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Review of Affective Factors on Performance Measurement in Supply Chain Management System (Case Study: IKCo, Iran)

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Abstract. This research try to deal with Review the performance measurement in supply chain management (Case Study: IKCO, Iran) and the main question of the research has raised as following: what are the affective factors on performance measurement in supply chain management and how will their prioritization be based on Friedman's Test? The methodology of this research is a kind of applicable descriptive – survey. Statistical population of this research is 63 related managers, top experts and experts of IKCO. After choosing the sample size, validity of questionnaire was appraised by using Cronbach's alpha coefficient that it was efficient and useful. For examining the normality of data distribution of statistical group, Kolmogorov – Smirnoff test was used. Obtained results from examination of conceptual model of research and testing of its hypotheses showed that the distribution of data in statistical group is abnormal. Ranking of examined main factors in conceptual model was conducted on Friedman test. Then for examination of level of main effective factors t-test was used.

Main words: Performance Measurement; Supply Chain Management, IKCO.

1. Introduction

Supply chains are flourish increasingly convened, from linear alignment to synchronized, multi-echelon, outward-facing networks of distributed servers. There is much more information that needs to be spied than there was just a few years ago. Most organizations lack the tools that can quickly shift through and present data coming from supply chain partners and systems. The overall performance of the supply chain significantly affects the financial health of all member organizations. Therefore, an effective supply chain performance measurement process should be able to straight address performance areas that create sustainable profitability and financial strength. In order to accomplish this requirement, the performance measurement process will need to provide a reliable indication of the contribution of supply chain operations to the areas like growth, cost minimization, working capital efficiency and fixed asset utilization. A robust and scalable performance management system is the platform for improvement. It must be exception-based and allow users to prevent problems, resolve issues, capture knowledge, and sustain improvements. The system must be able to handle an increasing number of users and amounts of information (due to expanded products, members of the supply chain, geography, and time). While it must be personalized and easy to use, it must also ensure high levels of security and privacy. Supply chain PM cycle is not just for the supply chain, but for all aspects of the enterprise as well as for the extended supply chain. Ultimately, by managing the performance of myriad processes across enterprise boundaries, organizations will have achieved the vision of Enterprise Performance Management (EPM) (Khamisabadi, 2013). In supply chain, large volumes of raw transactional data are generated by each process and stored. The challenge for many organizations lies in determining what information is necessary to drive improvements and efficiencies at each process in the supply chain, and designing an information management environment to turn the raw data into meaningful metrics and main performance indicators (MPI). Main performance indicators are measurements that straight relate to main business prescriptions. MPI come in multiple forms from simple reporting measurements to very convened, cross correlated analytic results. Information from supply chain management (SCM) processes must be collected, measured, analyzed and continuously monitored. This requires integration of data coming out of ERP (Enterprise Resource Planning), SCM and all other systems supporting these business processes. Data from transactional systems should be summarized into the Data Warehouse (DW), which should be able to scale to large sizes and be continually updated. A well designed and integrated PM framework increases the capability of business intelligence (BI) systems to provide accurate insights for effective supply chain

decision making. BI is evolving from traditional BI to pervasive BI (PBI), which enable everyone in the organization, at all levels, with analytics, alerts and feedback mechanisms. On the benefits side, PBI promises to (Parker, 2002):

- More effectively leverage the stabilities of the whole supply chain by giving every employee the power to contribute to and enhance main performance indicators that have been set by management.
- Increase sustainable competitive advantage by helping every employee to make the right decisions at the right time in step with company and customer objectives.
- Improve operational efficiency by uncovering new best exercises and driving those exercises from the bottom up as well as the top down.

2. Literature Review

Business performance management (Mittlender, 2005) describes the methods, metrics, processes and systems used in organizations to translate strategies into plans, monitor execution, and provide insight to improve financial and operational performance. It represents the strategic, integrated evolution of business intelligence to support the management process. The importance of performance measurement in the context of SCM cannot be overstated. Timely and accurate assessment of overall system and individual system component performance is paramount. An effective performance measurement system provides the basis to understand the system, influences behavior throughout the system, and provides information regarding the results of system efforts to supply chain members and outside stakeholders. In effect, performance measurement is the glue that holds the convened value-creating system together, directing strategic formulation as well as playing a major role in monitoring the implementation of that strategy. In addition, research findings suggest that measuring supply chain performance in and of itself leads to improvements in overall performance (Vriens, 2004). Despite its importance, supply chain performance often was measured in oversimplified and sometimes counterproductive (cost-reduction-based) terms (Bello, 1997). Lack of an appropriate performance measurement system has been cited as a major obstacle to effective supply chain management (Foster, 1991).

Traditionally, organizations have tracked performance based largely on financial accounting principles. Financial accounting measures are certainly important in assessing whether or not operational changes are improving the financial health of an enterprise, but insufficient to measure supply chain

performance for the following reasons (Lee, 1992):

- The measures tend to be historically oriented and not focused on providing a forward-looking perspective.
- The measures do not relate to important strategic, non-financial performance.
- The measures do not straight tie to operational effectiveness and efficiency. Most performance measurement systems are functionally focused.

Until few years ago, there were several reasons why most organizations did not implement supply chain performance measurement systems (Lappide, 2002):

1. No clear established approach or set of measures was available.
2. Software vendor products offered only a limited range of supply chain metrics.
3. Organizations were too busy with other more important initiatives.

The traditional approaches to monitoring performance had been metrics projects and balanced scorecards. In metrics projects, functional organizations and workgroups established and tracked metrics that were considered most relevant for measuring performance. Unfortunately, there were a number of limitations with metrics projects:

- By focusing on functional metrics, they ended up driving locally optimized ‖ behavior at the expense of the overall company.
- It was time consuming to compile and analyze information, so visibility often came too late to make a difference. In addition, they only provided information on limited history, not insight into the future.
- Metric tracking was manual, so numbers were often calculated incorrectly or inconsistently over time.
- Many times, workers didn't know what to do with the data. It wasn't always clear what constituted poor performance, when to act, or how to act. Or else, people were so distracted and confused by the measuring process itself that they didn't act.
- Although selected metrics were called main performance indicators, there was no feedback or validation to ensure that organizations were actually measuring the most relevant business drivers.
- Experienced managers learned how to —game‖ or— tinker with‖ the metrics to make themselves look good.

In an attempt to overcome some of these limitations, many organizations have initiated balanced scorecard (BSC) projects. Based on the methodology of Robert Kaplan and David Norton (Gintic, 2002), these organizations created a balanced set of metrics representing financials, customers, internal business processes and innovation. The goal was to enable better decision-making by providing managers with a broader perspective of both tangible and intangible assets. Although conceptually compelling, most balanced scorecards were implemented as static management dashboards, unable to drive action or performance improvement because (Kaplan and Norton, 1996):

- These dashboards are usually driven out of finance organizations, therefore are typically highly weighted by financial information. Much of the important non-financial data and qualitative information is not captured or synthesized.
- Information is often manually aggregated from operational data sources and is prone to errors and significant delays.
- Infrequent sourcing of information allows people to play tricks operationally to improve the numbers. Who hasn't heard of the manager who shipped orders early or incomplete to reduce inventory levels?
- Where there is data integration, it is often —hard-wired‖ and difficult to modify over time as strategies and objectives change. Static systems – which encourage the improvement of specific metrics, not necessarily overall business performance – become self-perpetuating due to the fact that those managers successful under the old systems do not want to introduce new ones.
- Executive-level systems are often disconnected from tactics and operations. Because the metrics are high level and presented without regard to their implicit interdependencies, managers are uncertain what action to take to improve overall performance.
- Dashboards do not track decisions and their effectiveness over time so it is difficult for organizations to improve by learning from experience. Moreover, there is no mechanism to embed business rules to help improve the decision-making and problem resolution process itself.
- There is little or no support for collaborative processes across organizations, up and down the chain of command.

The Balanced Scorecard has been successfully implemented at hundreds of organaizations, however, many organaizations still need a practical

measurement system that will enable them to improve profitability. As Kaplan and Norton state in (Hammer, 2001), the execution of the measurement system is more important than the measurement system itself. Accordingly, fewer than 10 percent of the strategies outlined on the Business Scorecard were successfully implemented. This implies that the measurement strategy must be simplified for a successful execution. 80 percent of enterprises that fail to integrate the balanced scorecard into PM methods and tools will drop the balanced scorecard and return to a less organized and less effective set of metrics (Kaplan and Norton, 2006).

3. Method

In the determination of the variables of the research (Table 1), performance measurement in supply chain management as a dependent variable has been considered. Also, General indexes, cost-based indexes, accountability-based indexes and productivity- based indexes as independent variables has been considered.

Table 1: Determination of the variables of the research

Dependent Variable	Independent Variables
performance measurement in supply chain management	General Indexes
	Cost-Based Indexes
	Accountability-Based Indexes
	Productivity-Based Indexes

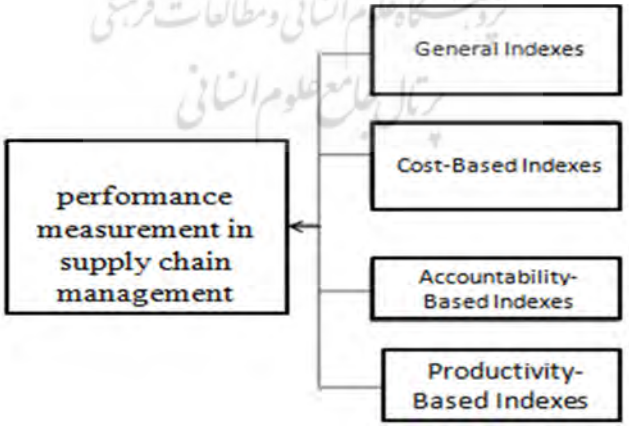

Figure 1: Conceptual Model (Khamisabadi and Kabaranzad Ghadim, 2017)

Based on the conceptual model of the research, Research hypotheses are as following:

- There is a positive relationship between general indexes and performance measurement in supply chain management.
- There is a relationship between cost-based indexes and performance measurement in supply chain management.
- There is a relationship between accountability-based indexes and performance measurement in supply chain management.
- There is a relationship between productivity-based indexes and performance measurement in supply chain management.

Findings

Statistical group of the recent research are 63 managers, top experts and experts of the IKCO.

In table 2, research participants' characteristic has shown in different working and organizational positions. This table show that about %11 are from managers and active assistants, 49% percentages from top experts and 40% from experts.

Table 2: Research participants characteristics based on their organizational position

Percentage	Abundance	Topic
11	7	Manager
49	31	top experts
40	25	Experts
100	63	Total

Instrument reliability called also as confidebility means that if an instrument made for rating a variable and trait show the same result in other similar time and place. In other word, valid or reliable instrument is an instrument that has the feature of repeatability and similar results. For assessment of questionnaire validity, Cronbach's alpha coefficient technique was used. In fact for questionnaires with multiple choice options, using of this test is suggested. This method is used for calculation of internal harmony of measurement instruments. It is said that if Alpha coefficient is more than 0.7, the test reliability is acceptable. Table 3 shows amount of Cronbach's alpha coefficient for research's variables.

Table 3: Amount of Cronbach's alpha coefficient for research's variables.

Alpha amount	Questionnaire
0.78	Performance measurement in supply chain management
0.86	General Indexes
0.84	Cost-Based Indexes
0.72	Accountability-Based Indexes
0.73	Productivity-Based Indexes

As we can see in table 3, amount of Cronbach's alpha coefficient for all variables is more than 0.7. It means that questionnaire reliability is confirmed. In this part of research, research's findings about investigating the effective factors on performance measurement in supply chain management and its results. In this part it was tried to assess the research's hypotheses in accordance with research's methodology and goals. This test was used for investigation of normality of data distribution in statistical group. This test results have been provided in table 4.

Table 4: One-Sample Kolmogorov-Smirnov Test

		Main factor 1	Main factor 2	Main factor 3	Main factor 4
N		63	63	63	63
Normal Parameters[a,b]	Mean	3.219	3.552	3.186	3.944
	Std. Deviation	0.6717	0.7368	07391.	0.7411
Most Extreme Differences	Absolute	.085	.073	70.8	.082
	Positive	.063	.061	.055	.068
	Negative	-.071	-.088	-.072	-.075
Kolmogorov-Smirnov Z		1.022	3.811	3.718	3.861
Asymp. Sig. (2-tailed)		.048	.033	.035	.038

As it can be seen in table 4, standard error of measurement for variables is less than standard error of measurement for the research. So the null hypothesis about normality of data distribution in statistical group was rejected. Therefore, non-parametric statistics was used for analysis of data.

Table 5: Friedman test

N	63
Chi-Square	36.471
Df	3
Asymp. Sig.	.000

As was shown in table 5, significance of the research is less than amount of research's error (0.05), so null hypothesis about similarity of variables' priority is rejected.

Table 6: Results of applying Friedman test

Final ranking	Ranking average	Affective Factors
1	4.27	General Indexes
3	3.81	Cost-Based Indexes
2	4.08	Accountability-Based Indexes
4	3.55	Productivity-Based Indexes

Based on results of table 6, general indexes has the most effect on performance measurement in supply chain management (Case Study: IKCO).

Table 7: result of applying Binominal test

Test result	Sig	Test ratio	Observed ratio	Research's *variables*
فصخ				
Suitable	0.000	0.6	0.83	Performance measurement in supply chain management
Suitable	0.000		0.76	General Indexes
Suitable	0.000		0.81	Cost-Based Indexes
Suitable	0.000		0.86	Accountability-Based Indexes
Suitable	0.000		0.73	Productivity-Based Indexes

Result of using this test showed that all factors of research are in a suitable level.

Conclusions

Supply chain performance measurement is vital for a company in order to survive in today's competitive business environment. Supply chain performance measurement should be a business-critical process, driven by metrics and supported by business intelligence. With increasing competition and changing market forces, tapping into this critical asset is essential in sustaining competitive advantage in the global space. we can summarize the results of this research as follows:

- Amount of Cronbach's alpha coefficient for all variables is more than 0.7. It means that questionnaire reliability is confirmed.

- The null hypothesis about normality of data distribution in statistical group

was rejected. Therefore, non-parametric statistics was used for analysis of data.

- Based on Friedman Test, general indexes has the most effect on performance measurement in supply chain management (Case Study: IKCO).

- Based on Binominal Test, Result of using this test showed that all factors of research are in a suitable level.

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