Pertanika J. Soc. Sci. & Hum. 25 (S): 175 - 190 (2017)

PERTANIKA JOURNALS

SOCIAL SCIENCES & HUMANITIES

Journal homepage: http://www.pertanika.upm.edu.my/

Synthesising Supply Chain Processes based on GSCF Framework

Mohsen Mohammadi[1]* and Muriati Mukhtar[2]

[1]Computer department, Esfarayen University of Technology, Esafarayen, 9668195, Iran
[2]Information Science and Technology, Universiti Kebangsaan Malaysia, 43600 Banig, Selangor, Malaysia

ABSTRACT

This paper compares and discusses six most important reference models and frameworks (SCOR, GSCF, VRM, CPFR, ISA95, SAP) in the domain of Supply Chain Management (SCM) to support different stages of supply chain information system. The results show that GSCF is a comprehensive SCM framework that facilitates identification of business and process areas as well as key activities in supply chain processes. Moreover, GSCF includes all types of business functions in association with the main supply chain processes, such as finance, marketing and R&D. The GSCF focuses on the relationship between suppliers and customers, addresses the inter- and intra-organisation processes in SCM transparently and efficiently. The purpose of this paper is to synthesise the supply chain processes based on the GSCF framework. A description of essential sub-processes and activities, included in GSCF, is also presented.

Keywords: Global Supply Chain Forum (GSCF), supply chain information system, supply chain process, reference model

INTRODUCTION

According to Lambert and Cooper (2000), supply chain is not a chain of B2B relationships but a network of several businesses. This relationship is referred to as Supply Chain Management (SCM). A supply chain is defined as a chain of organisation which are linked upstream and downstream and their diverse activities and processes that produce value in the form of services and products for the end-customers (Christopher & Martin, 2005). Nowadays, with the development of new patterns for business such as e-business and virtual organisations, many enterprises have resorted to an amalgam of integrated planning and new supply chain process

ARTICLE INFO

Article history:
Received: 15 September 2016
Accepted: 30 December 2016

E-mail addresses:
mohsen@esfarayen.ac.ir (Mohsen Mohammadi),
mm@ukm.my (Muriati Mukhtar)
* Corresponding author

ISSN: 0128-7702

(Shapiro & Jeremy, 2007) which requires tools, reference models, and methodologies. Dijkman, Vanderfeesten, Irene, and Reijers and Hajo (2011) evaluated different business approaches and found that reference model-based is a more effective approach in process architecture, in terms of 'ease of use', 'usefulness', and 'popularity' in the domain of Business Process Management (BPM). Therefore, reference model is the most appropriate approach, leading to better design,. As a result, several reference models have been developed for modelling and implementing business process in supply chain, which support different stages of information system development (Verdouw, 2010; Verdouw, Beulens, Trienekens, & Van der Vorst, 2011). The next section discusses the different reference models and frameworks in the domain of SCM. Section 3 illustrates GSCF framework and syntheses of supply chain processes based on GSCF framework. The last section concludes the paper.

Supply Chain Reference Models

This section provides an overview of existing SC reference models and frameworks, which have been broadly applied in the past years in the domain of SCM, which support supply chain information systems. The reference models are used for the designing and development of software components while supporting different stages in the development of information systems, including requirement engineering, design, and implementation (Verdouw, Beulens, Trienekens, & Verwaart, 2010). The major purpose of the requirement engineering (RE) is to elicit and document business requirements. RE comprises three areas, namely requirement elicitation, requirement evaluation, and requirement specification (Kurbel & Karl, 2008). In the development of information systems, process models are the first and essential artefacts that are concerned with the documentation and communication to stakeholders (Dehnert, Juliane, & Van Der Aalst, 2004; Reijers, Hajo, & Mendling, 2011). In the first stage, requirements should be defined via modelling business process (Wolfer et al., 2010). In the domain of supply chain, the reference models and frameworks which support different stages of information system development (Requirement, Design, and Implementation) (Verdouw, 2010; Verdouw et al., 2011) consist of Supply Chain Operation Reference (SCOR) (Council, 2008, 2010), Global Supply Chain Forum (GSCF) (Lambert, García-Dastugue, & Croxton, 2005), Value Reference Model (VRM) (Value-Chain-Group, 2007), Collaborative planning and Forecasting & Replenishment (CPFR) (VICS, 2004), International Society of Automation (ISA-95) (ISA-95, 2005), and System and Application Products reference model (SAP)(Curran, 1999).

Supply Chain Operation Reference (SCOR) model was developed by the Council of Supply Chain Management in 2005 as a cross-industry to represent business activities and processes of the supply chain (Council, 2008, 2010) that can be used in the requirement stage of

IS development (Verdouw et al., 2010). It (SCOR) includes five business processes: Plan, Source, Make, Deliver, and Return that can be implemented at four operational levels: Level 1 defines the number of supply chains and performance metric; Level 2 provides definition for the planning and execution process in material flow; Level 3 is the process element that defines the inputs, outputs, and information flow; and Level 4 provides the implementation details for supply chain processes (Lambert et al., 2005). However, SCOR does not have specification level in details (Chandra & Charu, 2008). As a result, SCOR focuses on production strategy rather than on SCM strategy (Stavrulaki, Euthemia, & Davis, 2010).

The GSCF is a supply chain framework founded on eight key business processes in which each business process is managed by a cross-functional team, including representatives from logistics, production, purchasing, finance, marketing, and R&D (Lambert et al., 2005). The eight key business processes are as follows: (1) Customer Relationship Management; (2) Supplier Relationship Management; (3) Customer Service Management; (4) Order Fulfilment; (5) Demand Management; (6) Manufacturing Flow Management; (7) Product Development; and (8) Commercialization and Returns Management (Lambert, 2008; Lambert et al., 2005). The GSCF framework is cross-firm and cross-functional which deals with production, R&D, logistics, marketing, purchasing and finance(Lambert et al., 2005; Verdouw et al., 2010). It defines the corporate strategy in SCM and links the strategy to the business processes (Lambert et al., 2005), and supports the requirement stage of IS development (Verdouw, 2010).

The VRM which similar to SCOR, is used to specify supply chain processes in Strategic, Tactical, and Operational levels (Verdouw et al., 2011). It contains process models and metrics, focusing on planning, governing and execution of activities for logistics, product development, and commercial processes (Value-Chain-Group, 2007; Verdouw, 2010). Further, VRM supports requirement stage in IS development based on Federated Enterprise Reference Architecture (FERA) (Verdouw et al., 2010). However, VRM is limited to information flow and the value of the information (Heinzel & Herbert 2005). Moreover, VRM does not support key supply chain processes and activities, for instance, it does not include Return Management Process (Kirikova, Marite, Buchmann, Robert, & Costin, 2012). The CPFR provides a general framework, focusing on Demand & Supply Management, Strategy & Planning, and Execution and Analysis (Verdouw et al., 2010). The framework contains process and data models that can support design stage of IS development (Verdouw, 2010). Nevertheless, the framework does not identify major business processes in SCM; it addresses, in fact, four supply chain processes including supplier-managed inventory, conventional order management, co-managed inventory and retail Vendor Managed Inventory (VMI)(Verdouw, 2010).

Further, the primary focus of CPFR is the relationship between buyer and supplier (Trienekens, Hvolby, Steger-Jensen & Falster, 2008).

The ISA-95 addresses the exchange of data within enterprise systems (planning, and production management systems) (Hvolby, Hans-Henrik, & Trienekens, 2010), including a number of components such as manufacturing operations & control, and business planning & logistics (Verdouw et al., 2010).The ISA-95 standards are based on four functional levels: Level 1 for production process; Level 2 for continuous and discrete control; Level 3 for manufacturing operations management; and finally Level 4 for business planning and logistics (Hvolby et al., 2010). It can be used in the design stage of IS development (Verdouw, 2010), but the scope of ISA standard is limited to describing the function, the domain and control of an enterprise (Hvolby et al., 2010). SAP Production Solution Center developed SAP-ERP to support process and application in SCM (Heidasch & Robert, 2007) that boost implementation stage of IS development (Verdouw et al., 2010). A business process reference model of SAP is SAP/R3 that uses Event-driven Process Chain (EPC) in ARIS toolset (Tscheschner & Willi, 2006). Nonetheless, SAP/R3 cannot address every perspective for supporting entire supply chain processes, for example, the relationship between suppliers (SRM) (Heidasch et al., 2007). Moreover, SAP is primarily focused on implementation of ERP and consolidates every detail in which the models are focused on one single enterprise (Verdouw, 2010). An overview of the aforementioned reference models is provided in Table 1. This table show the extent to which these reference models meet the IS development and scope of SCM. From the viewpoint of IS development, only reference models, namely SCOR, GSCF, and VRM, which support the requirement stage by prescribing the decomposition level of supply chain processes.

Table 1 states SAP and ISA95 support implementation stage of IS development and CPFR supports IS development in the design stage. Since business process modelling belongs to the requirement stage, none of reference models, support both the coordination and interaction of process models in the lower level (Lambert et al., 2005; Verdouw et al., 2011) nor service-oriented approach in supply chain process modelling. Of the two reference models SCOR and GSCF, which have been widely used in production and SCM, SCOR meets operation strategy while GSCF meets SCM strategy. The SCOR focuses on specific activities in SCM (Grubic et al., 2011), that is, SCOR does not describe supply chain processes from different views while GSCF is more process orientated that contains the key sub-process and activities of main business processes in SCM. In addition, GSCF includes all types of business functions in association with the main supply chain processes while SCOR does not include functions such as finance, marketing and R&D. Moreover, GSCF focuses on the relationship between

Table 1
Overview of SCM reference models

Reference model	Stage of IS development	Scope of SCM
SCOR	Requirement	- Operation strategy - Transactional activities related to demand, supply, sourcing, planning, distribution & reverse logistic
GSCF	Requirement	- SCM strategy
VRM	Requirement	- Key activities related to the successful implementation of macro-business process in SCM (Lambert et al., 2005) - Activities related to product development, logistic, planning & control, and supplier relations (Value-Chain-Group, 2007)
CPFR	Design	- Activities related to order management, supplier-managed inventory & Vendor Managed Inventory (VMI)
ISA-95	Implementation	- Strategic activities focusing on forecasting and replenishment process(VICS, 2004) - Function related to business planning & logistic, and manufacturing operation & control (ISA-95, 2005)
SAP	Implementation	- Process related to logistic, production & manufacturing focusing on 'make-to-order' and 'engineer-to-order' (Curran, 1999; Heidasch, 2007)

Source: (Hvolby & Trienekens, 2010; Lambert et al., 2005; Verdouw et al., 2010)

suppliers and customers, which is not the focus of SCOR (Lambert et al., 2005). Furthermore, SCOR does not address the inter- and intra- organisation processes in SCM transparently as efficiently as GSCF does (Grubic, Veza, & Bilic, 2011).

Supply Chain Processes based on GSCF

In the SCM domain, process architecture requires a reference model as guidance for the identification of landscape model, the boundary of the processes, and key activities. To this end, among SCM reference models, as discussed in earlier section, GSCF is an appropriate process-oriented reference model, which contains the key, sub-processes and activities of chief supply chain processes. Figure 1 shows the ways via which GSCF supports different levels of process architecture.

Figure 1 shows eight macro-business processes for the integration and the management of the relationships across the supply chain. These business processes include: (1) CRM; (2) SRM; (3) Customer Service Management; (4) Order Fulfilment; (5) Demand Management; (6) Manufacturing Flow Management; (7) Product Development and Commercialisation; and (8) Returns Management. However, as stated by Lambert (2008), a supply chain involves a more complicated structure than the row of silos displayed in Figure 1. In the following, a brief account of each of these eight processes is presented.

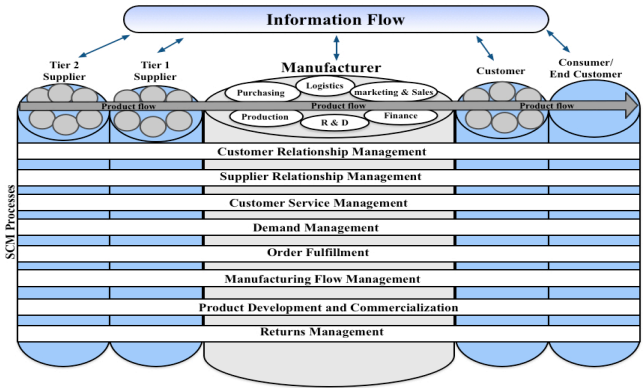

Figure 1. SCM processes in GSCF (Source: (Lambert, 2008)

Customer relationship management (CRM). The manner of developing and maintaining relationships with customers is determined by CRM process. To identify the chief targets and missions of an enterprise, the task of the board is to identify the chief customers or customer groupings. Such decisions and missions are defined at the strategic level. The chief objective is to compartmentalise diverse customers with regard to their value over a period of time and to augment customers' loyalty by providing tailor-made services and products. To satisfy the requirements of different customer groupings, cross-functional customer teams have to customize Product and Service Agreements (PSA). At the strategic level, CRM process team is engaged in the identification of the target businesses and markets, which are crucial for the success of an enterprise in the present and future. At this level, CRM team takes into account the marketing strategy as well as the corporate strategy of an enterprise. At the operational level, CRM process team classifies the target customers into varied segments and deals with writing and implementing of the Product and Service Agreement (PSA) (Lambert, 2008, 2010).

Supplier relationship management (SRM). SRM determines the nature of relationships between customers and suppliers and how to enhance and maintain it. Similar to CRM, SRM is also concerned with the enhancement of relations between suppliers, their value for an enterprise, and the manner of maintaining relationship with them over a period of time. Product and Service Agreement (PSA) determines the parameters of relationship with suppliers. At the strategic level, the team has to detect those markets, which play a crucial role in the success of a company. To achieve this, SRM process team deals with various tasks including the review of several strategies for corporate, manufacturing and sourcing, and marketing sectors. The team, at the operational level, is concerned with the development and implementation

of the PSAs. (Lambert, 2010; Lambert & Schwieterman, 2012).

Customer service management (CSM). As part of the CRM process, the CSM handles PSAs and their administration. The CSM performs two major tasks: (1) monitor PSAs; and (2) when customers experience problems in terms of service, they intervene on their behalf. The team, at the strategic level, takes responsibility for planning how potential services and products, included in the PSAs, can be managed and delivered. At the operational level, CSM process team performs three major tasks: the identification of the deliverables of the CSM process, the operationalisation of the signals for beginning an action, and the analysis of the staffing needs. It presides over the relationship between manufacturing flow and the supplier management in order to guarantee the fulfilment of promises made to customers (Bolumole, Knemeyer & Lambert, 2003; Lambert, 2010).

Demand management (DM). The Demand Management monitors the process that creates equilibrium between the customer's requirements and the capabilities of the supply chain. In terms of the right process, the management not only matches demands and supplies, it can also manage the business plans with minimal setbacks. The determined process is neither confined to forecasting nor to synchronising demand and supply, but it is focused on the reduction of variability and the enhancement of flexibility. The process also deals with the management of practices within an enterprise including terms of sales, which augments the volume of purchase and the variability of demands. At the strategic level, Demand Management process team is responsible for the development and implementation of the procedures. The team, at the operational level, deals with the execution of forecasting and synchronisation of demands, which have already been addressed at the strategic level. As soon as decision on the forecasting method is made, DM process team deals with information plan, including the determination of data source, the transference of input data, and the communication of the output needs to the appropriate sector (Croxton, Lambert, García-Dastugue, & Rogers, 2002; Lambert, 2010).

Order fulfilment (OF). OF is much broader than mere filling orders. It involves a range of activities, for example, the assessment of customer needs, the design of a proper network, and the improvement of an enterprise's capability to meet customer needs and to reduce the total cost of customer service at the strategic level, it handles the tasks relating to the improvement of the processes, which affect the financial performance of an enterprise, its suppliers and customers. At the operational level, OF is highly transactional, meaning that it is concentrated on the management of the customer cycle and the execution of particular tasks within its logistic function. Whereas the logistics function performs much of the work of the order fulfilment, this task has to be done in coordination between

business function and key customers and suppliers (Croxton, 2003; Lambert, 2010).

Manufacturing flow management (MFM). To achieve and to enhance flexibility in the supply chain as well as to procure products are among the tasks of Manufacturing Flow Management. An enterprise's capability to produce a broad range of products and to minimise the time and cost of customer service reflects its manufacturing flexibility. To attain a desirable degree of manufacturing flexibility, the organisation and execution of plans must extend beyond the walls of a manufacturing enterprise. To review the corporate and marketing strategies and to determine the best manufacturing strategies to meet customer demands are the tasks of MFM process team at the strategic level. The realisation of the processes considered at the strategic level is the concern of the MFM process team at the operational level. At this level, MFM ensures that all the necessary measures are taken for the movement of products through the plants as well as for the achievement and implementation of manufacturing flexibility in SCM (Goldsby & García-Dastugue, 2003; Lambert, 2010).

Product development and commercialization (PDC). The structure, which creates relation between customers and suppliers, includes two chief components: production and commercialisation. These two components together ensure the efficiency of a process in the sense that the management guarantees the flow of new products along the supply chain but it creates coordination among other functions such as logistics, marketing, and the other measures needed to be implemented for the commercialisation of the products. To determine the extent to which key suppliers and customers are engaged is the task of Product Development and Commercialisation process team at the strategic level. At the operational level, there must be a proper degree of coordination between CRM process teams and product manufacturing and commercialisation teams in order to identify the expressed or unexpressed customer needs, to select suppliers and the required materials, and to ensure the integration of production technology into the main flows in supply chain (Lambert, 2010; Rogers, Lambert, & Knemeyer, 2004).

Returns management (RM). RM process deals with a series of activities including returns, gate keeping, avoidance, and reverse logistics and their management within an enterprise and among key supply chain participants. The proper implementation of returns managements is achieved through the effective management of reverse product, the identification of opportunities for the reduction of unwanted returns, and the monitoring of reusable assets. The construction of a formalized structure via which a given sub-process is executed defines the goal of the strategic sub-process. The task of the operational sub-process begins when a customer's return request is received and its financial issue is well handled. The customer in the strategic

sub-process can be either a consumer or one from supply chain downstream (Lambert, 2010; Rogers, Lambert, Croxton, & García-Dastugue, 2002).

A classified description of essential sub-processes and activities, included in GSCF, is done by drawing upon the works of (Bolumole et al., 2003; Croxton, 2003; Croxton et al., 2002; Goldsby & García-Dastugue, 2003; Lambert, 2008, 2010; Lambert & Schwieterman, 2012; Rogers et al., 2002; Rogers et al., 2004) and by synthesising the supply chain processes illustrated in Table 2. Table 2 illustrates that each process involves both operational and strategic sub-processes. The manner of implementing a process and the direction of its implementation are provided via strategic sub-processes and operational sub-processes consecutively. The strategic process is a crucial step in the integration of an enterprise with supply chain participants, with daily activities continuing at the operational level. At the strategic level, an executive board, consisting of managers from each and every function, supervises each operational sub-process, with business functions ranging from production to logistics, marketing, sales and purchasing, finance, and R & D (Lambert et al., 2005; Lambert & Schwieterman, 2012). The detailed activities that comprise each of the abovementioned main SCM processes at the operational sub-processes are classified in the third column of Table 2.

Table 1
The macro-business processes and activities for SCM based on the GSCF framework

Macro Business process	Strategic Sub-process	Operational Sub-process	Activity
Customer Relationship Management	1. Review Corporate and Marketing Strategy	1. Differentiate Customers	Analysing customer profitability; evaluate potential growth; documenting segments
	2. Identify Criteria for Categorizing Customers	2. Prepare the Account Management Team	Identify sales person to be account/segment manager; select learn member
	3. Provide Guidelines for the Degree of Differentiation n the Product/ Service Agreement	3. Internally Review the Accounts	Review product purchased; review sales growth; review positioning in industry
	4. Develop Framework of Metrics	4. Identify Opportunities with the Accounts	Identify sales opportunities; Identify cost reduction opportunities; Identify service improvement opportunities

Table 1 *(continue)*

	5. Develop Guidelines for Sharing Process Improvement Benefits with Customers	5. Develop the Product/Service Agreement	Outline and draft the PSA; gain commitment of the company's functions; present PSA to account for acceptance; for key customers, report until they agree; Agree on a communication and plan
		6. Implement the Product/Service Agreement	Develop and follow implementation plan; meet regularly with key customers
		7. Measure Performance and Generate Profitability Reports	Measure by customer and for the customer (Revenue, cost, report performance, etc.)
Customer Service Management	1. Develop Customer Service Strategy	1. Recognize Event	Define staffing needs; define deliverables; Operationalize triggers and signals
	2. Develop Response Procedures	2. Evaluate Situation and Alternatives	Determine events that require response; Determine appropriate response; procedure for each type of event; define internal and external coordination
	3. Develop Infrastructure for Implementing Responses Procedures	3. Implement Solution	Determine information system's need; Determine communication needs
	4. Develop Framework for Metrics	4. Monitor and Report	Classify events; identify operational; problem/ improvement opportunities
Demand Management	1. 1. Determine Demand Management Goals and Strategy	1. Collect Data/Information	Collect historical demand; collect sales/ marketing information; collect customer information-CPFR/VMI
	2. 2. Determine Forecasting Procedures	2. Forecast	Analyse data; develop forecast; track errors and provide feedback
	3. 3. Plan Information Flow	3. Synchronize	Identify and plan within capacity constraints; determine confidence intervals for forecasts; develop aggregate demand execution plan; balance risk with financial constraint; plan capacity for new product

Table 1 *(continue)*

	4. 4. Determine Synchronization Procedures 5. Develop Contingency Management System	4. Reduce Variability and Increase Flexibility	Identify root causes of variability; work within the firm and the supply chain to reduce demand variability; determine how much flexibility is required; identify opportunities to increase flexibility; work within the firm and the supply chain to increase flexibility
	6. Develop Framework of Metrics	5. Measure Performance	Calculate process metrics; Link metrics to EVA
Order Fulfilment	1. 1. Review Marketing Strategies, Supply Chain Structure and Customer Service Goals	1. Generate and Communicate Order	Generate order; transmit order
	2. Define Requirements for Order Fulfilment	2. Enter Order	Receive order; enter order; edit order
	3. Evaluate Logistics Network	3. Process Order	Check credit; check inventory; plan order flow transportation
	4. Define Plan for Order Fulfilment	4. Handle Documentation	Acknowledge order; prepare dill of lading picking instructions and packing slips; generate invoice
	5. Development Framework of Metrics	5. Fill Order	Pick product; pack product; stage for loading; prepare load confirmation
		6. Deliver Order	Prepare shipping documents; transmit delivery confirmation; audit pay freight bill
		7. Perform Post-delivery activities and measure performance	Receive & post payment; record bad debt expense; measure process performance
	1. Review Manufacturing, Sourcing, Marketing, and Logistics Strategies	1. Determine Routing and Velocity through Manufacturing	Translate demand management output into resource and production planning; review aggregate production plan; integrate capacity of managed manufacturing facilities; develop master production schedule
	2. Determine Degree of Manufacturing Flexibility Requirement	2. Manufacturing and Materials Planning	Generate detailed capacity planning, time-phased requirements, and master capacity plans

Table 1 *(continue)*

Manufacturing Flow Management	3. Determine Push/Pull Boundaries	3. Execute Capacity and Demand	Manage inventories (raw material, sub-component, packing, WIP, finished goods, and shop floor management)
	4. Identify Manufacturing Constraints and Determine Capabilities.	4. Measure Performance	Examine and report quality level of product; identify root causes of quality issue; measure performance
	5. Development Framework of Metrics		
Supplier Relationship Management	1. Review Corporate, Marketing, Manufacturing and Sourcing Strategies	1. Differentiate Customers	Perform supplier profitability analysis or total cost analysis; assess potential growth, strategic
	2. Identify Criteria for Categorizing Suppliers.	2. Prepare the Supplier Management Team	Identify account/commodity manager; select team members
	3. Provide Guidelines for the Degree of Customization in the Product/ Service Agreement	3. Internally Review the Supplier	Product purchased; sales growth; criticality of supplier
	4. Develop Framework of Metrics	4. Identify Opportunities with Suppliers	Sales opportunities; cost reduction opportunities; service improvement opportunities
	5. Develop Guidelines for Sharing Process Improvement Benefits with Suppliers	5. Develop the Product/Service Agreement and communication plan	Outline and draft the PSA; gain commitment of the company; gain supplier acceptance of PSA; agree on a communication and continuous plan
		6. Implement the Product/Service Agreement	Develop & follow implementation plan; meet regularly with key customer
		7. Measure	Measure by supplier and for the supplier (Cost, revenue, service, quality, report performance)
	1. Review Corporate, Marketing, Manufacturing and Sourcing Strategies	1. Define New Products and Assess Fit	Generate and screen new product ideas; perform market assessment; consult with key customer; assess fit with channels; manufacturing and logistics
	2. Develop Idea Generation and Screening Processes	2. Establish Cross-functional Product Development Team	Determine functional roles; invoke key customers and suppliers;

Table 1 *(continue)*

Product Development and Commercialization	3.	Establish Guidelines for Cross-functional Product Development Team Membership	3.	Formalize New Product Development	Determine time to market, product profitability, HR requirements
	4.	Identify Product Rollout Issues and Constraints	4.	Design and Build Prototypes	Work with suppliers; conduct value analysis; source prototype materials; test product
	5.	Establish New Product Project Guidelines	5.	Evaluate Make/Buy Decision	Assess supply capabilities; send RFQs; Analyse RFQs
	6.	Develop Framework of Metrics	6.	Determine Channels	Determine market plan; plan inventory deployment
			7.	Product Rollout	Implement market, transportation, promotion plan, and sales force training; Deploy inventory; plan flow; source materials; manufacturing/ assemble
			8.	Measure Process Performance	Analyse process & identify opportunities for improvement; calculate process metrics
Return Management	1.	Determine Returns Management Goals and Strategy	1.	Receive Return Request	Initiate customer return request; implement gatekeeping guidelines
	2.	Develop Avoidance, Gatekeeping and Disposition Guidelines	2.	Determine Routing	Review routing guidelines; plan routing, generate return material authorization
	3.	Develop Returns Network and Flow Options	3.	Receive Returns	Receive return material; verify, inspect and process return/gatekeeping; determine return reason
	4.	Develop Credit Rules	4.	Select Disposition	Apply disposition guidelines; transport product to final disposition
	5.	Determine Secondary Markets	5.	Credit customer/supplier	Coordinate credit authorisation across supply chain; negotiate settlement
	6.	Develop Framework of Metrics	6.	Analyse Returns and Measure performance	Analyse returns and identify opportunities for avoidance; calculate process metrics and link to EVA; set goals performance improvement

Source: Synthesised from (Bolumole et al., 2003; Croxton, 2003; Croxton et al., 2002; Goldsby & García-Dastugue, 2003; Lambert, 2008, 2010; Lambert & Schwieterman, 2012; Rogers et al., 2002; Rogers et al., 2004)

CONCLUSION

Seven most important reference models and framework in the domain of SCM were compared and discussed. Of the two reference models SCOR and GSCF, which have been widely used in production and SCM, the former meets operation strategy while the latter meets SCM strategy. The SCOR focuses on specific activities in SCM, that is, it does not describe supply chain processes from different views while GSCF is more process-orientated and contains key sub-process and activities of main business processes in SCM. In addition, GSCF includes all types of business functions in association with the main supply chain processes. It focuses on the relationship between suppliers and customers, which is not the focus of SCOR. Furthermore, SCOR does not address the inter- and intra-organisation processes in SCM transparently as efficiently as GSCF does. Thus, GSCF as a comprehensive SCM framework facilitates the identification of business and process areas as well as key activities in supply chain processes.

REFERENCES

Bolumole Y. A., Knemeyer, A. M., & Lambert, D. M. (2003). The customer service management process. *The International Journal of Logistics Management, 14*(2), 15-31.

Chandra, C. (2008). Supply Chain Workflow Modeling Using Ontologies *Collaborative Engineering* (pp. 61-87): Springer.

Christopher, M. (2005). *Logistics and supply chain management: creating value-adding networks*: Pearson Education.

Croxton, K. L. (2003). The order fulfillment process. *International Journal of Logistics Management, The, 14*(1), 19-32.

Croxton, K. L., Lambert, D. M, García-Dastugue, S. J, & Rogers, D. S. (2002). The demand management process. *International Journal of Logistics Management, The, 13*(2), 51-66.

Curran, T. A., & Ladd, A. (1999). SAPR/3BusinessBlueprint:UnderstandingEnterpriseSupplyChain Management, *2nd edition, Prentice Hall*.

Dehnert, J., & Van Der Aalst, W. M. P. (2004). Bridging the gap between business models and workflow specifications. *International Journal of Cooperative Information Systems, 13*(03), 289-332.

Dijkman, R. M., Vanderfeesten, I., & Reijers, H. A. (2011). The road to a business process architecture: an overview of approaches and their use. *The Nederlands: Einhoven University of Technology*.

Goldsby, T. J, & García-Dastugue, S. J. (2003). The manufacturing flow management process. *International Journal of Logistics Management, The, 1*4(2), 33-52.

Grubic, T., Veza, I., & Bilic, B. (2011). Integrating process and ontology to support supply chain modelling. *International Journal of Computer Integrated Manufacturing, 2*4(9), 847-863.

Heidasch, R. (2007). Get ready for the next generation of SAP business applications based on the Enterprise Service-Oriented Architecture (Enterprise SOA). *SAP Professional Journal, 9*, 103-128.

Heinzel, H. (2005). *The value chain operations reference model as a framework to integrate and manage cross-enterprise business processes*. Paper presented at the PLM'05: international conference on product life cycle management.

Hvolby, H., & Trienekens, J. H. (2010). Challenges in business systems integration. *Computers in Industry, 61*(9), 808-812.

ISA-95. (2005). ISA-95: the International Standard for the Integration of Enterprise and Control Systems.

Kirikova, M., Buchmann, R., & Costin, R. A. (2012). Joint Use of SCOR and VRM *Perspectives in Business Informatics Research* (pp. 111-125): Springer.

Kurbel, K. E. (2008). The Making of Information Systems.

Lambert, D. M. (2008). *Supply chain management: processes, partnerships, performance*: Supply Chain Management Inst.

Lambert, D. M. (2010). Customer relationship management as a business process. *Journal of Business and Industrial Marketing, 25*(1), 4-17.

Lambert, D. M, & Cooper, M. C. (2000). Issues in supply chain management. *Industrial marketing management, 29*(1), 65-83.

Lambert, D. M., García-Dastugue, S. J., & Croxton, K. L. (2005). AN EVALUATION OF PROCESS-ORIENTED SUPPLY CHAIN MANAGEMENT FRAMEWORKS. *Journal of Business Logistics, 26*(1), 25-51.

Lambert, D. M, & Schwieterman, M. A. (2012). Supplier relationship management as a macro business process. *Supply Chain Management: An International Journal, 17*(3), 337-352.

Reijers, H. A, & Mendling, J. (2011). A study into the factors that influence the understandability of business process models. *Systems, Man and Cybernetics, Part A: Systems and Humans, IEEE Transactions on, 41*(3), 449-462.

Rogers, D. S, Lambert, D. M, Croxton, K. L, & García-Dastugue, S. J. (2002). The returns management process. *International Journal of Logistics Management, The, 13*(2), 1-18.

Rogers, D. S, Lambert, Douglas, M., & Knemeyer, A. M. (2004). The product development and commercialization process. *International Journal of Logistics Management, The, 15*(1), 43-56.

Shapiro, J. F. (2007). *Modeling the supply chain* (2): Cengage Brain.

Stavrulaki, E., & Davis, M. (2010). Aligning products with supply chain processes and strategy. *International Journal of Logistics Management, The, 21*(1), 127-151.

Supply Chain Council. (2008). SCOR: Supply-Chain Operations Reference model; version 9.0

Supply Chain Council. (2010). Supply Chain Operations References Version 10.0. Supply Chain Council.

Trienekens, J., Hvolby, H., Steger-Jensen, K., & Falster, P. (2008). Architectural frameworks for business information system analysis and design *Lean Business Systems and Beyond* (pp. 413-421): Springer.

Tscheschner, W. (2006). Transformation from EPC to BPMN. *Business Process Technology, 1*(3), 7-21.

Value-Chain-Group. (2007). Value Reference Model (VRM) 3.0. *Value-Chain Group*.

Verdouw, C. N. (2010). *Business process modelling in demand-driven agri-food supply chains: a reference framework.* Wageningen UR Library: Wageningen University.

Verdouw, C. N., Beulens, A. J. M., Trienekens, J. H., & Van der Vorst, J. G. A. J. (2011). A framework for modelling business processes in demand-driven supply chains. *Production Planning and Control, 22*(4), 365-388.

Verdouw, C. N., Beulens, A. J. M., Trienekens, J. H., & Verwaart, T. (2010). Towards dynamic reference information models: Readiness for ICT mass customisation. *Computers in Industry, 61*(9), 833-844.

VICS. (2004). Collaborative Planning, Forecasting and Replenishment (CPFR): An overview. *Voluntary Interindustry Commerce Standards*.

Wolfert, J., Verdouw, C. N., Verloop, C. M., & Beulens, A. J. M. (2010). Organizing information integration in agri-food—A method based on a service-oriented architecture and living lab approach. *Computers and electronics in agriculture, 70*(2), 389-405.