PROPOSED BASELINE TAXONOMY OF KEY PERFORMANCE INDICATORS FOR DECISION MAKING

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Abstract
The research attempted to propose a taxonomy that helped relate the set of key performance indicators (KPIs) with a specific circumstance facing top management in a typical medium-sized manufacturing firm. This taxonomy was derived from the observations on the frequency of KPI requested by 9 executives from 3 companies in Thailand during January-December 2005. For this study, there were a total of 120 KPIs. They were mostly in the ratio format as advocated by Sink and Tuttle concept (1989). They were grouped into 4 perspectives, according to the Balanced Scorecard concept (i.e., finance, customer, internal business, and knowledge and learning). The companies integrated these KPIs into their own database/ management reporting processes. The frequency was collected, based on the management's actual request numbers. To complete this taxonomy, these 9 top managers were asked to identify specific circumstances that their firms had experienced during the past 12 months. Based on the initial results, there were 18 common or general circumstances; e.g., high inflation, high interest rate, stronger competition, and market expansion opportunities. The next task was to match a scenario with a specific set of KPIs. This task generated the proposed taxonomy. For example, when being faced with the treat from new competitors, the top managers from the 3 companies generally paid attention to 2 customer-related KPIs (i.e., market share and % of customer lost), 3 financial-related KPIs (i.e., revenue-to-employee, profit margin, and Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs— EBITDAR), 2 internal process-related KPIs (i.e., inventory turnover and rate of productivity improvement), and one learning and growth-related KPI (i.e., investment in new product support and training). This proposed taxonomy had both potential benefits and limitations to be addressed later in the paper, including the effort on knowledge management.

Keywords: Performance measurement, Performance management, and Business performance

Introduction

The term performance measurement always had significant roles in business and operational management during the past few decades. Many organizations had used performance measurement as a primary tool for communicating directions, establishing accountability, defining roles, allocating resources, monitoring and evaluating activities, linking organizational processes, establishing goals and benchmarks, and initiating changes to ensure continuous improvement (Viken, 1995). Performance measurement provided information that would enable the organizations to understand the processes' capability. It provided feedback on the effectiveness of improvement interventions. Simply put, it was a critical element of a management process. This was to be highlighted by the following statement. "You cannot manage what you cannot measure" (Deming, 1986). Due to its importance, performance measurement has received lots of attentions from a number of researchers in

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various fields of study including Psychology, Human Resource Management, Economics, Accounting, and Industrial Engineering.

Generally, the executives and managers needed to measure the business performance in the key importance areas such as financial, operational, customers, stakeholders, strategies, and the resources. In the wake of continuous and accelerating changes and business circumstances, they needed to possess real-time information in order to make quality (i.e., timely and effective) decisions. Certainly, one of the most important components of performance measurement was KPI. KPIs were typically classified as financial or non-financial. Financial KPIs were likely related to the firm's accounting system such as inventory levels or cash on hand, liquidity, return on assets or return on investment, etc. Non-financial KPIs were opposite since they intended to provide information on productivity, customer satisfaction, supplier contributions, innovation on processes and product development, and the working life of employees, and etc. Most KPIs regardless of both financial or non- financial aspects were typically quantitative and were formulated in the ratio format such as the ratios of revenue-to-cost, of revenue from new products-to-revenue, and so on. When the identification of KPIs was completed, then the next important task would be to group them into different areas or categories. There had been several concepts that could be applied for KPIs grouping such as Harper (1984), Sink and Tuttle (1989), and Kaplan and Norton (2004). For this study, the Balanced Scorecard by Kaplan and Norton (2004) was adopted. It was a comprehensive framework that helped translate a company's strategic objectives into a coherent set of KPIs. The performance, according to the Balanced Scorecard, consisted of 4 perspectives; i.e., customers, financial, internal business, and innovation and learning.

Problem Statement

Given the importance of performance measurement, and the combination of science and art in using performance information, it was critical for any organization that a clarity on the issues regarding what to measure (KPIs and the performance areas or perspectives) and under what specific conditions or circumstances that they needed to be used. Based on the initial observations, one of the most difficult tasks during the firm's transitional period (i.e., a change at the high managerial position) was a lack of knowledge transfer on performance measurement that new managers needed for monitoring and evaluating the performance level. They likely had to rely their decisions on past experience and sometimes had to seek advices elsewhere. In other words, their intuition represented the source for their decisions, instead using information from performance measurement. This scenario was the great challenge for the small and medium firms when the founding members retired and subsequently their children would assume a control of business operations. To ensure this smooth transition, there was a need to develop a baseline taxonomy that would contain a specific set of KPIs with its corresponding circumstance that top managers could be expected to confront. Essentially, the experience on specific performance information needed for certain situations had to be recorded and shared. A lack of a baseline performance taxonomy potentially could result in slow responses to problems by new executives. They could take a long time to settle in with the position (although they might immediately face urgent problems). Figure 1 provides the research problem and scope.

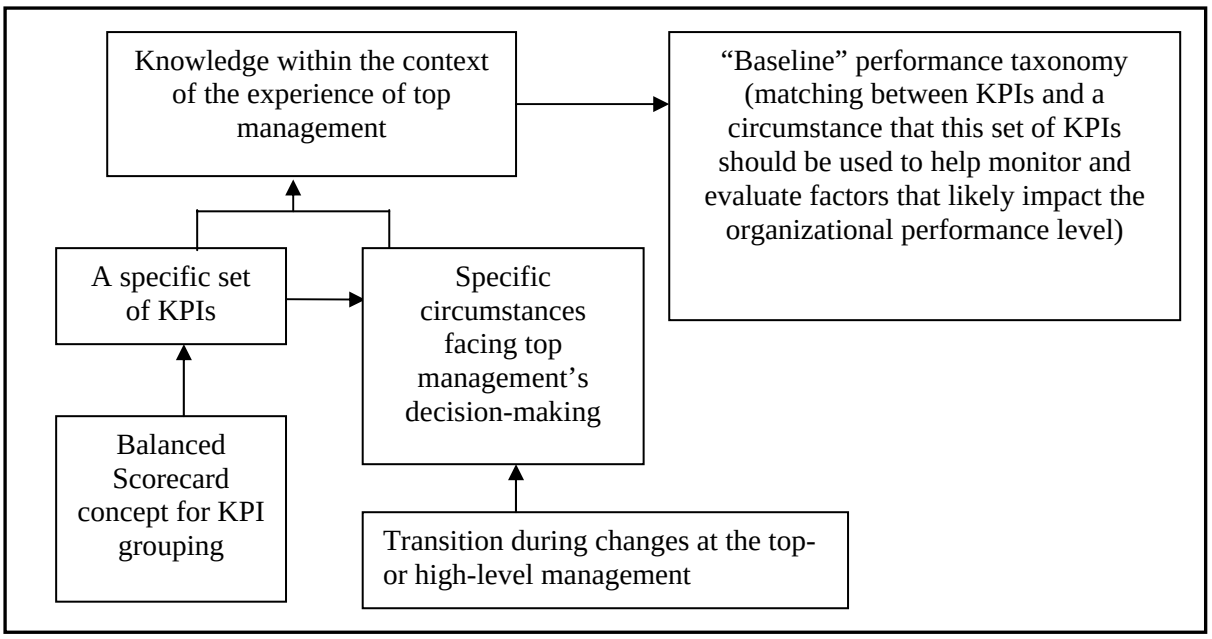

Figure 1: Research Scope

Research Objectives

There were two primary objectives of this research. They could be described as follows:

(1) It was to develop the baseline performance taxonomy to be used as a decision-making or a management tool. For this research, the taxonomy consisted of two parts. The first part was specific circumstances or situations facing top managers. They were further divided into internal and external points of view. The second part contained a specific set of KPIs that was suitable for the stated circumstance. The suitability was based on the actual frequency requested.

(2) It was to determine whether this proposed baseline taxonomy could be potentially helpful in capturing and sharing experience within an organization.

Research Methodology

There were several activities performed during the attempt to develop the proposed baseline or initial taxonomy. The task began with the identification of KPIs. See

Sink and Tuttle (1989) for more details. The next step was to categorize these KPIs

into the four perspectives according to the BSC (in reference to Figure 3 for common definitions used in this research to describe these four terms). It should be noted that these three companies shared many similar characteristics such as size, and ownership-management structure (i.e., dual roles as top managers and owners). Therefore, it was possible for these KPIs to be commonly adapted and used. In addition, these nine executives were informed about the objectives of this research, and later agreed to integrate these KPIs into their respective organizational databases. They also gave their consent that the frequency requests of KPI for reviews would be recorded. This helped ensure accuracy in the records that had to be collected. Moreover, these nine executives would assist in naming a specific circumstance (impacting their business operation) that confronted their companies during the observation period. For this study, the importance of KPIs was to be determined by the actual frequency requests recorded in the companies' databases. It was assumed that the high numbers of requests corresponds to the high level of importance. In order to develop the proposed baseline or initial taxonomy, other decisions also had to be made. The first decision was to set a criterion on the request frequency. This frequency would be used to determine important KPIs. In this study, the so-called important KPIs needed to be at the top 20% for each perspective in a circumstance. This 20% selection was made to

help avoid placing too many KPIs in each circumstance for the proposed model. The second decision was to merge or combine company-specific into common circumstances. At the same time, it was also necessary to further separate these common circumstances into internal and external points of view. As a result, the proposed model would consist of two parts according to these viewpoints.

A further analysis was required to help verify the initial results. To develop these results, other tasks had to be followed and undertaken. This was due to the fact that the competitive nature of the businesses, coupled with education background and experience of nine volunteered executives as well as their dual roles in their companies, probably influenced the early results. The first verification task was to confirm the initial results (directly from the frequency requests recorded) with the same group of nine executives. The follow-up discussion would focus on sharing and gathering the feedback on their opinions on the results' relevancy and acceptance. The second task was to conduct the individual interviews with nine invited experts on the results' usefulness. It should be noted that, originally, there were more than nine experts intended for this task. However, only nine persons agreed to provide their insights. For this study, the usefulness included the integration with other important managerial practices such as knowledge and strategic leadership management. For knowledge management, it is whether the proposed baseline or initial taxonomy successfully represented an attempt to capture and transfer experiences on what nine executives thought was necessary information to help them make quality decisions. For strategic leadership management, it was to test whether the proposed model was helpful in the areas relating to top managers such as policy formulation and strategy map. For the third task, it was to examine whether the three companies had been successful in their respective industries. It is important to note that if these three companies had in deed been successful, the confidence and credibility on the initial findings would be greatly enhanced. If a manager uses KPIs that are derived from successful companies to address a specific problem, he/ she should presumably make quality decisions that predictably result in business success. Finally, the last task involved comprehensive comparisons with other literatures to ensure that the initial findings were generally compatible or in-line with previous studies. If so, the proposed model could possibly be considered as a standard or a baseline for future use. See Figure 2 for the research process.

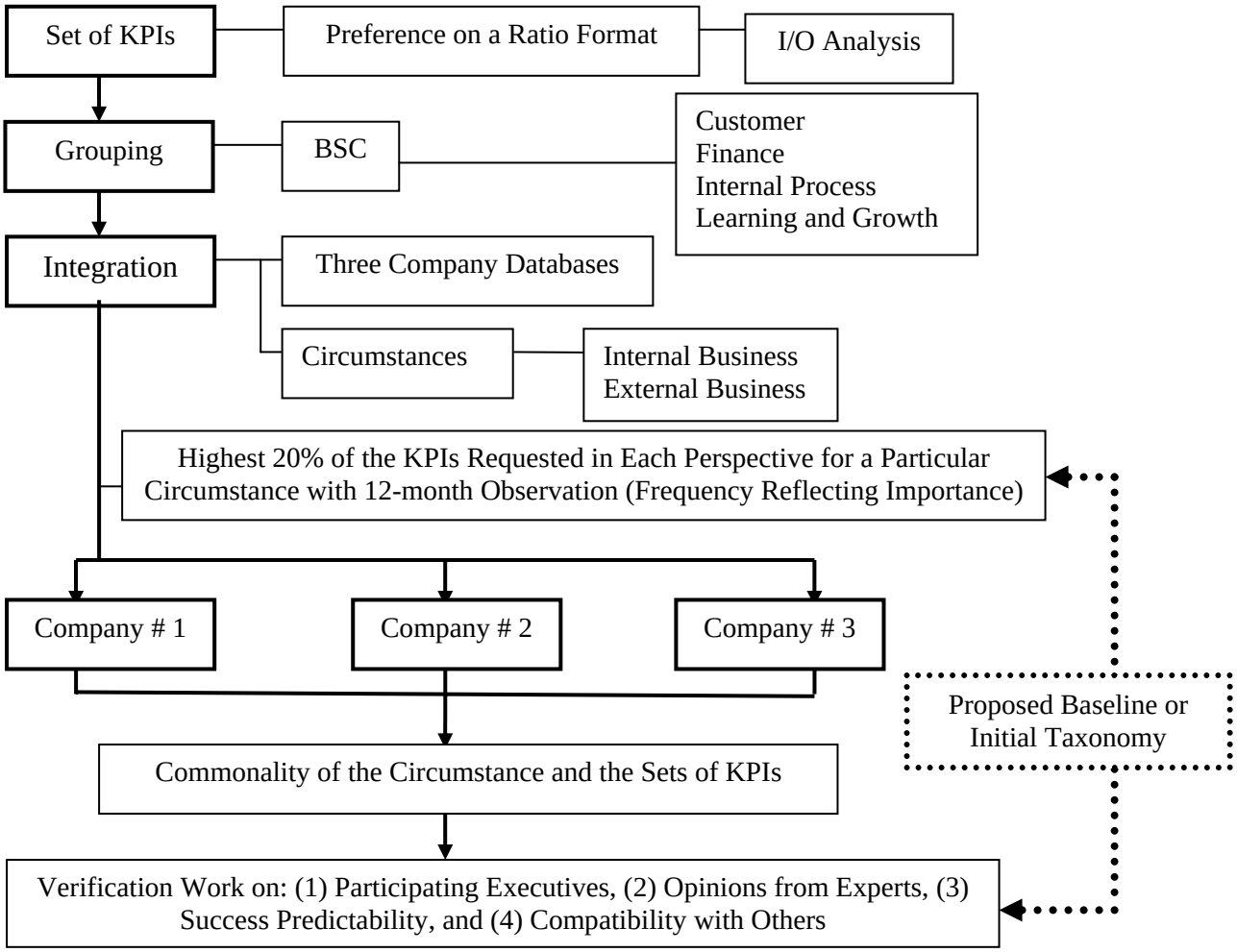

Figure 2: Research Process

Research Results and Discussion

A total of 120 KPIs were initially identified and later categorized into four perspectives— 32, 25, 43, and 20 KPIs for finance, customer, internal process, and learning/ growth respectively. At the same time, there were a total of 30 circumstances identified for the internal business point of view from three companies. It is important to note that one company did not necessarily have to face all 30 circumstances. An effort was later made to combine similar circumstances and eventually resulted in nine common internal circumstances. For the external perspective, originally, there were a total of 16 important circumstances cited, and later were combined into nine common ones. They included changes in interest rates, foreign exchange rates, and fuel or oil prices. From the verification effort, the initial result was perceived to be acceptable for providing required information to a new executive. From the scale of 1- 5, the score averages were in the range of 4.11 to 4.56 with corresponding standard deviation values between 0.33 and 0.53— reflecting high consistency. In addition, the group of nine invited experts generally considered the initial result to be useful in enhancing knowledge management effort as well as benefiting the issues relating to strategic management (e.g., a strategy map for planning). It received the overall scores in the range of 4.11 to 4.78 with the corresponding standard deviation values of 0.33 to 0.50. In regard to enhancing credibility and trustworthiness, there were three key parameters selected: (1) market position, (2)

market share, and (3) companies' previous achievement among their peers. Based on information collected from the Federation of Thai Industries and the Ministry of Industry, three participating companies were in general well- respected and always experienced business successes. Lastly, although a direct comparison on KPIs was not practical, it was necessary to scrutinize similar areas of focus. To do so, the initial result had to be further categorized into pertinent focus areas. This was conducted together with these nine executives. Then, a comparison with previous research could be made. The focus areas appear to be compatible with selected literatures. The main differences are the lack of focus of the initial result on workforce or human capital (e.g., teamwork and empowerment), time (e.g., flexibility), and environmental consideration. Simply put, at this junction, the initial result could be used for a further development of a prioritized business circumstances, and subsequently of a baseline KPIs for the 3 companies.

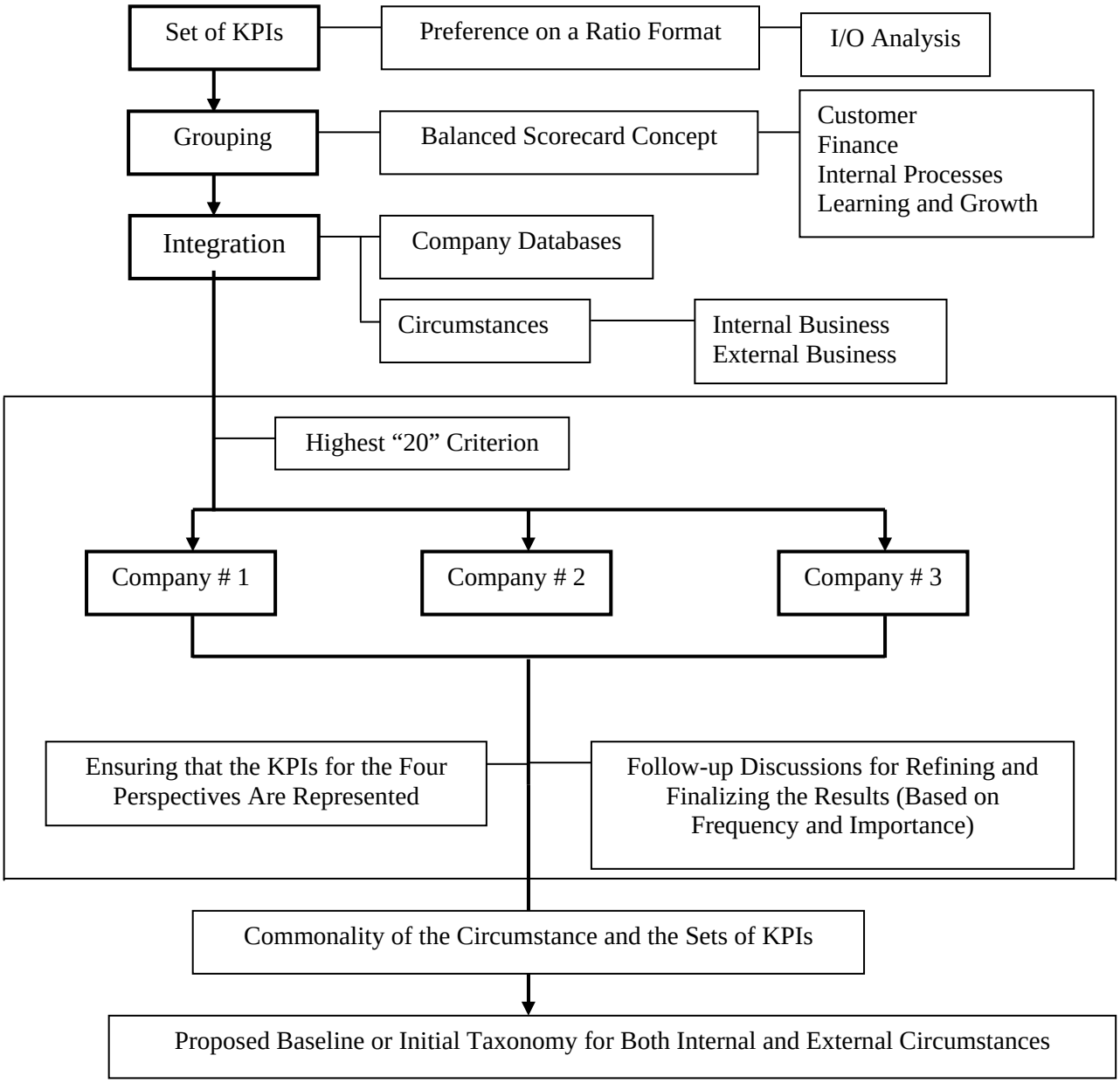

Figure 3: Research Methodology

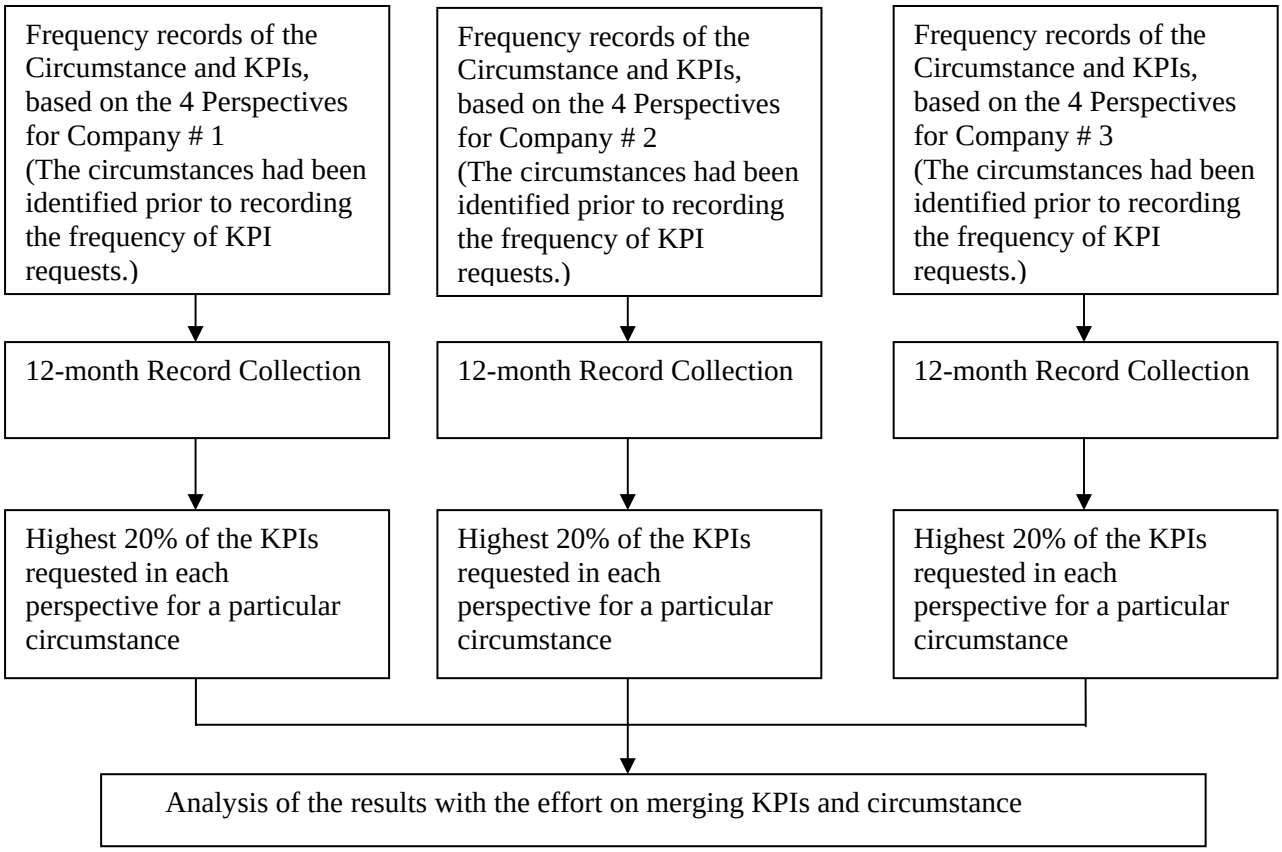

Figure 4: Details on Research's Recording Process

Table 1: Most Selected KPI, Based on the Requests Recorded by 9 Executives of the 3 Companies, During January – December 2005

Perspectives	Most Selected KPIs	Total Requests
Customer	1. Market share (%)	1,767
	2. Satisfied-customer index (%)	1,419
	3. New customers/total customers (%)	696
Financial	1. Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR) ($)	2,085
	2. Cost of Goods Sold	1,185
	3. Revenues/Employee	1,106
Internal Process	1. Total supply chain delivery performance to end customers	674
	2. On-time delivery (%)	493
	3. Percentage of new product/service development projects completed on time (%)	379
Learning/Growth	1. Investment in training/customers (No.)	454
	2. Direct communications to customers/year (No.)	412
	3. Marketing expense/customer ($)	312

Table 2: Internal Business Circumstances

#	Circumstances	Perspectives	KPIs
IC1	Material Handling, Machining, Assembly Improvement/ Problems	Customer	**C05.** Customers lost (No. or %) **C09.** Satisfied-customer index (%) **C13.** Number of complaints (No.) **C19.** Return on total assets (ROA) (%) **C24.** Cost of after-sales service ratio to turnover (%) **C26.** Return on investment (ROI) (%)
		Financial	**F10.** Revenues/total assets (%) **F12.** Revenue/Employee ($) **F19.** Return on total assets (ROA) (%) **F26.** Return on investment (ROI) (%)
		Internal Process	**IP03.** On-time delivery (%) **IP06.** Lead time, from order to delivery (No.) **IP08.** Lead time, production (No.) **IP11.** Improvement in productivity (%) **IP21.** Maintenance cost/Revenue (%) **IP25.** Total supply chain delivery performance to end customer (%) **IP26.** MTBF (Mean Time between Failure) (No.) **IP27.** MTTR (Mean Time to Repair) (No.)
IC2	Developing Advertising/ Promotion Campaign	Customer	**C01.** Number of customers (No.) **C02.** Market share (%) **C04**. New customers/Total customers (%) **C14.** Marketing expenses ($) **C23.** Advertising/Promotion cost ratio to turnover
		Financial	**F11.** Revenues from new products or business operations ($) **F12.** Revenues/employee ($) **F29.** Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR) ($)
		Internal Process	**IP10.** Inventory turnover (No.)
		Learning /Growth	**LG10.** Direct communications to customers/year (No.)
IC3	Developing Distribution Channels/ Problems	Customer	**C01.** Number of customers (No.) **C02.** Market share (%) **C04.** New customers/Total customers (%) **C09.** Satisfied-customer index (%) **C13.** Number of complaints (No.) **C17.** Average customer size ($)
		Financial	**F15.** Profits/employee ($) **F29.** Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR) ($)
		Internal Process	**IP04.** Average lead time (No.) **IP25.** Total supply chain delivery performance to end customer (%)
IC4	Sales Force and After Sales Services Improvement/ Problems	Customer	**C05.** Customers lost (No. or %) **C09.** Satisfied-customer index (%) **C10.** Customer-loyalty index (%) **C12.** Revenues/employee ($) **C13.** Number of complaints (No.)
		Financial	**F07.** Payment period (No.) **F12.** Revenues/employee ($) **F15.** Profits/employee ($) **F21.** Profit margin (%)
		Internal Process	**IP03.** On-time delivery (%) **IP25.** Total supply chain delivery performance to end customer (%)
		Learning /Growth	**LG06.** Investment in training/customers (No.) **LG08.** Investment in product support and training ($) **LG14.** Competence development expense/employee ($)
IC5	Procurement Improvement/ Problems	Customer	**C05.** Customers lost (No. or %) **C09.** Satisfied-customer index (%) **C13.** Number of complaints (No.)
		Financial	**F15.** Profits/employee ($) **F21.** Profit margin (%) **F24.** Cash flow ($) **F29.** Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR) ($) **F31.** Cost Of Goods sold
		Internal Process	**IP22**. Supplier on-time delivery (%) **IP25.** Total supply chain delivery performance to end customer (%)

IC6	Technology and Firm Infrastructure Development/ Problems	Customer	**C09.** Satisfied-customer index (%)
			C15. Brand-image index (%)
			C25. Customer payment on-time (%)
		Financial	**F19.** Return on total assets (ROA) (%)
			F20. Return on capital employed (%)
			F21. Profit margin (%)
			F26. Return on investment (ROI) (%)
			F31. Cost Of Goods sold
		Internal Process	**IP06.** Lead time, from order to delivery (No.)
		Learning /Growth	**LG02.** R & D expense/total expenses (%)
			LG20. Information coverage ratio (%)
IC7	Human Resource Improvement/ Problems	Customer	**C02.** Market share (%)
		Financial	**F13.** Profits/total assets (%)
			F21. Profit margin (%)
		Internal Process	**IP09.** Average time for decision-making (No.)
			IP30. Staff recruitment time (No.)
			IP40. Percentage of new product/service development projects completed on time (%)
		Learning /Growth	**LG06.** Investment in training/customers (No.)
			LG14. Competence development expense/employee ($)
IC8	Warehouse Improvement	Customer	**C09.** Satisfied-customer index (%)
			C10. Revenues/total assets (%)
			C13. Number of complaints (No.)
			C19. Return on total assets (ROA) (%)
		Financial	**F26.** Return on investment (ROI) (%)
		Internal Process	**IP03.** On-time delivery (%)
			IP06. Lead time, from order to delivery (No.)
			IP25. Total supply chain delivery performance to end customer (%)
IC9	Packaging Improvement/ Problems	Customer	**C02.** Market share (%)
			C09. Satisfied-customer index (%)
			C15. Brand-image index (%)
		Financial	**F03.** Current ratio (time)
			F10. Revenues/total assets (%)
			F21. Profit margin (%)
			F31. Cost Of Goods sold
		Internal Process	**IP10.** Inventory turnover (No.)

Table 3: External Business Circumstances

#	Circumstances	Perspectives	KPIs
EC1	Change in the Threat of New Entrants	Customer	**C01.** Number of customers (No.)
			C02. Market share (%)
			C05. Customers lost (No. or %)
		Financial	**F12.** Revenues/employee ($)
			F29. Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR) ($)
		Internal Process	**IP10.** Inventory Turnover (No.)
			IP11. Improvement in productivity (%)
		Learning/Growth	**LG08.** Investment in product support and training ($)
			LG16. Marketing expenses/customers ($)
EC2	Change in the Interest Rate	Customer	**C09.** Satisfied-customer index (%)
			C11. Cost/customers ($)
		Financial	**F04.** Interest expense to sales ratio (No.)
			F29. Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR) ($)
			F31. Cost Of Goods sold
		Internal Process	**IP19.** Non-product-related expense/customer/year ($)
		Learning/ Growth	**LG16.** Marketing expenses/customers ($)
EC3	Change in the Threat of Substitute Products	Customer	**C02.** Market share (%)
			C05. Customers lost (No. or %)
			C10. Customer-loyalty index (%)
		Financial	**F12.** Revenues/employee ($)
			F15. Profits/employee ($)
			F21. Profit margin (%)
			F29. Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR) ($)
		Learning/ Growth	**LG02.** R & D expense/total expenses (%)
			LG16. Marketing expense/customer ($)
EC4	Global Market Expansion Opportunities	Customer	**C02.** Market share (%)
			C14. Marketing expenses ($)

		Financial	**F12.** Revenues/employee ($) **F16.** Market value ($) **F21.** Profit margin (%) **F29.** Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR) ($)
		Internal Process	**IP43.** Ratio of employees involved in the strategic planning (%)
EC5	Change in the Bargaining Power of Buyers	Customer	**C02.** Market share (%) **C05.** Customers lost (No. or %) **C10.** Customer-loyalty index (%)
		Financial	**F12.** Revenues/employee ($) **F15.** Profits/employee ($) **F29.** Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR) ($)
		Internal Process	**IP10.** Inventory turnover (No.)
		Learning/ Growth	**LG10.** Direct communications to customers/year (No.) **LG16.** Marketing expense/customer ($)
EC6	Change in the Bargaining Power of Suppliers	Customer	**C09.** Satisfied-customer index (%) **C13.** Number of complaints (No.)
		Financial	**F15.** Profits/employee ($) **F24.** Cash flow ($) **F31.** Cost Of Goods sold
		Internal Process	**IP03.** On-time delivery (%) **IP06.** Lead time, from order to delivery (No.) **IP08.** Lead time, production (No.) **IP22**. Supplier on-time delivery (%)
EC7	Change in the Rivalry Among Competing Firms in an Industry	Customer	**C02.** Market share (%) **C04.** New customers/Total customers (%) **C05**. Customers lost (No. or %) **C10.** Customer-loyalty index (%) **C21.** Service expense/customer contact to sales response(No.)
		Financial	**F12.** Revenues/employee ($) **F15.** Profits/employee ($) **F21.** Profit margin (%)
		Internal Process	**IP25.** Total supply chain delivery performance to end customer (%)
		Learning/ Growth	**LG06.** Investment in training/customers (No.) **LG14**.Competence development expense/employee ($) **LG16.** Marketing expense/customer ($)
EC8	Change in Currency Exchange Rate	Customer	**C05.** Customers lost (No. or %)
		Financial	**F15.** Profits/employee ($) **F21**. Profit margin (%) **F29.** Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR) ($) **F31.** Cost Of Goods sold
		Internal Process	**IP19.** Non-product-related expense/customer/year ($)
EC9	Change in Oil Price	Customer	**C11.** Cost/customers ($) **C13.** Number of complaints (No.) **C24.** Cost of after-sales service ratio to turnover (%)
		Financial	**F29.** Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR) ($) **F31.** Cost Of Goods sold
		Internal Process	**IP28**. Energy saving index (%)

Research Limitations

There were several limitations that could restrict the taxonomy's applications. First of all, this taxonomy was based on the experiments with only 3 companies. They could be considered as labor- and material-intensive firms operating in competitive environment. The background of the executives who had volunteered for this study might also influence the research results. Sine they assumed the roles of both top managers as well as major shareholders, KPIs relating to the internal process, and learning and growth perspectives appeared to be less important. On the contrary, the focus of the companies' management seemed to be on the financial and customer perspectives. This could be attributed to their educational background and experience in the areas of sales and marketing. The firms that operated in different business environment might not be able to adapt the baseline taxonomy entirely. The service firms might

rely more on qualitative KPIs such as the surveys and the questionnaires for their performance information. The firms with considerable high control over the market (i.e., the supply side) would unlikely pay a lot of attention on non-financial KPIs. The large firms with a clearer separation between shareholders and managing directors might prefer a different set of KPIs altogether. Definitely, the administrators for public agencies could not simply adopt this taxonomy in its entire form. Figure 5 demonstrates some of the major research limitations.

Conclusion

The proposed taxonomy appeared to be useful as a baseline or a guideline to help monitor the performance levels. The initial reaction and feedback from the executives who had participated in this study were generally positive. The reason was that this taxonomy was based on their actual requests; therefore, it represented the transfer of their experience into the firm's records. It appears to be relevant, useful, and suitable for initiating and implementing the proposed taxonomy in an organization, and for supporting its effort on knowledge and strategic management. Nevertheless, this proposed taxonomy needed to be integrated into other management processes. It could be considered as a management tool designed to help newly- hired or –promoted executives prepare and adjust themselves into their new responsibility. Finally, additional work would still be conducted, especially in the areas discussed as the limitations. This was necessary to help further verify the usefulness of the proposed baseline taxonomy.

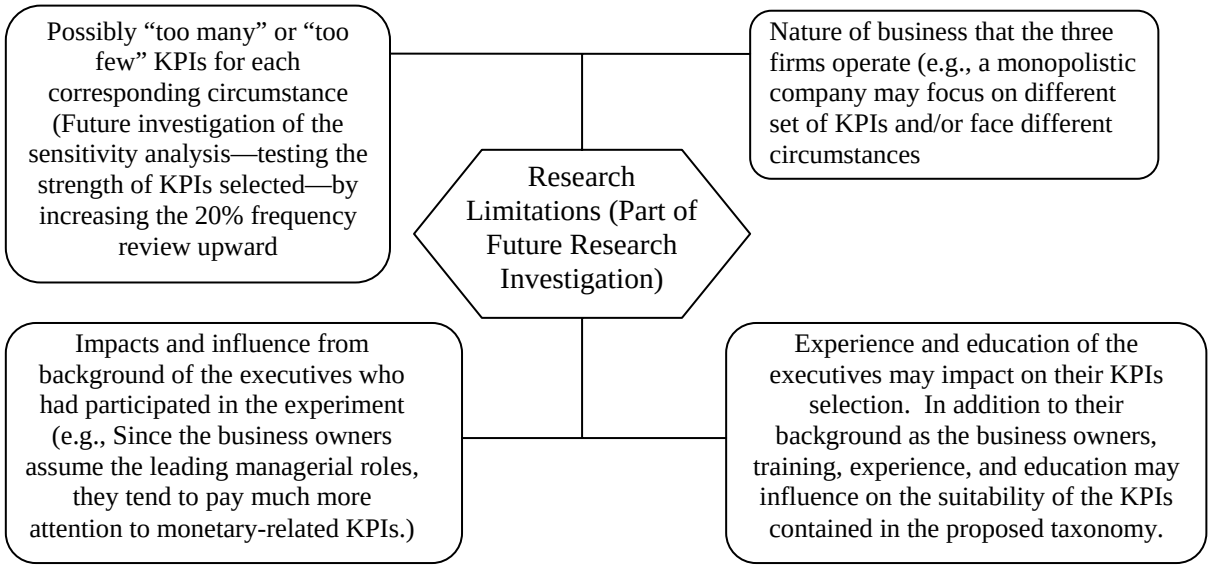

Figure 5: Research Limitations

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