3	4	5	Responsiveness to customer demand	1	2	3	4	5	
1	2	3	4	5	Number of skills per employee	1	2	3	4	5	
1	2	3	4	5	Delivery time	1	2	3	4	5	
1	2	3	4	5	Labour competency (skills)	1	2	3	4	5	
1	2	3	4	5	Cost of scrap and rework	1	2	3	4	5	
1	2	3	4	5	Productivity of direct labour or front office staff	1	2	3	4	5	
1	2	3	4	5	Productivity of indirect labour or back office staff	1	2	3	4	5	
1	2	3	4	5	Dependability of service staff	1	2	3	4	5	Table I. Instrument for measuring the congruence of PMS
1	2	3	4	5	Return on investment	1	2	3	4	5	
1	2	3	4	5	Profit margins	1	2	3	4	5	
1	2	3	4	5	Market share	1	2	3	4	5	
1	2	3	4	5	Education and training: budget versus actual	1	2	3	4	5	

of integration is generally indicated by a high value but for item 1, a lack of integration is indicated by a low value. Therefore, its recording was reversed before the analysis (for example, if the response for item 1 was 5 it was recorded as 1).

The fourth variable is strategic alignment. Again, the instrument designed by Dixon *et al.* (1990) was modified to measure the extent of alignment between the PMS and the strategy. The instrument consists of 11 areas of improvements and two scales (Table IV). The left-hand side represents the respondent's view of how important an area of improvement is to the long-term health of the organisation. The response is ranked on a scale of 1 to 5, where 1 denotes not important and 5 very important. The right-hand scale represents the extent to which the PMS supports or inhibits the area of improvement. A score of 1 indicates that the PMS inhibits the area of improvement and 5 is highly supportive.

An index was created by subtracting the right-hand score from the left-hand side. The absolute difference between the sides reflects the extent of agreement or disagreement on the importance of the respective area of improvement. A high score indicates a wide gap between the importance of the area and the support it receives. Conversely a small gap indicates a high degree of alignment.

Table II.
Instrument for
measuring
empowerment

Statements	Disagree----- Agree				
I am allowed to do almost anything to do a high quality job	1	2	3	4	5
I have a lot of responsibility in my job	1	2	3	4	5
I have the authority to correct problems when they occur	1	2	3	4	5
I am allowed to be creative when I deal with problem at work	1	2	3	4	5
I wish management would give me more authority	1	2	3	4	5
I do not have to go through a lot of red tape to change things	1	2	3	4	5
I have to go through a lot of red tape to get things done around here	1	2	3	4	5
I have a lot of control over how I do my job	1	2	3	4	5
I do not need management approval before I handle problems	1	2	3	4	5
I am encouraged to handle job-related problems by myself	1	2	3	4	5
I can take charge of problems that require immediate attention	1	2	3	4	5
I can make changes on my job whenever I want	1	2	3	4	5
I would like a job that would allow me more authority	1	2	3	4	5
I have to follow procedures closely in my job	1	2	3	4	5

Perceived success is the fourth variable and it is assessed using 13 measures covering financial, internal processes, customer satisfaction, and learning and growth measures. Respondents were asked to rank the perceived success of the organisation on a scale from 1 to 7, where 1 is negative success (deterioration) and 7 is over 50 percent improvement in the respective measure (Table V).

Initial analysis

Reliability

Reliability was operationalised as the internal consistency for the constructs of empowerment and integration and was calculated using Cronbach's alpha coefficient (Cronbach and Meehl, 1955).

Empowerment. Table VI shows the values of alpha if one item is removed. It was found that removing items 2, 8, 13 and 14 increases the alpha value and thus improved the reliability. The measure of reliability was found to be 0.847 with 14 items, with a standardized item alpha of 0.856. This is considered a relatively high reliability.

Integration. Table VII indicates the effect of calculating Cronbach's alpha coefficient with one item deleted at a time. The removal of items 1, 9 and 18 increases the alpha value and thus improved the reliability of the scale. The measure of reliability was found to be 0.9493 with 20 items, and the standardized item alpha was 0.9489. This is considered a relatively high reliability estimate.

Validity

The object of the validity measure is to examine the degree to which the items are related to one another, thus satisfying the category of constructs related evidence. The two commonly used analyses are:

- (1) correlation analysis; and
- (2) factor analysis.

Statements	Disagree----- Agree					The role of performance measurement
	1	2	3	4	5	
Everyone in the organization generally knows what contribution they make to the whole	1	2	3	4	5	1419 Table III. Instrument for measuring integration
People spend a lot of time blaming others for their mistakes	1	2	3	4	5	
The only way we learn of changes is by the grapevine (rumors and informal talk)	1	2	3	4	5	
It is not uncommon here to get conflicting orders and instruction	1	2	3	4	5	
People in the organization only get together when there is a crisis	1	2	3	4	5	
There seems to be quite a lot of friction and not much cooperation between departments	1	2	3	4	5	
In my job I am rather unclear about what goes on in other functions	1	2	3	4	5	
I do not think many people below senior management really understand the organization's objectives	1	2	3	4	5	
We are unable to secure funding for some long-term requirements	1	2	3	4	5	
Managers seem more concerned about the narrow interest of their department rather than the wider company objectives	1	2	3	4	5	
Some departments seem to have goals that are contrary to company goals	1	2	3	4	5	
We do not work very closely with other functions to meet our collective objectives	1	2	3	4	5	
Sometimes my decisions adversely affect the effectiveness of other departments	1	2	3	4	5	
I receive conflicting messages that make me uncertain about our strategic direction	1	2	3	4	5	
On the whole communication in the company seems to be rare and restricted	1	2	3	4	5	
I do not have all the necessary information to effectively meet my objectives	1	2	3	4	5	
All too often no one knows what his counterpart in another part of the organization is doing about things that affect them both	1	2	3	4	5	
It's only by experience you get to know the right people to go to	1	2	3	4	5	
Bosses seem to keep changing their minds without consultation	1	2	3	4	5	
There seems to be a lack of informal and voluntary co-operation amongst people in our organization	1	2	3	4	5	

The two techniques were used to identify the items representing the constructs of empowerment and integration.

Empowerment. The correlation analysis results show that the correlation between all pairs of items is significant at 0.01 level (two tails). However, items 2, 8, 13 and 14 have a low correlation coefficient, with item 14 showing the least.

Factor loading (Table VIII) indicates that items 2, 5, 7, 11, 13, and 14 have a low loading on factor 1, and a high loading on the second factor. Based on these results, items 2, 5, 7, 11, 13, 14 were removed from the set of items representing the construct in Table V.

Integration. It has been found that the correlation between all pairs of items is significant at the 0.01 level (two tails). However, items 1, 2, 9 and 18 have a low coefficient, with item 18 showing the least.

Table IV.Instrument measuring
the strategic alignment

Long term importance					Improvement area	Effect of current PMS				
None ----- Great						Inhibit ----- Support				
1	2	3	4	5	Quality	1	2	3	4	5
1	2	3	4	5	Productivity	1	2	3	4	5
1	2	3	4	5	New product or service development	1	2	3	4	5
1	2	3	4	5	Flexibility in meeting customer demand	1	2	3	4	5
1	2	3	4	5	Cost reduction	1	2	3	4	5
1	2	3	4	5	Utilization of resources	1	2	3	4	5
1	2	3	4	5	Performance measurement	1	2	3	4	5
1	2	3	4	5	Customer satisfaction	1	2	3	4	5
1	2	3	4	5	Financial performance	1	2	3	4	5
1	2	3	4	5	Education and training	1	2	3	4	5
1	2	3	4	5	Employee satisfaction	1	2	3	4	5

Table V.Performance measures
of perceived success

Performance measures					Degree of change				
Market share	1	2	3	4	5	6	7	NA	
Customer satisfaction rating from survey	1	2	3	4	5	6	7	NA	
Operational cost	1	2	3	4	5	6	7	NA	
Return On Investment	1	2	3	4	5	6	7	NA	
Profit margin	1	2	3	4	5	6	7	NA	
Productivity	1	2	3	4	5	6	7	NA	
Quality yield	1	2	3	4	5	6	7	NA	
Utilization of resources	1	2	3	4	5	6	7	NA	
Reliability of delivery of product or service	1	2	3	4	5	6	7	NA	
Lead time or service completion time	1	2	3	4	5	6	7	NA	
Responsiveness to customer demand	1	2	3	4	5	6	7	NA	
Employee satisfaction	1	2	3	4	5	6	7	NA	
Product development time	1	2	3	4	5	6	7	NA	

Factor loading (Table IX) indicates that items 1, 2, 6, 7, 8, 13, and 18 have a low loading on factor 1, and a high loading on the second factor. These items are eliminated from the set of items representing the construct in Table III.

The analysis

It can be seen from Table X that for the congruence of the PMS (CPMS), the score ranges from a minimum of 1 (highly congruent) to 61 (poor congruence). The best possible being zero and worst possible is $(23 \times 4) 92$ (no congruence). The mean is 18.05 with a standard deviation of 10.87. For the perceived success the score ranges from a minimum of 26 (less successful) to 91 (more successful). The mean is 59.9 with a standard deviation of 14.7. For empowerment the result ranges from a maximum of 40 (highly empowered) to a minimum of 10 (least empowered). The mean is 29.8 with a standard deviation of 5.75, and the maximum possible score is $(14 \times 5) 70$. The integration result ranges from a

						The role of performance measurement
Statement number	Scale mean if item deleted	Scale variance if item deleted	Corrected item total correlation	Squared multiple correlation	Alpha if item deleted	
1	44.9333	71.0765	0.5472	0.3932	0.8408	1421
2	44.3789	77.0742	0.3511	0.2693	0.8510	
3	44.7754	71.4705	0.6086	0.4851	0.8383	
4	44.6386	72.7175	0.5778	0.4847	0.8406	
5	46.4035	67.8965	0.5272	0.5654	0.8428	
6	45.3965	67.6908	0.6365	0.5404	0.8346	
7	45.4281	67.6330	0.5785	0.4777	0.8386	
8	44.9719	73.7739	0.4154	0.2491	0.8481	
9	45.5614	70.3739	0.5292	0.3846	0.8417	
10	44.7474	71.7599	0.5937	0.5661	0.8392	
11	44.5684	73.5913	0.5454	0.5074	0.8425	
12	45.8421	70.4222	0.5237	0.3275	0.8421	
13	46.4912	70.4902	0.4190	0.5264	0.8504	
14	46.7193	76.2378	0.2444	0.1701	0.8579	
Notes: Alpha = 0.8532 Standardised item alpha = 0.8596						Table VI. Cronbach's alpha estimate for empowerment

Statement number	Scale mean if item deleted	Scale variance if item deleted	Corrected item total correlation	Squared multiple correlation	Alpha if item deleted	
1	68.0256	317.7824	0.4798	0.3976	0.9494	
2	68.0330	311.1496	0.5520	0.5055	0.9486	
3	67.7070	304.2153	0.7076	0.5488	0.9463	
4	67.9670	308.0246	0.6220	0.4423	0.9476	
5	67.7033	299.3418	0.7602	0.6362	0.9454	
6	67.7949	303.8622	0.7126	0.6052	0.9462	
7	67.5238	304.0812	0.6648	0.5694	0.9470	
8	67.9121	308.3967	0.6202	0.4623	0.9476	
9	67.3773	311.2211	0.5328	0.4066	0.9489	
10	67.9927	305.1985	0.6719	0.5166	0.9468	
11	67.5861	299.7214	0.7282	0.5791	0.9459	
12	67.6117	298.8928	0.8175	0.7101	0.9446	
13	67.5568	305.7550	0.6413	0.5761	0.9473	
14	67.5568	303.2624	0.7472	0.6385	0.9457	
15	67.5788	298.9065	0.8040	0.6867	0.9447	
16	67.5897	299.8972	0.7851	0.6551	0.9450	
17	67.7839	304.2950	0.7606	0.6321	0.9456	
18	68.2015	315.7350	0.4436	0.3342	0.9502	
19	67.8828	301.8539	0.7354	0.6018	0.9458	
20	67.8791	303.1067	0.7362	0.5990	0.9458	
Notes: Alpha = 0.9493 Standardised item alpha = 0.9489						Table VII. Cronbach's alpha estimate for integration

Table VIII.
Factor loading for
empowerment

Statement number	Cases	Factor 1	Factor 2	Mean	Std dev.
1	285.0	0.65	-0.10	3.9018	1.0702
2	285.0	0.43	-0.31	4.4561	0.7285
3	285.0	0.74	-0.16	4.0596	0.9457
4	285.0	0.72	-0.29	4.1965	0.8741
5	285.0	0.51	0.66	2.4316	1.4066
6	285.0	0.65	0.16	3.4386	1.2307
7	285.0	0.55	0.40	3.4070	1.3332
8	285.0	0.48	-0.10	3.8632	1.0203
9	285.0	0.63	-0.14	3.2737	1.1668
10	285.0	0.74	-0.31	4.0877	0.9397
11	285.0	0.71	-0.33	4.2667	0.8344
12	285.0	0.64	0.04	2.9930	1.1718
13	285.0	0.42	0.72	2.3439	1.3793
14	285.0	0.25	0.54	2.1158	1.0928

Table IX.
Factor loading for
integration

Statements	Cases	Mean	Factor 1	Factor 2	Std dev.
1	273.0	3.3040	0.491	0.515	1.0740
2	273.0	3.2967	0.601	0.534	1.2617
3	273.0	3.6227	0.669	0.101	1.2750
4	273.0	3.3626	0.654	-0.065	1.2677
5	273.0	3.6264	0.764	-0.029	1.3718
6	273.0	3.5348	0.739	0.263	1.2804
7	273.0	3.8059	0.702	-0.289	1.3541
8	273.0	3.4176	0.655	0.266	1.2550
9	273.0	3.9524	0.562	-0.270	1.2982
10	273.0	3.3370	0.690	0.241	1.2962
11	273.0	3.7436	0.745	-0.101	1.4117
12	273.0	3.7179	0.826	0.008	1.2994
13	273.0	3.7729	0.650	-0.381	1.3283
14	273.0	3.7729	0.765	-0.265	1.2484
15	273.0	3.7509	0.807	-0.127	1.3188
16	273.0	3.7399	0.797	-0.140	1.3125
17	273.0	3.5458	0.779	0.028	1.1908
18	273.0	3.1282	0.483	0.003	1.2668
19	273.0	3.4469	0.746	-0.210	1.3194
20	273.0	3.4505	0.764	0.144	1.2713

Table X.
Data summary of
variables' statistics

Variables	Frequency	Mean	Range	Min.	Max.	Std dev.
Congruence of PMS	295	18.05	60	1	61	10.87
Perceived success	301	59.9	65	26	91	14.7
Empowerment	301	29.8	30	10	40	5.75
Integration	301	46.4	52	13	65	12.94
Strategic alignment	289	12.1	42	1	43	6.78

maximum of 65 to a minimum of 13 with a mean of 46.4 and a standard deviation of 12.94, and a maximum score of (20×5) 100. Finally, strategic alignment ranges from a maximum of 43 to a minimum of 1. The best possible being zero and worst possible is (11×4) 44 (no alignment), with a mean of 12.1 and standard deviation of 6.78.

The hypothesis (a relevant and congruent performance measurement system is a prerequisite for the design and implementation of BPR), was tested by assessing the association between the congruence of PMS (dependent variable) and the four independent variables. Regression models were developed representing this relationship. The four independent variables are:

- (1) perceived success;
- (2) level of empowerment;
- (3) level of integration; and
- (4) strategic alignment of PMS.

The correlation analysis result (see Table XI) shows that the Pearson coefficient is highest for strategic alignment at 0.83 and lowest for level of integration at 0.33.

From Table XII it can be seen that the R^2 values are ranging from 0.69 for strategic alignment to 0.11 for integration. The multiple regression model for congruence of PMS with all the independent variables is shown below.

Variables	PS	LI	SA	LE	CPMS
Perceived success (PS)	1	0.01	-0.51**	0.3*	-0.51**
Level of integration (LI)	0.01	1	-0.33*	0.23	-0.33*
Strategic alignment (SA)	-0.60**	-0.33*	1	-0.39**	0.83**
Level of empowerment (LE)	0.30*	0.23	-0.39**	1	-0.54**
Congruence of PMS (CPMS)	-0.51**	-0.33*	0.83**	-0.54**	1

Note: * $p < 0.05$; ** $p < 0.01$ (two-tailed)

Table XI.
Pearson correlation
coefficients

	R	R^2	Adjusted R^2	Std error of the estimate	Change statistics R^2 change	F change	df1	df2	Sig. F change
Perceived success	0.51	0.26	0.24	7.14	0.26	16.11	1.00	47.0	0.00
Level of integration	0.33	0.11	0.09	7.82	0.11	5.62	1.00	47.0	0.02
Strategic alignment	0.83	0.69	0.69	4.58	0.69	106.14	1.00	47.0	0.00
Level of empowerment	0.54	0.29	0.28	6.95	0.29	19.60	1.00	47.0	0.00

Table XII.
Summary of bi-variate
regression of
congruence of PMS
against each variable

By controlling for other variables, the regression model (Table XIII) indicates that 25 percent of the variations in congruence of PMS is explained by the level of empowerment and 57 percent is explained by the strategic alignment. The effect of the level of integration and perceived Ssuccess is very weak.

There are four outcomes that will lead to the acceptance of the hypothesis:

- (1) the association with strategic alignment;
- (2) the association with integration;
- (3) the association with empowerment; and
- (4) the association with perceived success.

Without speculation on the causality, the data clearly support the association with strategic alignment and hence we can conclude that the hypothesis is accepted. The data also indicates that there is moderate support for the association between PMS and empowerment. The support for the association with integration and perceived success is much weaker, which indicates that PMS plays a less prominent role in the perceived success and integration of the organisation.

Summary and conclusion

The focus of the research is to explore the role of PMS. The research question is whether this role is a prerequisite to introducing change. The proposition is that to introduce a major change, organizations are advised to start by designing a PMS that supports the mission, strategy and plan of action.

The data collected did find a strong association between the congruence of a PMS and the independent variables. Table XII shows that the explained variation (R^2) ranges from 69 percent for strategic alignment to 11 percent for level of integration, with perceived success and level of empowerment

CPMS	=	23.80	-	0.00PS	-	0.01LI	-	0.25LE	+	0.57SA
CPMS	=	24.15	-	0.01LI	-	0.25LE	+	0.57SA		
CPMS	=	22.43	-	0.01PS	-	0.25LE	+	0.58SA		
CPMS	=	23.23	+	0.57SA	-	0.25LE				
CPMS	=	7.5	-	0.026PS	-	0.033LI	+	0.62SA		
CPMS	=	4.95	-	0.029LI	+	0.64SA				
CPMS	=	3.32	-	0.01PS	+	0.65SA				
CPMS	=	73.74	-	0.29PS	-	0.12LI	-	0.35LE		
CPMS	=	68.59	-	0.27PS	-	0.41LE				
CPMS	=	55.89	-	0.37PS	-	0.16LI				
CPMS	=	62.4	-	0.1LI	-	0.48LE				

Table XIII.
Regression models of
CPMS and the
independent variables

Notes: CPMS, congruence of PMS; PS, perceived success; LE, level of empowerment; LI, level of integration; SA, strategic alignment of PMS

explaining 26 percent and 29 percent respectively. The results also show that the multiple regression model indicate a relatively high predictive power for the strategic alignment with beta equal to 57 percent and a moderate power for the level of empowerment with beta equal to 25 percent.

This suggests that as hypothesized, the introduction of a relevant and well-designed PMS early in the change process will improve the strategic alignment and is likely contribute appreciably to the empowerment of the employees and the integration of the processes and functions of the re-engineered organisation.

The results confirm previously unsubstantiated beliefs that any organisation should seriously consider the development of a PMS that focuses on strategic aims before embarking on any re-engineering projects.

The data were collected from two sectors of a small but prosperous country. Future research should be undertaken to extend the data collection over the same and perhaps other sectors in larger economies. Especially interesting would be trans-national data collection within a large international company.

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