Computers in Industry 82 (2016) 135–150

Contents lists available at ScienceDirect

Computers in Industry

journal homepage: www.elsevier.com/locate/compind

Review of supply chain performance measurement systems: 1998–2015

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ARTICLE INFO

Article history:
Received 21 October 2015
Received in revised form 30 May 2016
Accepted 4 July 2016
Available online xxx

Keywords:
Supply chain management
Performance measurement systems
Models
Frameworks

ABSTRACT

In today's competitive business environment, supply chain performance is one of the most critical issues in various industries. It is argued that supply chain performance measurement is fundamental to efficient supply chain management. Over the past two decades, several frameworks and systems have been developed to meet this need. This study reviews the literature in the field of supply chain performance measurement and assembles an overview of those systems, approaches, techniques and criteria. For this purpose, 83 of 374 related articles from 1998 to 2015 were selected for final review using the Scopus and ISI databases. Findings disclose that performance measurement in supply chain contexts is still a fruitful area of research. The study also provides an overview of the performance measures employed in supply chain systems. These findings present a solid basis for future academic and practitioner work in the field of supply chain performance measurement.

Contents

1. Introduction

Supply Chain Management (SCM) has received a substantial amount of attention from academics and practitioners in the past few years [114]. Supply chains (SCs) are involved in the entire product life cycle, from material procurement to manufacturing to

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http://dx.doi.org/10.1016/j.compind.2016.07.002
0166-3615/

distribution, customer service and eventually the recycling and disposal of the product [54]. During recent years, the focus has shifted from the manufacturing management level (internal business processes) to the enterprise management level of SCs [56]. Businesses today have fewer boundaries because of globalisation, outsourcing, information technology (IT) and the incremental needs of integration [42]. These new elements in the business environment have provided an urgent motive to develop new perspectives of managerial functions. Consequently, these new managerial perspectives require adequate performance measures and metrics to enhance SC efficiency [94]. As a fundamental managerial tool, performance measurement enables managers to succeed in managing the SC in an efficient way i.e. it provides the support required for performance enhancement as a means to achieve SC excellence [22]. Effective SCM is fundamental to the company to maintain sustainable competitive advantage; for that to be achieved, performance measurement for the whole SC is necessary [61].

An organisation's performance measurement system (PMS) has a significant role in managing businesses, and SCs. Kaplan and Norton [65] state: 'No measures, no improvement'. It is vital to measure the right thing at the right time in SCs to allow timely decisions to be taken. Frequent drawbacks in a PMS could be summarised as the lack of connection between organisations' strategies and the measurements used, the lack of linking measures to customer value, the biased concentration on financial metrics and the existence of several conflicting performance measures [24]. Furthermore, performance measurement criteria should be based on business objectives and have a clear definition of purpose and scope to focus on suitable data collection and calculation methods [92]. There are different purposes for developing a PMS in SCs, such as to identify success, identify whether customer needs are met, understand business processes, provide factual decisions, enable progress, track progress and identify bottlenecks, waste, problems and improvement opportunities [55]. Accordingly, consideration of the SC as a whole is very significant when designing a supply chain performance measurement system (SCPMS).

Gunasekaran and Kobu [55] highlight the rareness of review papers on performance measures and metrics in supply chains. SC performance has been presented from different perspectives according to the researcher's unique vision of what SCM is about [84,52]. The majority of studies reviewing the literature in SC performance concentrate on one or some parts or key processes of SCs. On the other hand, few investigate the performance of SCs as a whole. An overview of the different performance metrics and measures across SCs has been provided by Gunasekaran et al. [57]. Shepherd and Gunter [106] have prepared a critical analysis of SCPMSs and proposed a taxonomy of performance metrics. Another attempt has been ventured by Gunasekaran and Kobu [55] to determine the key performance metrics in SCs. They aimed to select performance measures that provide sensible accuracy with minimal cost. Another review work has been performed by Cuthbertson and Piotrowicz [40] with the aim of identifying, categorising and comparing SC measures, metrics and their benefits. Arzu Akyuz and Erman Erkan [6] have reviewed research in the areas of SC, IT and performance measurement to establish a wide perspective covering different aspects, such as people, technology and processes. Najmi et al. [82] have reviewed articles that consider SCs as whole entities to identify prevalent approaches and techniques adopted in the models. However, the metrics have not been discussed and articles published after 2010 have not been included.

SCM has been broadly practised by many organisations; therefore, there is a need for a comprehensive review to reflect performance in new business environments. This article reviews SCPMSs, models and frameworks developed in certain databases, such as ISI and Scopus, from 1998 to 2015 and surveys the applied approaches, techniques and performance measurement. This research is bound to prompt more interest in the area of performance measurement in SCM. The organisation of the paper is as follows. Section 2 describes the methodology used to conduct the review. The approaches applied in advancing SCPMSs are discussed in Section 3. Section 4 provides an overview of the techniques used in SCPMSs. A discussion on the most applied approaches, techniques and criteria in SCPMSs and their limitations is presented in Section 5. Finally, Section 6 concludes the paper and ends with a few significant suggestions for future research directions.

2. Review methodology

The literature survey was conducted using the ISI Web of Knowledge and Scopus online databases to select the qualified articles. Due to the fact that SCM is a relatively new topic, the review was limited to the period between 1998 and 2015. Initial keywords, such as 'supply chain measurement', 'supply chain performance', 'supply chain measures' and 'supply chain systems' were searched for in the above mentioned databases to obtain a list of articles within our research scope. A total of 374 articles were identified. First, identical papers retrieved from different databases were eliminated. In the preliminary search process, non-referred articles, such as notes, reports and book reviews, were excluded from the research. Titles and keywords of the identified papers were reviewed for further filtration. Finally; the abstracts and conclusions of the remaining articles were surveyed to remove unrelated articles. The review methodology is illustrated in Fig. 1.

The bibliographies of the articles were investigated to assure that the most important SCPMS articles were selected. Eventually, the review in this study came to be based on 83 articles from major journals. The distribution of these papers with respect to journals is provided in Table 1.

The purpose of this review paper is to classify the literature to gain detailed comprehension of SC performance measurement systems, approaches, and techniques as well as to gain insights into various PMSs to enhance the SC decision making process. It is significant to mention that the term "approach" in this paper refers to a methodical arrangement of ideas or activities designed to manage SC performance measurement. While the term "technique" refers to a practical methods or tools used in developing SC performance measurement systems. Furthermore, the following criteria were adopted to justify the procedure for this extraction:

- SC performance measurement systems, frameworks and models.
- Approaches of SCPMSs.
- Techniques of SCPMSs.
- Performance measurement criteria of SCPMSs.

In brief, papers that have comprehensively dealt with SC performance measurement and fulfilled any of the above criteria have been included in this research. This has yielded the most relevant 83 papers from a pool of 374 papers that fit the scope of this article. The detailed classification of the 83 final selected articles with respect to author, title, approach and technique are shown in Appendix A.

3. Approaches

There have been relatively few endeavours to categorise SC performance measurement systems/frameworks/models in a systematic way. Furthermore, there has been a discussion in the literature regarding the most adequate method to classify them.