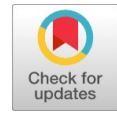


# Key Performance Indicators On Supply Chain Performance Measurement In An Electronic Commerce: A Literature Review

Wahyu Oktri Widyarto, Mohamad Jihan Shofa, Nugraheni Djamal



**Abstract:** *Based on the information and communication technology revolution are characterized by Internet usage in various fields, the business environment also does changing by applying the concept of Electronic Commerce (e-commerce) on its process. Like business activities in general, e-commerce also requires the involvement of various parties, which are referred to Supply Chain Management (SCM). The challenge is while the Supply Chain (SC) performance measurement, that generally conducted in the company with non e-commerce, applied on e-commerce business process. Otherwise, only a few literature studies discuss partially dimension of performance measurement in e-commerce. Therefore, it is important to conduct a literature study about key performance indicators (KPIs) for measuring SC performance in e-commerce dimensions, and it would be explained in this paper. The contribution of this paper proposed the KPIs' that could be used for measuring SC performance in an e-commerce business process in order to be a new approach on the development of SC performance measurement models.*

**Index Terms:** *e-commerce, KPIs, literature review, SC performance measurement.*

## I. INTRODUCTION

Along with the rapid development of information technology, one of which is marked by the utilization of the internet in various fields, the business world has also made a change by applying the e-commerce concept to its business processes. As conveyed by [1]–[3], that web and the Internet have an effect on the company in building its business. The rapid development and use of the Internet and the web have brought about the concept of e-commerce marketing where transactions between consumers and companies are done virtually [4], [5]. Many companies adopt the e-commerce concept in the face of global competition [3].

The importance of the role of all parties from suppliers, manufacturers, distributors, retailers, and customers in creating cheap, quality, and fast products is what creates a new concept of Supply Chain Management (SCM) [6]. SCM consists of all parties involved directly or indirectly in meeting the consumer's wishes [7]. As with business

activities in general, business activities with e-commerce also require the involvement of various parties. Reference [4] states that effective and efficient SCM is essential to support the success of companies involved in e-commerce.

As a basic information to determine the supply-chain performance, the supply chain performance measurement needs to be done considering the presence of various parties in the supply chain network [8]–[11]. The existence of supply chain performance measurement enables the supply chain to manage strategically and continuously to achieve its goals [12]. Measurement of supply chain performance can be the basis of control, communication and company strategy to improve operational [13].

Measurement of supply chain performance needs some performance indicators called Key Performance Indicators (KPIs) [14]. Determination of KPI on measurement of supply chain performance needs to be tailored to company goals. The challenge faced in measuring supply chain performance is determining KPIs based on company strategy goals, determining how to measure and determining how to implement them [15]. Related to that, it is necessary to identify the KPI used for measuring supply chain performance in e-commerce. The discussion on the measurement of supply chain performance has been done. The challenge is while the Supply Chain (SC) performance measurement, that generally conducted in the company with non e-commerce, applied on e-commerce business process. Otherwise, only a few literature studies discuss partially dimension of performance measurement in e-commerce. References [13], carried out a performance measurement on the food supply chain. References [16], determines the KPI to evaluate the implementation of Radio Frequency Identifier (RFID) as a technology application in SCM. E-commerce performance measurement in terms of logistics is carried out by [4]. E-commerce performance measurement reviewed from aspects of information systems by [2]. References [17], identified performance indicators to measure supply chain performance on e-commerce based on logistics capabilities. References [15], states that performance measurement is very important in managing a supply chain effectively, especially in e-commerce and virtual enterprise. Therefore, it is prominent to identify KPIs from various aspects for measuring supply chain performance in e-commerce, and that will be discussed in this paper through literature study. The contribution that can

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be given from this paper is KPI's proposals from various aspects that can be used for measuring supply chain performance in e-commerce business processes that are expected to be a new approach in the development of the supply chain performance measurement model.

## II. LITERATURE REVIEW

### A. Measurement Of Supply Chain Performance

Performance management and continuous improvement are an important aspect of SCM. There is a need for a measurement system that can be the basis of overall SC performance evaluation [18]. Performance measurement can be defined as an act of measuring an effectiveness and efficiency of a process [11], [15], [19]. Reference [20] states that performance measurements are performed to measure the effectiveness of the strategies used in the supply chain and to identify opportunities in the future. Improved supply chain performance is an ongoing process that requires two aspects of analytical performance measurement system and mechanisms to achieve KPI goals [21]. Measurement of supply chain performance can be a facilitator for mutual understanding and integrating supply chain members [22].

The purpose of performance measurement in SCM is to obtain information on activities that are not in line with the objectives and to determine the plan of action that can be done. The main advantage of the supply chain performance measurement system is to provide a framework for information on business performance [8]. Many metrics are used in supply chain performance evaluations designed to measure operational performance, evaluate effectiveness levels and test overall SCM strategies [21]. While [14], states that the measurement of supply chain performance can be done with various approaches, techniques, criteria and metrics based on the supply chain strategy.

Reference [7], using the Supply Chain Operation Reference (SCOR) model in measuring supply chain performance by applying a process-based approach. Supply chain performance can be categorized into five supply chain processes: plan, source, make, deliver and return or customer satisfaction that will measure cost, time, flexibility and innovative quality, also qualitative and quantitative measures [23], [24]. Performance measurement based on cost and non-cost perspective, strategy perspective, tactical, and operational focus has been studied by [25]. Based on the system approach, [14], categorizes the supply chain performance measurement into perspective approaches, process approaches, and hierarchical approaches. Measurement of supply chain performance in an individual usually uses four categories: quality, time, cost and level of flexibility [21].

### B. Electronic Commerce (E-Commerce)

E-commerce is the use of inter-network computers to create and modify business relationships. E-commerce is also expected to provide a simpler and more efficient way to complete business transactions [1]. In general, business transactions occur between sales and purchase of information, products, and services via the internet [1], [5], [26]. While according to [2], e-commerce is the use of the internet to facilitate, process, and carry out business

transactions. E-Commerce requires a new logistics approach. Generally, logistic activities take place are small order sizes, increased volume of daily orders, small packet delivery, and day delivery. However, to ship goods to the front door of the customer on time is a complex task. The success of the company in e-commerce depends on the efficiency of the company's distribution network [4]. E-commerce can impact on marketing, customer service, and supply chain efficiency. This is because e-commerce can open new markets, lower costs, and more business competition. Therefore, e-commerce can make the company easy to understand consumer desires and can provide fast and accurate service to consumers. With the internet, e-commerce also enables companies to develop and enhance cooperation with suppliers [27].

E-commerce is a new phenomenon in the business and will be redefining the business world rapidly. To manage and make decisions in e-commerce, organizations or companies need to know the essential aspects of e-commerce architecture [28]. The e-commerce component consists of: [5]

1. Electronic Data Interchange (EDI), i.e the exchange of computer data between departments within the organization of a structured and computerized information.
2. Digital Currency, a facility that users can use to make their money electronically.
3. Electronic Catalogs, which is the main component of e-commerce that provides information on products and services offered.
4. Intranet, which is a collection of web sites owned by a group and accessible only by members of the group.
5. Extranet, which is a particular part of the intranet that can be accessed by a specific authorization by a party outside the intranet group member.

E-commerce develops in a variety of ways in business environments, including Business to Customer (B2C), Business to Business (B2B), Business in Business (BIB), and Customer to Customer (C2C). Generally, most e-commerce is formed by the B2B concept [29]. Technological innovation has led to the development of various theories associated with the diffusion of information technology and information systems [30].

## III. METHODOLOGY

In this literature study, identification of performance measurement characteristics will be adjusted between the supply chain and e-commerce through research exploration. Reference [31] states that the purpose of conducting research expositions is to get the initial idea of a topic, to get the basis for detailed research development, to improve the technique of existing ones. The methodology in the study of this literature is to collect scientific articles in journals and proceedings both national and international. The scientific articles collected are regarding the measurement of supply chain and e-commerce performance. Search keywords used are supply chain performance measurement, supply chain and e-

commerce. The scholarly articles that have been acquired hereafter are grouped into a supply chain performance measurement group and e-commerce group. This grouping is done to facilitate the sorting of unsupported scientific articles to conduct literature studies on the measurement of supply chain performance on e-commerce. Whereas for scientific articles that are appropriate to the study will be reviewed to get the relevant theories to the topic of this study. Some matters are considered in selecting scientific articles such as title, abstracts, keywords, and topics (supply chain and e-commerce).

Identification of KPIs is carried out by reviewing scientific articles in which performance measurement on e-commerce is generally still tend to be done partially on different dimensions of each. From these sources or scientific articles, it is then compiled into a KPI proposal that can be used in the measurement of supply chain performance in e-commerce and is expected to be a new approach in the development of the supply chain performance measurement model.

**IV. RESULT**

Based on literature studies that have been conducted, some literature has shown the results of e-commerce performance measurement with different indicators. In this paper, KPIs are identified from various measurement indicators. The literature study that produces KPI as a proposal in the development of the supply chain performance measurement model is shown on the table 1.

**Table1. Proposal of KPI Measurement of Supply Chain Performance On E-Commerce**

No	Indicator	References
1	Improvement in profitability	[1], [2], [27], [32]–[38]
2	Increase in sales	[1]–[3], [26], [27], [33]–[36], [39]
3	Return on investment	[2], [32], [34], [36], [40], [41]
4	Reduction of operational costs	[1]–[3], [29], [36], [41]
5	Pre-Sale Customer service	[1], [2], [4], [40], [42]
6	After-sales service	[1], [2], [4], [32], [40], [42]
7	Delivery speed	[1], [2], [4], [32], [33], [39], [40], [42]
8	Delivery reliability	[1], [2], [4], [33], [39], [43], [44]
9	Responsive to target market	[1], [2], [4], [5], [27], [37], [45]
10	Low distribution costs	[4]
11	Inventory management	[1], [5], [27], [40], [43], [44], [46]
12	Payment process	[1], [42]
13	Order tracking	[1], [43], [44],

	status	[46]
14	Ability to share information with suppliers and partners	[1], [2], [4], [26], [33], [34], [38], [40], [44], [47]–[51]
15	Booking system	[1], [4], [44], [52]
16	Infrastructure of information technology	[1], [2], [3], [5], [28], [34]–[39], [41], [45], [46], [52], [53]
17	Ease of use of web site	[1], [2], [26], [34], [36], [46], [47], [52], [54]
18	Web site design	[1], [2], [4], [5], [26], [34]–[36], [41], [47], [51], [52], [54]
19	Electronic Data Interchange	[32], [39], [46], [47]
20	Data Consistency	[4], [32], [38]
21	Human Resource Skills on IT	[3], [28], [30], [34]–[37], [41], [45], [52], [53]
22	Information system security	[2], [29], [34], [36], [39], [42], [46], [52]
23	Internet service provider	[1], [28], [37], [39], [45], [47]
24	Information technology investment	[1], [3], [28], [30]
25	Ability to share information with internal parties	[1], [4], [26], [33], [34], [38], [40], [44], [47]–[50]

**V. CONCLUSION**

Measurement of supply chain performance is important in efforts to improve operational effectiveness. This is because the results of performance measurement can be considered in making plans and strategies of corrective actions, especially in e-commerce as a growing business concept in the business world in the face of the challenges of information technology development that is rapid and influential in the increasingly competitive business competition.

Based on the literature review, it can be shown that many factors can be a variable in the measurement of the supply chain performance on e-commerce. The KPIs identified in the literature review are the combination of various measurements indicating that performance measurements on e-commerce are likely to still be partial in each dimension. Therefore, development of the supply chain performance measurement concept in e-commerce is still needed, which integrates various dimensions of measurement.

Several matters can be recommended for further research are:

1. Conducting a validation of KPIs that have been proposed in measuring supply chain performance in e-commerce.
2. Conducting a wider and deeper exploration to develop a supply chain performance measurement KPI on e-commerce that can complement the identified KPIs.
3. Conducting a measurement of supply chain performance on e-commerce with various approaches such as SCOR, Analytical Hierarchy Process (AHP), and others.
4. Developing a supply chain performance measurement model on e-commerce with various dimensions of measurement.

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