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A Delphi Approach to the Development of an Integrated Performance Measurement and Management Model for a Car Assembler

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Abstract. Today's dynamic competitiveness requires an organization to improve its performance measurement and management. Quality Management Systems (QMS) abound, the main ones being: ISO series, Malcolm Baldridge National Quality Award (MBNQA), European Forum for Quality Management (EFQM), Six Sigma Business Scorecard and the Balanced Scorecard. Based on the literature, the IPMMM (Integrated Performance Measurement and Management Model) identified 7 key synthesized factors: leadership, strategy management and policy, customer and market, learning and growth, partnership and resources, internal processes and business results that are employed to investigate the key performance indicators of a car assembler using the Delphi methodology. In the 2 rounds of Delphi panels consisting of 20 senior management personnel, the 1st round of 198 indicators in the IPMMM yielded 90 indicators. The 2nd round yielded 43 performance indicators with 18 rated as critical based on the % assigned in the 1st and 2nd priority rating of "very important factor" and "key performance indicator" that must be ranked high on both of the priorities. The very critical indicators appeared to be: defect percentage and first time capability (tie in 1st place) and revenue, goal setting, customer satisfaction index, on-time delivery, brand image, return on investment, Claim Occurrence Ratio, and debt being ranked from 3rd to 10.th It can be surmised that an organization can identify and develop an appropriate set of performance indicators through the Delphi methodology and implement and manage them based on the Balanced Scorecard.

Keywords: Performance Measurement, Performance Management, Key Performance Indicators and Delphi Methodology

1. INTRODUCTION

Over the past decades, a rapid increase in global competition brought about by technological changes and product variety proliferations had accentuated the role of continuous performance improvement as a strategic and competitive requirement in many organizations worldwide. Nowadays, in order to maintain and improve their competitive advantages, performance measures are widely used to evaluate, control and improve business processes that gave rise to the performance management system.

The adoption of Quality Management System (QMS) and Performance Management System (PMS) is a strategic decision by the top management of an organization. The purposes of an organization to implement QMS and PMS are to identify and meet the needs and expectations of its customers and other interested parties (people in the organization, suppliers, owners, society). The QMS and PMS are aimed at achieving a competitive advantage in an effective and efficient manner by achieving, maintaining, and improving the overall organizational performance and capabilities (Teay, 2005).

At present, many automotive companies would like to improve their products to respond to the needs of their customers and to fulfill the goals of their businesses. In this case, companies have to set up the systems in terms of both the Quality Management System (QMS) and the assessment criteria. Many quality management and performance management systems and criteria are available; including the ISO9000, the Malcolm Baldridge National Quality Award (MBNQA), the European Quality Award (EFQM), the Six Sigma Business Scorecard, and the Balanced Scorecard. In addition, all of them have their own criteria and factors (Kaplan

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and Norton, 2004). However, a set of QMS and criteria which could be accessed, certified, and were suitable for the automotive companies was needed and this formed the research direction of this paper–to identify an Integrated Performance Measurement and Management Model with its corresponding performance indicators to be developed with the following objectives:

- To develop an IPMMM system for an automotive car assembler.
- To define the Key Performance Indicators (KPI) and management system for the IPMMM system.
- To select the appropriate KPI or PI of the IPMMM system for a car assembler.

2. LITERATURE IN PERFORMANCE AND QUALITY MANAGEMENT SYSTEM

At the beginning of the 1970s, Japanese automakers challenged the U.S. industry by deploying the quality management tools taught by J.M. Juran, Edwards Deming, Phil Crosby, Genichi Taguchi, and others. In the 1980s, other ways to promote process and performance standards were created, such as the ISO9000 quality management system developed by the International Organization for Standardization (ISO) and the Malcolm Baldridge National Quality Award (MBNQA) guidelines established by the U.S., and the Motorola-pioneered Six Sigma. The purpose of these new quality management techniques was to improve the performance of business process (Gupta, 2004) as follows:

- ISO9000 system improved inter-relationships between business functions.
- Six Sigma accelerated the rate of improvement.
- The Malcolm Baldridge National Quality Award enhanced the image of the organization.

The organization's implementation of these systems for improving and managing the quality of the organization were through reduced variation, continuous improvement of products and services, design quality, speed and prevention and zero defects. These were the major concepts and factors that were introduced by quality gurus, such as Deming, Juran, Crosby, and Feigenbaum, Ishikawa and Garvin in one form or another in managing quality (Tummala and Tang, 1994). These quality concepts and factors had been translated into the assessment criteria, core elements and values of various quality awards like the MBNQA and EQA (Puay *et al*., 1998) and standards such as the ISO 9000 (Pun and Chin, 1999).

With the proliferation of several quality awards and standards, many organizations had taken their initiative to employ different awards and standards in one form or another to sustain their competitive edge. The ultimate objective of a self-assessed quality management system was to assist the organization in its quest for corporate performance, business results and financial health (Pun and Chin, 1999; Olve and Wetter, 1999).

A summary of the main thrust of the major models is as follows:

- The Six Sigma Business Scorecard consisted of measurements for various leadership and operational processes specified as quality management processes in the ISO9001: 2000 standards. To establish measurements for effectiveness that met ISO 9001 requirements, it was necessary to construct a business process flowchart, identify key processes, establish criteria for effectiveness, and determine measurement for effectiveness. It could, therefore, be a great mechanism for implementing effectiveness measure in quality management system and could make the ISO9001:2000 a value-added system by improving the corporate performance (Gupta, 2004; Crowe and Noble, 1998).
- Both EFQM and Balanced Scorecard models contained several key objectives focused on specifics, i.e. the nine criteria of the Excellence Model and the four generic perspectives of the Balanced Scorecard. The EFQM Excellence Model did not particularly address the plans or strategies for organizations wishing to improve through the self-assessment (Andersen and Lawrie, 2004; Bryde, 2003; EFQM, 2000; Porter *et al*., 1998; Wongrassamee, 2003). On the other hand, the Balanced Scorecard approach (Kaplan and Norton, 1992 and 1996) provided a "strategy map", which had been created to help managers establish a cause-and-effect logic mapping between the measures and strategy outcomes (Amaratunga, 2001). Both models were quite similar. The only major difference was that the key objectives in the Excellence Model were assigned based on the TQM principles whereas in the scorecard approach, the key objectives were based on the desired corporate strategy (Wongrassamee, 2003).
- The ISO 9000 focused on the conformity to practices specified in the organization's own quality system. Its disciplines imposed on calibration, document control and internal audit ensured that a company was operating efficiently with the current system, and in turn, facilitated quality improvement (Pun and Chin, 1999). However, there had been a widely held view that ISO 9000 was weak on continuous improvement (Chin *et al*., 1995). Reliance solely on the ISO 9000 registration was not sufficient to sustain a competitive edge.
- On the other hand, MBNQA assessment criteria could drive the company towards the continual maintenance, development and impro-vement of overall operation performance and delivery of ever-improving values to customers (Pun and Chin, 1999; Brown, 1996; Affisco *et al*., 1997; Panirselvam, 2001).

Table 1. Key factors of leading quality and performance management models synthesized into key factors grouping.

Models and their Key Factors \ Synthesized Factors		Leadership	Strategy, Management	Customer and Market	Learning and Growth	Internal Processes	Partnership and Resource	Business results
6σ	Leadership and Profitability	●●●	●●					
	Service and growth		●	●●				
	Management and improvement		●●●					
	Employee and Innovation		●		●●●			
	Operation execution		●			●●●		
	Purchasing and supplier Management		●				●●●	
	Sales and Distribution		●	●●				●
Balanced Scorecard	customer		●	●●●				●●●
	Learning and growth	●	●		●●●			●●●
	Internal business processes		●			●●●	●	●●●
	Financial		●					●●●
EFQM	Leadership	●●●	●●					●
	Policy and strategy		●●●					●
	Customer results		●	●●●				●
	People management		●		●●●			●
	Processes		●			●●●		●
	Partnerships and Resources		●				●●●	
	Customer Results, People Results, Society Results, Key Performance Results		●	●	●	●	●	●●●
MBNQA	Leadership	●●●	●●					●
	Strategic planning		●●●					●●
	Customer and market focus		●	●●●				●●
	Measurement, analysis and Knowledge Management		●					●●●
	Human resource focus		●		●●●			●●
	Process Management		●			●●●	●●	●●
	Business results		●●	●	●	●	●	●●●
ISO9000	Leadership	●●●	●●					●
	Customer focus		●	●●●				●
	Continual improvement		●					●
	Involvement of people		●		●●●			●
	Process approach, System		●			●●●		●
	Factual approach to		●					●●
	Mutuallly beneficial supplier relationship		●				●●●	●

Legend: ●●● (Factor is a key identifiable variable).
●● (Factor is a variable that is a sub-set of the key factor).
● (Factor is discussed within the context of the other factors/or do not exist as a key variable or as a sub-set of the key factor).

Due to the fundamental similarities of all the frameworks (models), the researcher posited that the key success factor in applying them to an organization was linked to the question of how to select adequate and appropriate measures. Table 1 provides a cross-reference of the specific factors which were found in the award criteria of EFQM and MBNQA, the principles of ISO and performance management models of Six Sigma Scorecard and Balanced Scorecard. The table is largely self-exploratory as most of them refer to the same fundamentals or principles but use different terminologies.

Based on the literature that included 7 factors of Six Sigma Scorecard, 4 factors of Balanced Scorecard, 9 factors of EFQM, 7 factors of MBNQA, and 8 factors of ISO9000:2000 (based on the key topical areas or category or grouping of key factors) as shown in Table 1 and Figure 1, the synthesized factors with similar terminology or context, were identified and re-categorized into the 7 factors used in this research: Leadership, Strategy, Management and Policy, Customer and Market, Learning and Growth, Internal Processes, Partnerships and Resources and Business results. The synthesis used the "existence as a key factor" (●●●), "a sub-set of the key factor (●●) or just being a "factor is discussed within the context of the other factors/or do not exist as a key variable or as a subset of the key factor" (●) through a "context and content" analysis that defines these factors in the management models as summarized in Table 1. "Key factor existence" is determined based on its emphasis as a key factor or topic with other sub-variables discussed within its context. The matrix indicated that the EFQM and the MBNQA criteria are much broader in its factor existence with the synthesized factors than the others. The Balance Scorecard, MBQNA followed by the EFQM and Six Sigma placed the greatest emphasis on the specific KPI used to identify the results signifying a high degree of result-orientation. Six Sigma Scorecard, EFQM, and ISO9000 had a strong factor existence with Leadership factor. The Strategy, Management and Policy factor as the overriding factor in the management of the other aspects is more clearly discerned in the EFQM and MBNQA as compared to the other models, but this does not mean that in the other models, they are not important but the strategic aspects and its policy specification is assumed to be part and parcel of the models without going into its specifics. Balance Scorecard, EFQM, MBNQA, and ISO9000 had strong factor co-existence with Customer and Market factor. Learning and growth and Internal Processes had strong factor co-existence with all models. Six Sigma Scorecard, EFFQM, and ISO9000 had strong factor co-existence with Partnerships and Resources factor. In the table, some of the cells do not have specific "factors existence" and it should not be implied that they are not important but they are normally discussed in an integrative way in the other aspects as they are assumed to be the norms and standard practices subsumed under the key factors and their sub-sets.

In conclusion, it could be posited that these 7 synthesized factors were key factors in all management models and criteria as the majority concurred on all aspects of the 7 factors: learning and growth and internal processes (5 models with strong factors existence), customer and market focus (4 models with strong and 1 with weak factors existence), leadership (4 models with strong factors existence), Business results (3 models with strong and 2 with weak factors existence), partnerships and resources (3 models with strong factors existence), and strategy, management and policy (2 models with strong and 3 models with weak factors existence). The development of the Research Framework as shown in Figure 1 with its corre-

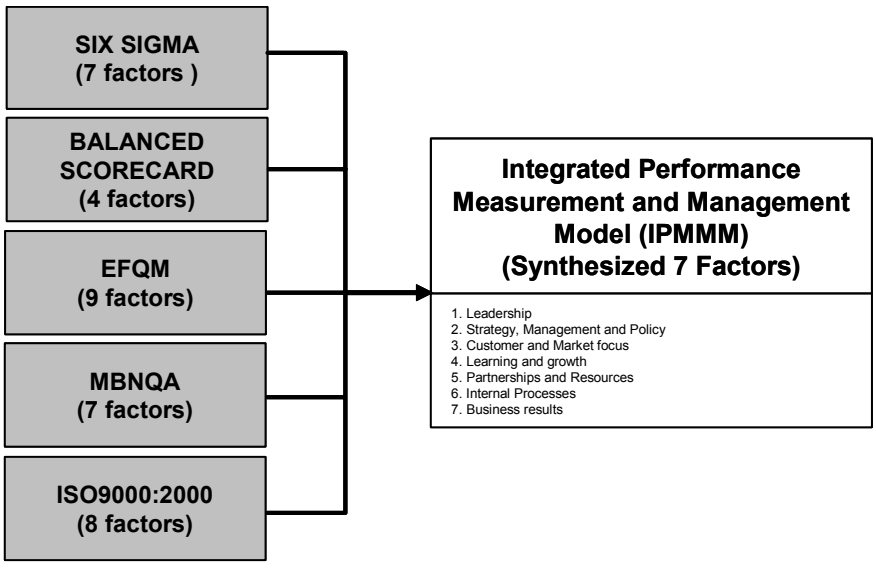


Figure 1. The Integrated Performance Measurement and Management System (IPMMS) framework and its consolidated factors.

Table 2. Explanation of the 7 key factors of the Integrated Performance Measurement and Management Model (IPMMM).

	FACTORS	DESCRIPTION
1	Leadership	Leadership is the important factor that has developed and has clarified a statement of vision, mission, goals and objectives affecting the organization's direction and strategy.
2	Strategy, Management and Policy	Strategy is organization's "mechanisms of the WHAT and HOW" to achieve its vision and mission.
3	Customer and Market focus	Customer and Market focus is the key driver of organization of which the customers' needs and expectations are and that should be understood and managed through its value proposition
4	Learning and growth	The ability and development of the knowledge, skills and values of employees in the organization is a significant factor to improve the business processes continuously; it reinforces the accomplishment of organization's action plans, and the retention of critical organizational knowledge including long-term sustainability.
5	Partnerships and Resources	Partnerships (supplier, sub-contractor) are important to create the value to the long-term growth and development of the business industry value chain. Management and utilization of Internal resources and external resources (partnership) can produce effective business performance.
6	Internal Processes	Internal processes are the key aspect of organization related with the systems, processes and activities to contribute the organization's effectiveness and efficiency in achieving its objectives and customers' requirements.
7	Business results	Business results are the factors used to examine what the organization is achieving in relation to its planned business performance and in satisfying the needs of its stakeholder.

sponding explanations in Table 2 was an outcome of the synthesis as shown in Table 1.

3. RESEARCH METHODOLOGY

Traditionally, in most exploratory studies, factor analysis would be the immediate choice to determine the patterns of relationships amongst dependent variables, with the goal of discovering something about the nature of the independent variables that affect them, even though the independent variables were not measured directly. In this research, as it is not aimed at identifying the "correlation matrix" of the factors affecting its factor loading to identify the grouping of determinants of the factors, the Delphi methodology was opted to fulfill the purpose of identification of the KPI or PI through "expert" heuristics opinions. The Delphi Approach is a method for the "systematic solicitation and collation of judgments on a particular topic through a set of carefully designed sequential questionnaires interspersed with summarized information and feedback of options derived from earlier responses" (Linstone and Turoff, 2002; Okoli, and Pawlowski, 2004)). As such, in this study, the researcher used an adapted Delphi approach as discussed below as the basis for the exploration and determination of the KPI for a specific organization as each organization had its own unique culture and modus operandi. Based on this rationale, the researcher used a panel of experts who have experience and/or knowledge of the subject being studied especially in the firm under study.

The Delphi panel and the Delphi process focused in this study were to elicit knowledge and opinion from individuals with a broad cross-sectoral perspective on the company's performance management and decisions. The criteria used in identifying likely panel members were knowledge of and interest in performance measurement and ability to take a broad-sectoral view of the issues involved in performance measurement as the key management of the company under study. A total of 20 persons with 2 representatives each from the Human Resource Management, Production, Engineering, Cost and Financial Management, Quality and Environment Management, Procurement and Supply Management, Production Control, Logistics, Quality Control, and Sale and Marketing, were identified and invited to participate in this adapted Delphi study. All of the panelists were Thai department and deputy managers, with the exception of the Production, Engineering, Production Control and Quality Control who were Japanese managers.

The 7 synthesized factors from the Integrated Performance Measurement and Management Model (IPMMM) was used as the basis to develop the questions and its performance indicators as the initial set to interview the key management of the company. Prior to the interviews, the table of performance indicators' details of the variables in each of the 7 factors was constructed as questionnaires for the interviews. Two rounds of interviews were arranged. For the 1st interview session, a questionnaire was developed based on the 198 performance indicators that were identified for consideration in the first round of the Delphi study and the resulting 90 performance indica-

tors, were used to determine an appropriate set of Key Performance Indicators for the company for the 2nd round. In the 2nd round, the same approach yielded 43 sets of KPI and PI for the company.

In the 1st round of the questionnaire, the respondents were asked to select the performance indicators that were important indicators concerned with Leadership factors (LP), Strategy, Management and Policy factors (SP), Customer and Market focus factors (CM), Learning and growth factors (LG), Partnerships and Resources factors (PR), Internal Processes factors (IP) and Business result factors (BR), respectively. From the results of the 2nd round, 43 indicators were chosen from the synthesized 198 indicators and 1st round 90 indicators based on most likely response and the evaluation criteria, the details of criteria and the results of the first round. For both rounds, the criteria for selection of the indicators were based on the percentage of response for the importance (1 to 3) and identification of being a KPI, PI or not necessary (4 to 6). In order to be selected, there are 4 sets of criteria as follows:

1. (C1): percentage of response of 1 and 4 are equal to or greater than 50%.
2. (C2): percentage of response of 1 and 5 are equal to or greater than 50%.
3. (C3): percentage of response of 2 and 4 are equal to or greater than 50%.
4. (C4): percentage of response of 1 and 5 are equal to or greater than 50%.

4. RESEARCH FINDINGS

In the 1st round, Customer Satisfaction Index in Customer and Market focus factor was the top priority that the respondents determined. First Time Capability (FTC) in internal process factor was the second priority. The Market share in customer and market focus factor was the third, and the others were prioritized as shown on Table 3. The 7 synthesized factors were found in the top ten listing. This could be interpreted as that the factors selected by the respondents were in this integrated model. Table 4 shows only 14 items of performance indicators of the top ten that were prioritized based on the criteria of importance and the Key Performance Indicator (KPI).

In the second round interview, the respondents were asked to select the performance indicators based on the first round selection to find the Key Performance Indicators (KPIs) of the company of the IPMMM. The final results of the 43 performance indicators were chosen from 90 indicators based on most likely response and the same evaluation criteria as the first round. Table 4 showed only 23 items of performance indicators of the top ten Key Performance Indicators(KPI).

The results of the second interview were summarized in terms of performance indicator of each factor as shown below. PASS CRITERIA represented that the indicator was selected to be a KPI or PI. And % RESPONSE represented the percentage response as a KPI or PI of key management of the company. Tables 5 to Tables 11 showed the KPI or PI of each of the key 7 factors as follows:

Table 3. Top ten priority of KPIs of the first round interview.

Priority1 is the percent response of key management in 'Very important indicators' and Priority2 is the percent which responds that it should be a 'KPI.'

no.	Factor	Performance indicator	% Priority1	% Priority2	Seq. of priority
1	CM	Customer satisfaction index	100%	81%	1
2	IP	First Time Capability (FTC)	95%	90%	2
3	CM	Market share	90%	86%	3
4	IP	On-time delivery	90%	81%	4
5	IP	Delivery productivity	90%	81%	4
6	LP	Profitability	90%	71%	5
7	PR	Supplier quality	86%	81%	6
8	IP	Defect percentage	86%	81%	6
9	SP	Goal Setting	86%	76%	7
10	CM	Customer complaints	86%	52%	8
11	IP	Improvement in productivity (%)	81%	71%	9
12	BR	Net income	81%	71%	9
13	LP	Progress on leadership initiative and programs	81%	57%	10
14	CM	Corporate Image	81%	57%	10

Table 4. Top ten priority of KPIs of the second round interview.

Priority1 on the table is the percent response of the key management that should be a 'Key Performance Indicator'. And Priority2 is the percent response in 'Very important indicators.'

no.	Factor	Performance indicator	% Priority1	% Priority2	Seq. of Priority
1	IP	Defect percentage	91%	91%	1
2	IP	First Time Capability (FTC)	91%	91%	1
3	CM	Customer satisfaction index	82%	82%	2
4	IP	On-time delivery	82%	82%	2
5	BR	Revenue	73%	91%	3
6	PR	Supplier quality	73%	73%	4
7	IP	Product Audit Score	73%	73%	4
8	SP	Goal Setting	64%	91%	5
9	CM	Brand–image index (%)	64%	82%	6
10	BR	Return on investment (ROI)	64%	82%	6
11	CM	Market share	64%	73%	7
12	IP	Inventory rate	64%	73%	7
13	IP	Part shortage unit vehicle/shift	64%	73%	7
14	BR	Cash flow	64%	73%	7
15	IP	Claim Occurrency Ratio	55%	82%	8
16	BR	Debt	55%	82%	8
17	IP	Fixed cost	55%	73%	9
18	IP	Variable cost	55%	73%	9
19	IP	Complete Car Inventory Turn over	55%	73%	9
20	LG	Feportable accidents	55%	64%	10
21	IP	Planning accuracy	55%	64%	10
22	BR	Net income	55%	64%	10
23	BR	Productivity	55%	64%	10

Table 5. Leadership factor (LP).

No.	FACTOR	PERFORMANCE MEASURE	PASS CRITERIA	TYPE OF INDICATOR	% RESPONSE
1	LP	Progress on leadership initiatives and programs	C2	PI	55%
2	LP	Compensation/Profitability	C2	PI	55%
3	LP	Profitability	C2	PI	55%

Table 6. Strategy, Management and Policy factor (SP).

No.	FACTOR	PERFORMANCE MEASURE	PASS CRITERIA	TYPE OF INDICATOR	% RESPONSE
1	LP	Progress on major strategic product initiatives	C2	PI	55%
2	LP	Goal Setting	C1	KPI	64%

Table 7. Customer and Market focus factor (CM).

No.	FACTOR	PERFORMANCE MEASURE	PASS CRITERIA	TYPE OF INDICATOR	% RESPONSE
1	CM	Customer satisfaction index	C1	KPI	82%
2	CM	Customer complaints	C2	PI	64%
3	CM	Market share	C1	KPI	64%
4	CM	Brand–image index (%)	C1	KPI	64%
5	CM	Price relative to competition	C2	PI	55%

Table 8. Learning and Growth factor (LG).

No.	FACTOR	PERFORMANCE MEASURE	PASS CRITERIA	TYPE OF INDICATOR	% RESPONSE
1	LG	Motivation index	C4	PI	73%
2	LG	Employee productivity	C2	PI	55%
3	LG	Training hours per year	C1	KPI	55%
4	LG	Reportable accidents	C1	KPI	55%

Table 9. Partnership and Resource factor (PR).

No.	FACTOR	PERFORMANCE MEASURE	PASS CRITERIA	TYPE OF INDICATOR	% RESPONSE
1	PR	Supplier quality	C1	KPI	73%

Table 10. Internal Processes factor (IP).

No.	FACTOR	PERFORMANCE MEASURE	PASS CRITERIA	TYPE OF INDICATOR	% RESPONSE
1	IP	On-time delivery	C1	KPI	82%
2	IP	Lead time, product development	C2	PI	55%
3	IP	Lead time, from order to delivery	C2	PI	55%
4	IP	Defect percentage	C1	KPI	91%
5	IP	Operational Cycle Time	C2	PI	55%
6	IP	Waste reduction	C2	PI	55%
7	IP	Planning accuracy	C1	KPI	55%
8	IP	Fixed cost	C1	KPI	55%
9	IP	Variable cost	C1	KPI	55%
10	IP	Claim Occurrency Ratio	C1	KPI	55%
11	IP	Delivery productivity	C2	PI	55%
12	IP	Complete Car Inventory Turn over	C1	KPI	55%
13	IP	Inventory rate	C1	KPI	64%
14	IP	Part shortage unit vehicle/shift	C1	KPI	64%
15	IP	First Time Capability (FTC)	C1	KPI	91%
16	IP	Product Audit Score	C1	KPI	73%

Table 11. Business Results factor (BR).

No.	FACTOR	PERFORMANCE MEASURE	PASS CRITERIA	TYPE OF INDICATOR	% RESPONSE
1	BR	Total assets	C2	PI	55%
2	BR	Return on net assets	C2	PI	73%
3	BR	Return on total assets	C2	PI	73%
4	BR	Return on investment (ROI)	C1	KPI	64%
5	BR	Net income	C1	KPI	55%
6	BR	Profit margin (%)	C2	PI	64%
7	BR	Revenue	C1	KPI	73%
8	BR	Cash flow	C1	KPI	64%
9	BR	Debt	C1	KPI	55%
10	BR	Sales and Market share	C1	KPI	55%
11	BR	Cost per employee	C1	KPI	55%
12	BR	Productivity	C1	KPI	55%

5. DISCUSSION

In the IPMMM, the Key Performance Indicators (KPI) and Performance Indicators (PI) that were found in this study could be used as follows:

- In the leadership factor, three PI were identified to measure the leadership, 'Progress on leaderships and programs' could be used to assess the leadership that established the purpose and direction of the organization and to achieve the organization objectives as profitability by 'Profitability indicator'. The creation and maintenance of the internal environment driven by the people in the organization could use 'Compensation/profit' as a leading indicator.
- For the Strategy, management and policy factor, to measure the strategy planning of the organization 'Goal setting' and 'Progress on major strategic product initiatives' was identified to determine how the organization developed its strategic objectives and action plans that underlines the planning concept of MBNQA.
- In the Balanced Scorecard, the Learning and Growth perspective would only succeed based on adequate skill and motivation of employees. ISO9000: 2000 principle also mentioned that people at all levels were the essence of an organization to enable their abilities to be used for the organization's benefit. So to ensure that there was involvement of the people, 'Motivation index' could be used as an indicator and 'Training hour per year indicator' as a lead indicator to the 'Employee productivity indicator' to increase their competency. The "No accident" KPI was measured by 'Reportable accidents.'
- For mutually beneficial supplier relationship of ISO9000:2000's principle, both supplier and organization relation was important to create value. 'Supplier quality' was identified as the KPI to measure this objective.
- The Process and system approach in the ISO9000: 2000's principle was used to manage more efficiently the activities of the internal processes. The key benefits of these were the lower cost and shorter cycle time that should be measured. 'Fix cost', 'Variable cost' and 'Operational cycle time' were the KPI and Lag indicators that were the results from many indicator of internal process factor such as 'Planning accuracy', 'Waste reduction'. The application of this principle lead to the capability of the activities that could be measured by 'First Time Capability (FTC)', 'Defect percentage', 'Claim occurrence ratio' and 'Product audit score.' To measure the indicator that supported customer focus, 'Delivery productivity' was the indicator that should be measured and this result came from many of the lead indicators of internal process factor, such as 'On-time delivery', 'Lead time of product development', 'Lead time from order to delivery', 'Inventory rate' and also 'Part shortage unit vehicle/shift.' 'Complete car inventory turn over' indicator showed how much the operational processes could create the value to the customers.
- For the customer and market focus factor, 'Market share indicator' was identified by the management, and it was mentioned as a key benefit of customer focus principle in ISO9000: 2000. To measure the increasing effectiveness in the use of the organization's resource, 'Customer satisfaction index' was also a key of ISO9000. 'Brand-image index' and 'Price relative to competition' were identified and they could be determined as the key variables which led to customer acquisition, satisfaction, loyalty and retention as the concept of MBNQA.

- At the baseline, business results was the key factor to examine the organization's performance and improve key business areas product outcomes. Based on the MBNQA, financial indicators are critical and all KPI and PI found in this study could indicate the business situation in terms of Liquidity, Asset Management Efficiency, Leverage and Coverage, and Profitability.

As the above represents the KPI of the car assembler in the IPMMM, the aspect of the performance measures has been identified using the Delphi Methodology and are defined as discussed above. This result could be used as a guideline to weigh the score for the performance indicators and to balance the scorecard. The target for each indicator should be set. All of these indicators should be deployed to the related process, function and activities of the organization to achieve the organization objective and develop the strategy to meet the target. As to the performance management aspect, the Balanced Scorecard (BSC) can be used as the "implementation model" of the strategic KPI. In the BSC (Kaplan and Norton, 2006), the key philosophy of the BSC is "management through measurement" and all the KPI of the 4 perspectives are cascaded and aligned through the cause effect linkages as shown in Figure 2 in section 8.

6. IMPLICATIONS

The research findings did not reveal any inconsistency from the literature and that they do conform to the main theoretical frameworks and researches of performance management. The key implications were that:

- For performance management to be successful, the firm has a need to select from a seemingly endless and equally important plethora of indicators, a set of indicators relevant to and specific to the practices of the firm.
- The performance indicators or the key performance indicators selected should be the direct and specific indicators of the performance important to the firm, as an indicator important to one firm might be unimportant to another. This highlights the strategic management and the importance of the vision, mission, goals and objectives of the firm that had a very important guiding effect in the selection of the PI or KPI that they fulfilled the credo and what it intended to achieve in the industry.
- The PI or KPI selected for the learning and growth and the internal processes would define the competency of the firm in terms of its human capital, information capital and its organizational capital that had to be developed or built as they represented the very foundation of the competency that was important to the success of the internal processes. It was also important to note that the competency identified for the internal processes were the very key mechanisms used to create and deliver on the value as needed by the customer to retain and achieve not only customer satisfaction but potential customer loyalty.

It is also not surprising to note that as a car assembler, the mindset was placed on the internal processes as the beliefs and implications was that this would bring about the creation and delivery of value to the customer in the product and service quality part of the customer evaluation of value in the purchase of the car.

It was also important to note that the bottom line business revenues were also given high priority that supported the fact that financial measures were still important to and were still used as the traditional measure of success. This did not stray from the mainstream literature that the measure of success was still financial in nature but being lag indicators, they might not be the best of measures for proactive management. The new era literature and management practices that aligned itself to the balanced scorecard approach had defined cause-effect linkages of the 4 main perspectives for measuring an organization's performance with the use of its lag and lead indicators. This could imply the fact that all the 4 sets of PI and KPI should be identified rather than to have the financial and the internal processes PI and KPI taking a major bulk of the indicators used to determine the performance of the organization and with little emphasis placed on the other sets of indicators or measurements.

The research also indicated that there was also a very disturbing fact that the learning and growth PI and KPI were not afforded as much importance as they should be. This was also consistent with the mainstream literature in that the implementation of the strategy was normally rather unsuccessful in the sense that the firm was not investing enough or had neglected to note that the very success of the internal processes was based on its competency foundation of its capital assets. This was supported by the Table 9 that only identified 2 sets of KPI and sets of PI that were important to the firm. This could be interpreted that there was still a tremendous lack of interest or understanding of the critical aspect of the learning and growth perspectives that would ultimately lead to the achievement of competitive advantage.

7. RECOMMENDATION

Based on the outcome of the implications of the research as highlighted in the previous session, it is highly recommended that the key or core management of the company be exposed to the Balanced Scorecard approach. This does not mean that they have to use the BSC approach as the management aspect of the IPMMM, but to highlight the deficiency of certain important PI and KPI that are the competency indicators critical to the success of its internal processes to create and deliver on the cus-

tomer value that ultimately lead to the achievement of the business results that are normally the lag results that might be too reactive rather than being proactive. The emphasis on the use of the business results might be myopic and the development of an inappropriate set of action plans or strategic plan, affecting the long-term strategic positional change that placed more emphasis on a short-term monetary profitability gain.

As such, the use of the Balanced Scorecard will highlight the resolutions that need to be implemented by the firm to highlight the importance of:

- The identification of a comprehensive set of PI and KPI that covers all perspective of the performance management of the organization rather than just concentrating on the business results and the internal processes results as shown in this study.
- The cause-effect linkages of all the 4 sets of PI and KPI that will ultimately bring about the final business results and the achievement of the vision, missions, goals and objectives of the organization.
- The use of the PI and KPI as the main set of performance measures in achieving the basic philosophy of "management through measurement."

This underlines the fact that the learning and growth perspective and the internal processes will be the key to the achievement of the customer value as defined by **Customer Value = f {Product Quality, Service Quality, Image, Relationship}/Cost**. The only reason that the firm is able to survive is that the customers buy from them. The customer buys not the physical products but the benefits that the customer gets from consumption of the product or service offers. This is represented by the "value" that the customer derives from the consumption of the specific product or service. The firm must fully understand the value that it intends to propose to the customer in choosing its product or service rather than that of the competitor. The differential lies in the "difference in the value proposition" that is created and delivered by the firm as compared to that of its competitors.

It must also be understood that the success in the value proposed is contingent on the definitions and positioning of its internal processes, and that all these act as a "unified whole" rather that independently of each other. Based on Value Engineering which is the "analysis of the functions of a program, project, system, product, item of equipment, building, facility, service, or supply of an executive agency performed by qualified agency or contractor personnel, directed at improving…" (Younker, 2003, p. 280) or is the "formal or informal attempt to assure highest value by delivering all required functions at the lowest overall cost and seeks optimum value by balancing performance and cost" (Miles, 1964), this is the base of the creation and delivery of the customer value. The two key variables that define Value here are: **Function** (required performance) and **Cost**. The premise is that inadequate performance at very low cost will not be good value because the needed functional performance is not provided and high performance at excessive cost cannot be good value either; as other needs will surely be marginalized or go unsatisfied entirely. In the creation and delivery of customer value, all functional performance costs money. As not all performance is needed or even wanted, eliminating the cost of unneeded or unwanted functional performance will improve value through a thorough strategic cost analysis of the internal processes value chain. As such, Good Value is the median between excessive cost and inadequate performance and must be balanced.

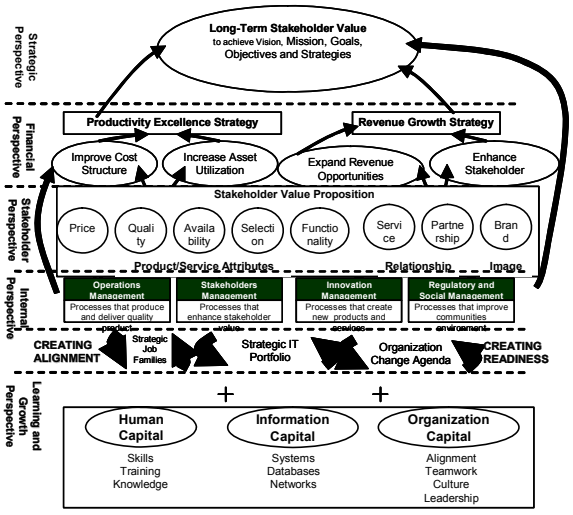
Whenever a firm expends resources (pay a cost) to produce a product or service offer, they do so for a reason. The functions in the value chain to be performed results in value to the user and represent that "reason" to get the customer to buy resulting in the customer value derived from the purchase.

Having good processes to create value is only as good as just having the resources. The success lies in the utilization of the resources or the firm's competencies in the use of the internal processes to create and deliver on the value. This would mean that the competencies of the firm lies in the human and the organizational capacity and capability which are the intangible capital assets of the firm as they are the foundation of success of the organization. In the end, the success of the firm lies in the very competency of the learning and growth perspective of the firm and what and how they manage it is of critical importance to the firm and that differentiates high performers from low performers.

8. STRATEGY AND PERFORMANCE MANAGEMENT OF THE IPMMM

The firm should define its organization strategy that can cascade down to the strategic business units, departments, divisions and personal levels to ensure that the strategies at all levels are aligned. The burning question is whether the strategy should be top-down or bottom-up. Pragmatically, it should be both top-down and bottom-up and strategic guidelines should be promulgated to ensure that the different SBU (Strategic Business Units) are aligned in the same direction. Normally for a firm, the main strategic theme is to achieve long term stakeholder value that is brought about by its strategies on operation and productivity excellence and revenue growth mix (Kaplan and Norton, 1996, 2001, 2004 and 2006) contingent upon the customer being happy and satisfied with the value proposition of the firm, as they are inter-related as depicted in Figure 2 through its cause-effect linkages of the 4 perspectives.

As has been identified in the research outcome, using the balanced scorecard approach as the performance management portion of the IPMMM, most of the PI and KPI, the performance measurement portion of the IPMMM of this case study are concentrated in the financial perspective and the internal processes perspectives. Two of the key critical aspects of the definition of its value



Source: Adapted from Kaplan, Robert S. and Norton, David P. (2004), Strategy Maps: Converting Intangible Assets into Tangible Outcomes, HBS Press, 2004.

Figure 2. IPMMM measurement and management using the Balanced Scorecard to Create Value.

proposition and its capital asset and competency foundation need further development as the BSC has a holistic and balanced approach covering the management of the 4 perspectives with its respective KPI for each of the components of its perspectives. As such, it is recommended for the company to develop the:

- Strategic skills and competency and performance metrics
- Strategic organizational support systems and performance metrics

From the research, the main learning and growth PI and KPI that are missing are the strategic skills and competency performance metrics. In the mainstream strategic management literatures (Thomson and Strickland, 2008; Wheelen and Hunger, 2004; Prahalad and Hamel, 1999) to name a few, the edge to competitive advantage is the competency profile of the organization in terms of readiness (Kaplan and Norton, 2004). These competency are normally human based and is not on having the resources. The main competencies are:

- ***Human Capital:*** This comprises the knowledge, skills and values of the staffs as human assets in the creation of product and service value to the stakeholders.
- ***Information Capital:*** This comprises the MIS systems, networks and databases that are horizontally and vertically integrated to support empowerment of the staffs and personnel. A key competitive edge is the technology capabilities (Pramongkit and Teay, 2002) of the human sophistication in identifying, interpretation and integration of information into knowledge and market wisdom leading to competent curiosity and competent wisdom (Barabba and Zaltman, (1991).
- ***Organization Capital:*** This comprises the leadership, teamwork, alignment and culture that form the operating core and foundation of the organizational success for all the other aspects to function and be managed in totality in an integrated total open system.

It must be noted that these 3 sets of capital that are intangible in nature, forms the foundation of the firm to utilize its internal processes of: operation management, customer management, innovation management and regulatory and social management to manage its creation and delivery of the value proposition to the customer. The firm has to decide on a set of values to be proposed to the customer that can take the form of: total customer solution, product leadership, customer intimacy or best cost values. Each value proposed has a different strategic objective based on the value equation of: **Customer Value = f {Product Quality, Service Quality, Image, Relationship}/Cost** that are managed differently. If a firm was to propose a product leadership proposition especially in the case of a car manufacturer, it must excel in product quality as compared to its competitors but must manage and maintain the minimal industry standard of the other components of service quality, image, and relationship and cost.

These 3 sets of capitals work in tandem to achieve the value as proposed to the customers that would ultimately derive the financial benefits as the final outcome of the cause-effect linkages. Ultimately, this would mean that the firm must manage all the 4 sets of KPIs of each of the perspectives that form the integrated performance measurement and management model of the firm.

What is important in the measurement and management of the linkages in the IPMMM is the rationale that:

- Management must be measured through the performance metrics that are inherent in all the systems,
- There is a cause effect linkages of all the systems and their implicit performance metrics,
- It is the summation of the total and synergistic outcome that is more important than the individual system outcome.

9. CONCLUSION

In conclusion, this research showed a few important things that are fully recommended to all firms when they develop their own IPMMM in that:

- Due to the uniqueness of each firm in the industry, they should develop performance indicators or key performance indicators that best reflect the uniqueness of the firm.
- There must be a balanced set of measures that covers all the perspectives of an organization,

namely, the financial, the customer, the internal processes and the learning and growth perspectives as they are inter-linked and inter-dependent with each other. This is important as the management of the cause-effect linkages provides a holistic approach in managing the firm in totality rather than in a piece-meal approach.

- In the end, it must be recognized that the success of the organization lies in its intangible capital assets of the human capital, information capital and the organization capital that must be managed.

This paper has highlighted the fact that a firm can no longer ignore the intangible measures that would ultimately affect the tangible measures. To achieve competitive advantage, it must approach the development of the performance measurements and management from a holistic perspective by measuring and managing the KPI of the 4 perspectives under the IPMMM developed.

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