



Research article

Integrated quality and supply chain management business diagnostics for organizational sustainability improvement

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ARTICLE INFO

Article history:

Received 26 May 2018

Received in revised form 24 August 2018

Accepted 10 September 2018

Available online 11 September 2018

Keywords:

Quality management

Supply chain management

Supply chain integration

Sustainable production and consumption

Sustainable development

Integrated sustainability management

ABSTRACT

A growing number of organizations are integrating economic, ecologic and financial sustainability considerations into their management processes, driven by increased societal and stakeholder pressures. With a view to support organizations in this global challenge, this paper examines integration of sustainability into the two influential management approaches of quality management and supply chain management. To achieve this, a critical evaluation of the extant integrated models in the literature is undertaken, analyzing strengths and weaknesses and evidencing the limitations. Stemming from the gaps identified, a conceptual framework is formulated, holistically incorporating quality and supply chain management principles for organizational triple bottom line sustainable development. A road map for industrial practitioners is presented along with a business diagnostic tool that were constructed on the basis of novel, synergistic relationships established between the management principles of quality, supply chain integration and sustainability of organizations.

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1. Introduction

Stakeholders external (customers, legislative bodies, public) and internal (employees, shareholders) to organizations are demanding higher performance levels from organizations, not only economically, but also environmentally and socially (Bastas and Liyanage, 2018; Rajeev et al., 2017). Delivering the current needs of the society while conserving the same ability of future generations lies at the heart of sustainability management (SM). This includes management of organizational products, services and processes across their supply chains and life cycles against the multi-dimensional criteria of triple bottom line (TBL) i.e. economic, ecologic and social. Stemming from this societal and industrial challenge, sustainability management research is growing to provide innovative management approaches, synergistic strategies and integrated decision-making tools for holistic development of economic, ecologic and social sustainability.

Meeting or exceeding stakeholder requirements is at the core of quality management (QM), including the needs and requirements of important interested parties such as customers, suppliers, regulatory bodies, employees and public. Stemming from this internal and external focus, quality management approaches are well positioned for support and facilitation of sustainable development in organizations. This view point was elaborated further by Siva

et al. (2016) that conducted a state-of-the art literature review into the integration of QM and sustainability, presenting various QM approaches as catalyzers of sustainability in organizations. The mediating effect of QM to supply chain management was also recognized in the literature, Robinson and Malhotra (2005) proposing the integrated concept of supply chain quality management (SCQM) for enhanced supply chain collaboration along with product, service and process performance improvements in the organizational context.

To support the dynamic business environment that the organizations operate in, a growing number of activities, processes and services are being outsourced to external providers, resulting in increased supply chain complexity and interorganizational activities. Supply chain management (SCM) approaches support integration and execution between firms, their suppliers, distribution network and their customers. Thus, supply chain management is strategically positioned for the continuity, performance and sustainability of organizations and how these are perceived by the stakeholders (Reefke and Sundaram, 2016). On this basis, research streams started embedding sustainability considerations in supply chain management practices, leading to the growing research stream of sustainable supply chain management (SSCM) (Ansari and Qureshi, 2015). The integrated management concept of SSCM was articulated by Seuring and Müller (2008) as: “the management of material, information and capital flows as well as collaboration among firms along the supply chain while taking goals from all three dimensions of sustainable development,

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i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements”.

Fernandes et al. (2017) integrating QM and SCM (SCQM), Rajeev et al. (2017) undertaking an in-depth literature review into SSCM and incorporation of sustainability as part of supply chain management, Siva et al. (2016) concluding the pivotal role of QM in driving sustainable development and Bastas and Liyanage (2018) reviewing the QM, SCM and sustainability integration literature from a collective perspective; the management integration literature resonate that there are further synergies and potential to be revealed in our journey towards holistic and integrated approaches for sustainability and performance enhancements. Although the focal management integration research streams that are present, the research from the lens of all three approaches (QM, SCM and sustainability) remains highly limited (Bastas and Liyanage, 2018). In this article, the authors aim to address this shortfall, conducting an extensive review of the extant integrated management models in the literature. Constructed based on the established gaps in the literature, an integrated management framework is provided along with the associated implementation road map and an organizational diagnostic technique, with a view to support the academics and industrial practitioners in the global sustainable development challenge.

The subsequent sections of this article are outlined as follows: the extant management models, integrating QM, SCM and sustainability are analyzed in Section 2, with a view to identify gaps and improvement opportunities; stemming from the further integration potential established in the literature, an integrated framework incorporating QM and SCM for sustainable development is presented in Section 3; the framework is elaborated into an integrated organizational sustainable development concept in Section 4, and finally, conclusions are provided in Section 5 along with limitations and future research directions.

2. Literature review

2.1. Quality and supply chain management as an avenue for integration of sustainability

QM is regarded as a strategic management philosophy, including deployment of quality principles, practices and techniques at all levels and functions of firms, seeking performance improvements and customer satisfaction (Evans and Lindsay, 2010; Fernandes et al., 2017; Nguyen et al., 2018; Talib et al., 2011). This involves management of products, services and processes with a view to meet or exceed customer and stakeholder expectations (Evans and Lindsay, 2010; Fernandes et al., 2017). Therefore, QM concerns a wide range of intra and interorganizational activities throughout the product/service lifecycle, including sourcing, manufacturing, delivery of products/services and after sales issues (Evans and Lindsay, 2010; Fernandes et al., 2017). QM philosophy seeks organizational excellence, efficiency, sustainability and competitiveness through a continuous and collective focus on improvement of processes, systems and procedures (Bastas and Liyanage, 2018; Evans and Lindsay, 2010; Fernandes et al., 2017; Terziovski and Hermel, 2011). In our journey towards organizational excellence, quality gurus such as Deming, Juran, Crosby, Taguchi, and Feigenbaum introduced QM principles, models and practices (Evans and Lindsay, 2010; Kuei and Lu, 2012; Nguyen et al., 2018). National and international quality awards including Deming Prize, EFQM excellence model, Swedish Quality Award, and Malcolm Baldrige National Quality Award further facilitated achievement of “meaningful and worthwhile improvements” in the performance and quality of operations and supply chains (Kuei and Lu, 2012; Nguyen et al., 2018). International Organization for Standardization (ISO) was founded in 1987, including members

from 163 countries, promoting standardization and implementation of quality management internationally (ISO, 2015a; Nguyen et al., 2018). ISO9001 framework was created as a quality management system standard, providing business guidelines for product, service and process performance measurement and improvement (ISO, 2015a; Nguyen et al., 2018). Other QM practices include total quality management (TQM) and Lean Six Sigma (LSS), both structuring improvement activities at firms through engagement of people, cultural transformation, reduction of process variation and aligning products/processes/services with customer requirements.

A supply chain is defined as “a network of materials, information, and services processing links with the characteristics of supply, transformation, and demand” (Chen and Paulraj, 2004). Introduced in 1980s, SCM involves planning and control of materials, information flows, distribution, logistics within and outside the boundaries of organizations with a view to add value to customers and stakeholders (Chen and Paulraj, 2004; Lambert and Enz, 2017). SCM has been further utilized in the literature for articulation of higher level, interorganizational matters including: “discussion of an alternative organizational form to vertical integration, explanation of the relationship a company develops with its suppliers and establishment of the purchasing and supply perspective” (Chen and Paulraj, 2004). A wide range of key functions, processes and operations are incorporated in supply chains including the distribution and transformation of materials from its raw material extraction phase all the way to its end users (Seuring and Müller, 2008). Lambert and Enz (2017) described the key SCM processes as: “customer and supplier relationship management, customer service management, demand management, order fulfillment, manufacturing flow management, product development and commercialization, returns management”. This not only demonstrates SCM’s wide scope and influence on organizational performance but also highlights its potential for sustainable development (Bastas and Liyanage, 2018; Rajeev et al., 2017; Reefke and Sundaram, 2016).

The exponential incline in global demand for products, services and associated consumption is imposing significant pressure on the industry and supply chains along with negative outcomes on the ecology and public (Rajeev et al., 2017). Sustainability is increasingly growing as a customer, societal and market need, placing sustainability management as a key stakeholder requirement for organizations (Garvare and Johansson, 2010; Siva et al., 2016). Kuei and Lu (2012) defined sustainability and sustainability management (SM) as following:

Sustainability: “continuity of economic development, environmental performance and social equity”

SM: “accelerating the adoption of best management principles, models, and practices throughout the operation system, and enabling the environment to achieve sustainable development”

The multi-dimensional agendas (economic, ecologic and social) involved in SM leads to conflicts and complexity for integration, performance measurement and sustainable development (De Brito and Van der Laan, 2010; Kuei and Lu, 2012; Seuring and Müller, 2008). New management concepts are highly required to facilitate this complex issue of integrating sustainability into organizational and supply chain management mechanisms (Bastas and Liyanage, 2018; Beske and Seuring, 2014; De Brito and Van der Laan, 2010; Rajeev et al., 2017; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013). Use of existing best practices, models and principles of management can accelerate this transition towards effective integration and management of sustainability, which is defined as a key input factor for organizations (Kuei and Lu, 2012). Isaksson (2006) described QM as “a management system that could be expanded to include components of sustainable development”, establishing the process management principle of QM as a key

tool for addressing not only economic agendas but also ecologic and social considerations. Zink (2007) reinforced this view point, emphasizing the high potential of QM approaches and excellence models in catalyzing the organizational change towards corporate sustainability through establishment of congruent goals and objectives, supporting conflict resolution with reference to multiple dimensions of triple bottom line. Mehra et al. (2001) anticipated the future of QM as a management philosophy that drives incorporation of ecologic issues, governmental regulations, social/ethical considerations and market conditions through supporting the business transformation towards sustainable development under the facilitation of QM principles such as customer focus.

Due to their stakeholder orientation and operational depth across functions, QM and SCM philosophies are strategically positioned for integration of sustainability into organizational and supply chain systems and processes (Bastas and Liyanage, 2018). A quality and supply chain based response strategy carries the potential to aid organizational capability and systems development towards sustainable development (Kuei and Lu, 2012). The deeply rooted principles of QM and SCM can play a significant role in reinforcing transition towards sustainable management through adaptation and development of intra and interorganizational capabilities, business culture, management processes and operation systems. QM and SCM share common principles such as “improvement, customer satisfaction and leadership”, collective implementation increasing the influence of both (Azar et al., 2010; Bastas and Liyanage, 2018; Kaynak and Hartley, 2008; Mahdiraji et al., 2012). Integrated QM and SCM approaches support collaboration and coordination for improvement activities internal and external to organizations, which will facilitate this imperative shift towards development of sustainability agendas in organizations and supply chains (Bastas and Liyanage, 2018; Vanichchinchai and Igel, 2009). The industrial and societal need for development and adaptation of QM and SCM principles to support integration and improvement of sustainability is further emphasized in recent literature reviews (Bastas and Liyanage, 2018; Rajeev et al., 2017; Reefke and Sundaram, 2016; Siva et al., 2016). In the early 2000s, the integrated lens of “sustainable operations management” was born, seeking to frame environmental, social and financial issues under holistic and collective approaches in organizations and supply chains, under the supporting role of QM and SCM (Rajeev et al., 2017; Seuring and Müller, 2008; Siva et al., 2016). As evidenced by Bastas and Liyanage (2018), research streams integrating QM, SCM and sustainability are increasingly growing since 2005, a review of which have been provided in Section 2.2. Stemming from this current industrial and research requirement, the primary aim of this study is to provide theoretical and conceptual insights to facilitate this transformation towards integration of sustainability through the deeply embedded QM and SCM principles, accelerating the global management transition towards sustainable operations.

2.2. Review of extant models integrating quality, supply chain and sustainability management

Literature reviews facilitate investigation of management research inquiries through in-depth scanning, critical evaluation and establishment of “knowns” and “unknowns” on the research topic (Briner and Denyer, 2012). To support our journey towards more coherent management approaches for sustainable development of organizations and their supply chains, the extant literature integrating QM, SCM and sustainability was reviewed and critically analyzed from a collective perspective (Webster and Watson, 2002).

Peer reviewed articles from key aggregator (Scopus, WOS and EBSCO) and publisher (Elsevier, Emerald, Taylor & Francis, Springer and IEEE) databases, presenting integrated management models that study the relationships (theoretical and/or empirical) between

QM, SCM and sustainability were included. This decision was made to maintain the reliability of the publications considered in the study, resulting in the inclusion of publications with significant managerial impact (Saunders et al., 2015). The adoption of two levels of databases (aggregator and publisher), although resulted in redundancies to a certain extent, enabled validation of the independent searches conducted in the databases, contributing towards identification and consideration of all relevant publications under the search criteria. Papers published in English were included only.

Kyoto protocol agreement in 2005 is noted as a key milestone for the QM, SCM and sustainability integration literature, the research streams in this domain growing post this global treaty (Bastas and Liyanage, 2018; Rajeev et al., 2017). Robinson and Malhotra (2005) marked 2005 and beyond as the “birth of a new integrated management avenue”, supply chain quality management (SCQM) that integrated QM and SCM for performance improvements. Therefore, the search period for the review has been set as 2005 to 2017. For verification of this decision, a test has been carried out, searching the time period between 1990 and 2004, however these searches identified no, or highly limited results relevant to the research agenda of the review.

The search protocol included QM, SCM and sustainability integration along with related subsets. Keywords central to SCM, sustainability, QM and integration were adopted such as: “sustainable or green supply chain”, “sustainable or green or environmental purchasing”, “sustainable or green design”, “sustainable or green logistics”, “reverse logistics”, “closed loop supply chain”, “sustainable or green manufacturing”, “sustainable or green or environmental supplier selection”, “lean six sigma”, “quality management systems”, “total quality management”, “ISO9001”, “EFQM”, “Baldrige Model” (Bastas and Liyanage, 2018; Rajeev et al., 2017). The search protocol utilized provided research materials covering a wide range of sustainability, QM and SCM integration issues not limited to but including environmental and social sustainability impact of SCM practices, integration of TQM with sustainability, product life-cycle assessment and supply chain integration for sustainable products and quality function deployment based environmental sustainability decision making.

Stemming from the resonance in the sustainability integration literature that fully integrated approaches are imperative for true sustainable development, the extant constructs were assessed in relation to full or partial incorporation of triple bottom line (economic, ecologic and social) (Ansari and Qureshi, 2015; Gold and Schleper, 2017; Reefke and Sundaram, 2016). The key contributions of the authors were extracted, strengths and weaknesses were assessed through a lens of collective integration and inclusion of QM and SCM approaches were reviewed to pave the path for development of a holistic approach. Considering the highly limited research on the QM integration research, particular attention was given to this area, elaborating on key approaches e.g. TQM, Six Sigma/Lean Six Sigma, ISO9001; with a view to explore potential opportunities and provide further insights (Bastas and Liyanage, 2018). The findings of this critical evaluation are presented in Table 1, facilitating gap analysis and providing a current state map of the integrated models under our research domain.

The literature review identified 50 models integrating QM, SCM and sustainability as demonstrated in Table 1 and Fig. 1, critical evaluation of which resulted in the following observations:

- The 34% of the models (17/50) discussed integration of QM and SCM, establishing the highly synergistic nature of integration between the two approaches enabling organizational performance improvements and enhanced collaboration across the supply chain network.

Table 1
Integrated SCM, QM and sustainability management models overview and gap analysis.

Authors (Year)	SCM	TQM	SS/LSS	ISO 9001	Other QM	Sustainability			Remarks
						Econ.	Envir.	Social	
Agi and Nishant (2016)	✓			✓			✓		Confirmed a positive relationship between quality management principles (ISO9001) and organizational environmental performance, QM principles positively impacting GSCM through facilitating deployment of green practices to the supply chain partners. Relationships with Social and Economic dimensions not established (green supply chain management only).
Agrawal and Sharma (2015)	✓							✓	Established social supply chain sustainability practices through comparative case study method, contributing to revealing of several social supply chain sustainability dimensions. Although the explorative nature of the findings on social supply chain literature, potential relationships with QM were not considered along with links to economic and environmental sustainability.
Aquilani et al. (2016)		✓				✓	✓	✓	Integrated TQM and TBL, redefining critical success factors at their interface with a view to foster organizational sustainability through QM processes and value co-creation.
Asif et al. (2011)					✓	✓	✓	✓	Proposed an integrated framework using EFQM and Baldrige models to incorporate TBL aspects and indicators into business processes from stakeholder requirements.
Azar et al. (2010)	✓	✓							TQM practices are interdependent in supply chain and SCQM has the potential to improve organizational performance.
Azizi et al. (2016)	✓	✓							SCM and TQM principles considered for an integrated SCQM model construct. SCQM positively contributes to competitive advantage.
Banawi and Bilec (2014)			✓				✓		Integrated Lean (VSM), Green (LCA) and Six Sigma (DMAIC, Pareto, Ishikawa) for sustainable development of construction projects and organizations. Supply chain management principles were not considered along with holistic TBL view.
Beske and Seuring (2014)	✓					✓	✓	✓	Defined SSCM categories (collaboration, continuity, orientation, risk management and proactivity) and associated practices. Potential effects of QM principles and practices not considered.
Chardine-Baumann and Botta-Genoulaz (2014)	✓					✓	✓	✓	Framework proposed to assess sustainability performance of SCM practices. The potential relationships and influence of QM practices not explored/included.
Cherrafi et al. (2017)			✓				✓	✓	Integrated Lean, Green and Six Sigma approaches at the manufacturer level for structured, sustainability performance improvement. The framework, although provides key practical insights for industry, it is limited to deployment at focal organizations and does not include SCM.
Chuang (2014)			✓				✓		Adopted a compound approach for green performance improvement, formed on the basis of DMAIC structure. The model was applied to the case of two footwear organizations in Taiwan, showing significant sustainable development benefits.
Cluzel et al. (2010)			✓				✓		Developed an integrated concept of lean six sigma and eco-design for environmental sustainability improvement, incorporating environment as the fourth dimension (in addition to time, quality and cost) of lean six sigma.

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Table 1 (continued)

Authors (Year)	SCM	TQM	SS/LSS	ISO 9001	Other QM	Sustainability			Remarks
						Econ.	Envir.	Social	
De Freitas et al. (2017)			✓			✓	✓	✓	Studied the impact of LSS on organizational sustainability, capturing the perceptions of international experts. It was established that LSS has the most influential impact on economic sustainability, positive correlation between economic and ecologic dimensions and quality parameters of LSS having the highest impact on TBL.
Dubey et al. (2015)	✓	✓					✓		Evidenced that supplier relationship management and TQM positively contribute to environmental performance of firms and facilitate GSCM. The economic and social sustainability dimensions not included.
Fernandes et al. (2017)	✓				✓				Common SCM and QM practices were identified for an extensive SCQM model construct. Sustainability included in the conceptual model however, specific hypothetical relationships with Sustainability/TBL not identified.
Flynn and Flynn (2005)	✓				✓				Presented empirical evidence that demonstrates synergies between QM practices (derived from MBNQA model) and SCM practices. Suggests positive relationship between QM and SC performance.
Francis (2009)		✓					✓		Established a positive link between TQM and design for environment, proposing incorporation of environmental considerations into product development process as part of TQM for sustainable development
Fynes et al. (2005)	✓				✓				Integrated supply chain relationship quality (SCRQ) dimensions with quality performance. Suggests positive relationship between SCRQ and design quality through enhanced collaboration with supply chain partners.
Govindan et al. (2014)	✓	✓				✓	✓	✓	Relationships between lean, resilient and green supply chain management practices and SC sustainability investigated. The influence of TQM (as a lean practice) on SC sustainability established. Only paper identified in the literature, considering SCM, QM and SC TBL performance although empirical findings are only limited to perceptions of five automotive companies in Portugal.
Grosvold et al. (2014)	✓					✓	✓	✓	Articulated sustainable supply chain performance as the result of SSC management (training, collaboration, 3rd party certification etc.) and SSC measurement (auditing, monitoring, KPIs etc.). Links with QM not included.
Gu et al. (2017)	✓	✓							Demonstrated the benefits of TQM strategy deployment across the supply chain, enhancing stakeholder management at service oriented manufacturing organizations.
Jabbour et al. (2015)	✓						✓		Conducted empirical study on relationships between Green SCM practices and environmental performance indicators. Links with QM not included along with social and economic sustainability dimensions.
Jabbour et al. (2014)	✓	✓		✓			✓		Only paper identified that studies relationships between SCM, QM and sustainability performance although, social and financial dimensions were not included. QM (ISO9001, TQM and supplier quality certification) is identified as the key antecedent of environmental management, GSCM and green performance of organizations.

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Table 1 (continued)

Authors (Year)	SCM	TQM	SS/LSS	ISO 9001	Other QM	Sustainability			Remarks
						Econ.	Envir.	Social	
Jraisat and Sawalha (2013)	✓				✓				Suggests key role of quality control in improving SC performance. Effects on supply chain sustainability performance not considered.
Kuei and Lu (2012)		✓				✓	✓	✓	Developed conceptual framework, integrating TQM principles and sustainability management. The framework proposed is based on implementation at a single organization and SCM practices / supply chain thinking is not employed.
Kuei et al. (2011)	✓				✓				Four major SCQM themes (Design for Six Sigma; international standards; SCM; global leadership and human resource management) identified for successful implementation of SCQM, utilizing SCM and EFQM approaches with a view to develop a hybrid, integrated framework. Links with sustainability/TBL performance not studied.
Lin (2013)	✓						✓		Studied using fuzzy DEMATEL method to facilitate assessment of various GSCM practices and their effect on environmental performance. Links with QM not included along with social and economic sustainability dimensions.
Lin et al. (2005)	✓	✓							Studied relationships between TQM practices, supplier selection, supplier participation and organizational performance. Key TQM practices can be integrated into supplier participation programs, leading to increased cross-enterprise cooperation and hence enhanced organizational performance. Links with sustainability/TBL performance not studied.
Lin et al. (2013)	✓				✓				Set out critical enablers, key practices and possible pathways for a high performing SCQM system. Links with sustainability/TBL performance not studied.
Maletič et al. (2011)		✓				✓	✓	✓	Established an integrated construct of sustainable quality management (SQM), empirically proposing primary characteristics of SQM as “green development and environmental aspects, top management commitment, employee support, corporate social responsibility and local community engagement”
Marshall et al. (2015)	✓						✓	✓	Developed a theoretical basis for environmental and social supply chain sustainability practices under two key categories of process and market based practices. The economic sustainability practices have not been included, the framework does not consider the integrated TBL sustainability view and QM practices were not studied.
Mellat-Parast (2013)	✓				✓				Established firm level and supply chain level quality management practices and their effects to buyer–supplier satisfaction and performance. Links with sustainability/TBL performance not studied.
Quang et al. (2016)	✓				✓				SCQM structural model proposal that sets out direct and indirect relationships with firm performance. Links with Sustainability/TBL not identified.
Powell et al. (2017)			✓				✓		Demonstrated the positive effects of combining LSS (VSM-DMAIC) with environmental sustainability. Green sustainability improvements were achieved through deployment of LSS tools and elimination of wastes.
Rusinko (2005)					✓		✓		Developed a framework that expands Deming’s PDCA QM cycle to manage and implement environmental sustainability practices. SCM practices and supply chain thinking not studied. Links with social and economic sustainability not established.

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Table 1 (continued)

Authors (Year)	SCM	TQM	SS/LSS	ISO 9001	Other QM	Sustainability			Remarks
						Econ.	Envir.	Social	
Schmidt and Schwegler (2008)	✓						✓		Provided a decision-making aid, considering cumulative environmental sustainability indicators across the supply chain network. The framework does not include economic and social indicators therefore; the integrated TBL approach was not considered. Effects of QM were also not included.
Seuring and Müller (2008)	✓					✓	✓	✓	Suggested a SCM model for sustainable products through product life-cycle assessment and supply chain integration. Links with QM not included.
Shalij et al. (2009)	✓			✓					Exploited the synergy offered by ISO9001 and SCM integration, resulting in ISO9001 based supply chain quality management system. The potential advantages that could be obtained from such a system from the sustainability point of view have not been explored.
Silvestre (2015)	✓					✓	✓	✓	Developed a framework for managing supply chain sustainability in developing countries based on case study investigation of oil and gas supply chain. Links with QM not included.
Soares et al. (2017)	✓				✓				SCQM model established through an in-depth review of extant SCQM models. Evidenced that SCQM practices significantly influence quality performance. Links with Sustainability/TBL not identified.
Somsuk and Laosirihongthong (2016)	✓					✓	✓	✓	Impact of GSCM practices and drivers on economic, ecologic and social sustainability performance studied. The potential relationships and influence of QM practices not explored/included
Srdić and Šelih (2011)				✓			✓		Put forward an integrated quality and environmental sustainability performance management framework for sustainable development of construction projects, incorporating ISO9001, ISO14001 and environmental sustainability.
Stindt (2017)	✓						✓	✓	Framework proposed to assess environmental and social sustainability impact of various SCM practices. The assessment is conducted individually specific to sustainability dimension as opposed to an integrated TBL approach. The potential relationships and influence of QM practices not explored/included.
Tsoufas and Pappis (2008)	✓						✓		Developed a decision-making model to evaluate environmental performance of supply chains. Links with QM not included along with social and economic sustainability dimensions.
Türkay et al. (2016)	✓					✓	✓	✓	Adapted the standard aggregate supply chain planning model to integrate TBL considerations, facilitating sustainability impact assessment.
Utne (2009)					✓		✓		Outlined that the structure introduced by an integrated eco-quality function deployment facilitates stakeholder requirement analysis with potential improvements in environmental sustainability decision making.
Vanichchinchai and Igel (2010)	✓	✓							Identified that TQM practices have a direct effect on SCM practices and firm supply performance. Links with Sustainability/TBL not identified. The potential relationships and influence of QM practices not explored/included.
Zeng et al. (2013)	✓				✓				Studied impact of internal, upstream and downstream QM practices on customer satisfaction and conformance quality and concluded that the internal implementation of QM practices is fundamental to customer satisfaction. Links with Sustainability/TBL not identified.

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Table 1 (continued)

Authors (Year)	SCM	TQM	SS/LSS	ISO 9001	Other QM	Sustainability			Remarks
						Econ.	Envir.	Social	
Zhang and Awasthi (2014)			✓			✓	✓	✓	Set out a road map for sustainable development of organizations through an integrated Six Sigma and Sustainability framework. The framework has not been validated empirically, has less emphasis on economic sustainability and is focal organization orientated. Relationships with SCM and links with supply chain not included.
Zhong et al. (2016)	✓				✓				Investigated relationships between SCM practices, QM practices, SC quality and performance in hospitality sector. Identified that QM practices have no direct effect to hotel performance although discussing that this finding might be sector specific. Links with Sustainability/TBL not identified.
Our proposal - SSCQM	✓			✓		✓	✓	✓	Model is proposed that incorporates synergies offered by the ISO9001 quality management principles across the supply chain reinforced through the key SSCM principle supply chain integration for organizational sustainable development.

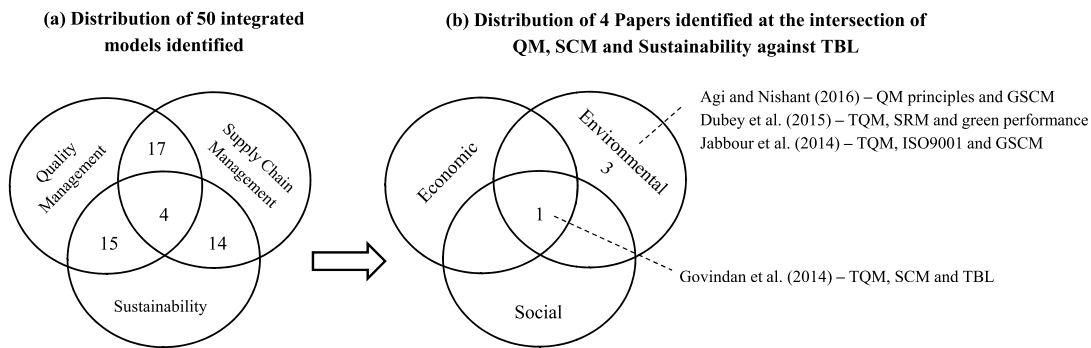


Fig. 1. The distribution of integrated models identified in the literature and gap analysis.

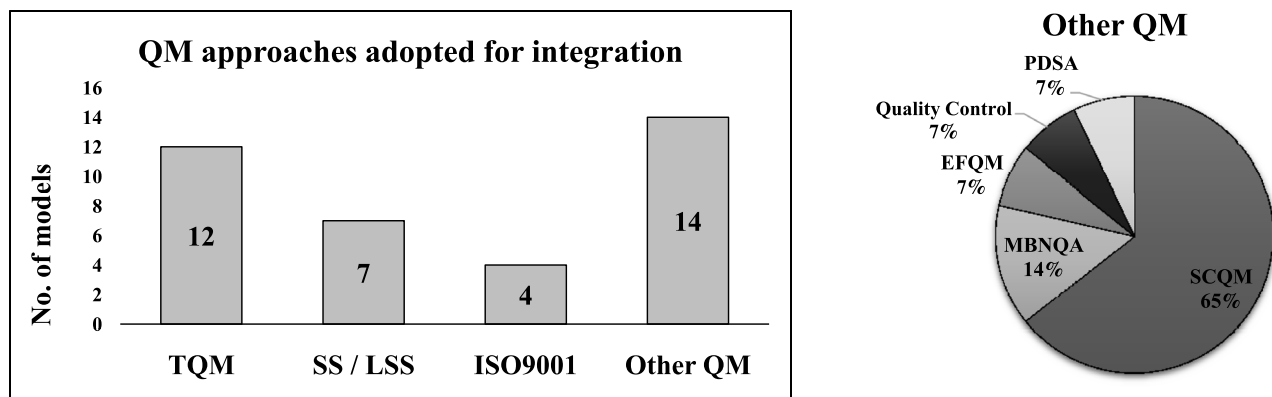


Fig. 2. The distribution of QM approaches utilized in the literature for integration with sustainability and SCM.

- Only 42% of the integrated models adopted a holistic approach, collectively taking into account economic, ecologic and social sustainability (TBL) considerations. Additionally, it was seen that a remarkable portion of the literature (45%) only considered ecologic sustainability considerations in their integrated models. This observation resonates with the latest sustainability integration literature that holistic and multi-dimensional approaches are required to support true sustainable development in organizations (Ansari and Qureshi, 2015; Ashby et al., 2012; Awudu and Zhang, 2012; Bastas and Liyanage, 2018; Beske and Seuring, 2014; Gold and Schleper, 2017; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013).
- As outlined in Fig. 1(b), only 4 models were identified at the intersection of QM, SCM and sustainability although the clear benefits extensively discussed in the literature that would be utilized from integrated approaches (Agi and Nishant, 2016; Dubey et al., 2015; Govindan et al., 2014; Jabbour et al., 2014). Govindan et al. (2014) established positive relationships between TQM, SCM practices and supply chain TBL sustainability performance, and can be denoted as the first study to holistically link QM, SCM and TBL.
- As represented in Fig. 2, the integration of TQM and Six Sigma/Lean Six Sigma (DMAIC) methodologies of QM into SCM and sustainability were noted as focal integration research streams, with 33% and 19% of integrated models incorporating these approaches respectively. The research integrating other key QM approaches such as ISO9001 and MBNQA was observed to be highly limited in the literature.
- In conclusion, considering the development of the latest quality and supply chain management research, the sustainability research seeking approaches for full incorporation

of TBL, recent research including Govindan et al. (2014) proposing prospective interdependencies between QM, SCM and supply chain TBL performance, further integration is projected along with the development of an emerging research line named as “sustainable supply chain quality management (SSCQM)” to represent its holistic nature (Bastas and Liyanage, 2018).

On the other hand, the two of the four models that were identified to collectively incorporate QM, SCM and sustainability included ISO9001 in their constructs (Agi and Nishant, 2016; Jabbour et al., 2014). Both Agi and Nishant (2016) and Jabbour et al. (2014) established embedding of quality management system (ISO9001) in organizations as an influential factor for green supply chain management and environmental sustainability. Several other authors in the literature echoed with these studies, Robinson and Malhotra (2005) proposing ISO9001 as a building block for supply chain performance improvement, Carmignani (2009) discussing the increasing effect of ISO9001 in driving improvements when implemented across the supply chain network and Shalij et al. (2009) developing an integrated construct of ISO9001 based SCM. Moreover, Rusinko (2005) underlined the potential of ISO9001 and quality management system implementation, putting forward that integration of ISO9001 can provide structure and support to driving sustainable development in organizations. A similar view point was shared by a study conducted on the incorporation of ISO9001:2015 principles at banking sector, outlining that ISO9001 QM principles possess the potential to facilitate sustainability improvements in organizations across all sectors (Luburić, 2015).

ISO9001:2015 quality management framework, with over a million organizations certified around the globe in over 170 geographical areas and across a wide range of business sectors,

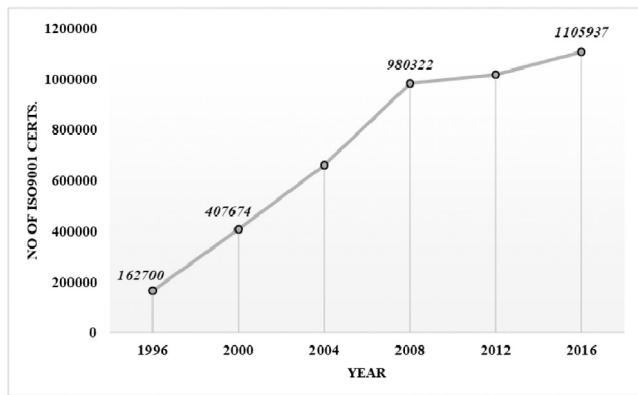


Fig. 3. Worldwide ISO9001 certification.
Source: ISO Survey (ISO, 2017).

has seven fundamental principles “customer focus, leadership, engagement of people, process approach, improvement, evidence based decision making and relationship management”, which are also being accepted as core principles by other management system frameworks such as organizational health and safety standard ISO45000 and environmental management system ISO14001 (Anttila and Jussila, 2017; Fonseca, 2015; ISO, 2015a). ISO9001 is thus, “a reference model and a norm” for other management systems including health and safety, environmental, food traceability, automotive and aerospace, establishing their governance structure (Carmignani, 2009). For many industries and customers, ISO9001 certification is now a market norm and a mandatory requirement therefore, ISO9001 is widely implemented across many business sectors globally. Unlike other QM approaches such as lean six sigma, there are less barriers to ISO9001 implementation (more training and support is available globally) and it is applicable to most business sectors including manufacturing and service sectors.

As demonstrated in Fig. 3, the number of organizations certified globally to ISO9001 quality management is increasingly growing, underlining ISO9001’s significance and impact for organizations in all geographical regions and business sectors (Heras-Saizarbitoria and Boiral, 2013; ISO, 2017).

Stemming from these facts, Anttila and Jussila (2017) described ISO9001 as “the world’s best-selling standard”. Heras-Saizarbitoria and Boiral (2013) summarized the organizational benefits of adoption of ISO9001 as: “improvement of operational performance; greater customer satisfaction; improved relationships within the organization; improvement in the internal efficiency of the company; improved image for competitors and stakeholders”. On the other hand, the potential effects of this widespread business improvement methodology to sustainability and TBL is not very well understood. Anttila and Jussila (2017), in their critical review of ISO9001:2015 and business excellence models, emphasized the significance of simultaneous ISO9001 implementation and integration with other management systems for coherent and effective organizational performance management. Although its significance for organizations globally and its high potential indicated in a wide spectrum of integration literature, the extant literature on ISO9001 integration with other management approaches and sustainability remains highly unexplored. With a view to address the gaps evidenced in the literature and support transition into holistic sustainability improvement models, ISO9001:2015 framework was decided to be taken forward for further exploitation along with key sustainable supply chain management (SSCM) principle (supply chain integration) in the journey towards a concept for integration of sustainability into organizational mechanisms, processes and

supply chains (Bastas and Liyanage, 2018; Beske and Seuring, 2014; Liebetruht, 2017; Rajeev et al., 2017).

3. Sustainable supply chain quality management, utilizing QM and SCM principles for sustainable development

Theoretical contributions play a significant role in management research and development of businesses through tailoring of novel perspectives against industrial and societal challenges such as sustainable production and consumption. This is achieved through “fashioning of theoretical lenses that allow us to see the world as it might be, as opposed to representing the phenomenal world as it is” (Suddaby, 2014). A thorough theory construction consists of four essential building blocks of what, how, why and who/where/when (Dubin, 1978; Whetten, 1989).

“What” concerns the variables, constructs and concepts logically should be considered as part of the phenomena of interest, where theorists should balance comprehensiveness and parsimony (Dubin, 1978; Whetten, 1989). All of the ISO9001:2015 quality management principles were included as the ISO9001 approach is coherent, comprehensive and widely implemented across organizations globally for performance measurement and improvement along with its high potential indicated for sustainability (Agi and Nishant, 2016; Anttila and Jussila, 2017; Bastas and Liyanage, 2018; Carmignani, 2009; Fonseca, 2015; Jabbour et al., 2014; Robinson and Malhotra, 2005; Rusinko, 2005; Shalij et al., 2009; Tarí et al., 2013). The supply chain integration and leadership principles of supply chain management were established as “fundamentals” for integration of sustainability into organizations and supply chains by the SSCM literature (Bastas and Liyanage, 2018; Beske and Seuring, 2014; Liebetruht, 2017; Rajeev et al., 2017). As the leadership principle was already considered through inclusion of ISO9001 principles, the theoretical framework was developed consisting of eight principles, formulated from quality and supply chain management principles for the facilitation of integration and improvement of triple bottom line. Other quality or supply chain management principles were excluded to ensure coherence of the ISO9001 framework, maintain conciseness, avoid further complexity and prevent confusions in practice that could arise from adoption of similar QM, SCM principles such as TQM principles of “employee involvement” and “process centered”.

“How” introduces causality, describing the patterns and the relationships (Dubin, 1978; Whetten, 1989). A positive relationship was established between the quality management and supply chain integration principles for integration and improvement of triple bottom line sustainability, based on the evidence in the literature, framed under the theory of SSCQM. “Why” outlines the rationale for the psychological, economic or social dynamics and requirements for the theory, justifying the selection of constructs, concepts and causal relationships developed (Dubin, 1978; Whetten, 1989). The multi-dimensional nature of sustainability brings together inherent complexity for integration, performance measurement and improvement in organizations and supply chains (Bastas and Liyanage, 2018; De Brito and Van der Laan, 2010; Seuring and Müller, 2008). New management approaches and concepts are highly required to facilitate integration of triple bottom sustainability into organizations and supply chains for sustainable development (Bastas and Liyanage, 2018; Beske and Seuring, 2014; De Brito and Van der Laan, 2010; Rajeev et al., 2017; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013). Seeking to address this current sustainability management research problem that highly concerns the academia and the industry, the research motivation behind the SSCQM framework is the development of a theory and concept for integration of triple bottom line sustainability into organizational and supply chain management mechanisms to facilitate performance measurement and improvement by

industrial practitioners. The ISO9001 framework has been selected due to its wide implementation level in organizations globally, its applicability to most business sectors, high availability of support for its implementation compared to other QM methods, familiarity of managers with its principles and its well-recognized role in structuring and catalyzing organizational performance measurement and improvement (Anttila and Jussila, 2017; Bastas and Liyanage, 2018; Carmignani, 2009; Fonseca, 2015; ISO, 2015a; Robinson and Malhotra, 2005; Shalij et al., 2009; Tari et al., 2013). The supply chain integration principle was included as the eighth principle to both increase the effects of ISO9001 principles and embedding the triple bottom line into the supply chain practices, as an imperative SSCM principle (Bastas and Liyanage, 2018; Beske and Seuring, 2014; Liebetrueth, 2017; Rajeev et al., 2017; Robinson and Malhotra, 2005; Shalij et al., 2009).

“Who/where/when” consists of contextual and temporal factors, establishing the range of the theory and the limitations of its propositions which are typically discovered or confirmed through empirical tests (Dubin, 1978; Whetten, 1989). The theoretical framework of SSCQM is primarily designed for managers and leaders in strategic, tactical and operational levels in organizations and supply chains operating in manufacturing and other business sectors. No time dependence or variation over time periods is anticipated for the theory, considering the growing stakeholder pressures and current trends on the integration of sustainability and the global motivation for sustainability performance measurement and improvement through established management approaches (Bastas and Liyanage, 2018; Rajeev et al., 2017; Reefke and Sundaram, 2016; Siva et al., 2016). The sustainable supply chain quality management theory formulated and its key ingredients as per Whetten (1989) and Dubin (1978) are presented in Table 2.

The key purpose of this research is to construct a new theoretical platform for the integration sustainability into organizational management processes, where researchable propositions have been formulated between the deeply rooted management principles of quality, supply chain management and sustainability. Theory development articles should be “built on a foundation of convincing argumentation and grounded in reasonable explicit views of human nature and organizational practice”, thus, viewpoints of a wide base of authors and evidence in the sustainability literature have been captured, revealing the fruitful collective potential of quality management and supply chain integration principles in our journey towards a management framework for integration of triple bottom line sustainability (Whetten, 1989).

3.1. Customer focus

The customer focus principle of quality management drives firms towards meeting customer requirements and exceeding customer expectations with the benefits of increased market responsiveness, potential increases in revenue and focus of resources on activities important for the customers (ISO, 2015b). Sustainability management literature establishes customer and market pressures as a key driving and motivation factor for implementation of economic, environmental and social sustainability practices in organizations and supply chains (Aquilani et al., 2016; Garvare and Isaksson, 2001; Lin, 2013; Seuring et al., 2008; Somsuk and Laosirihongthong, 2016).

Garvare and Isaksson (2001) established customer focus principle as a critical success factor of organizational sustainable development. Sustainability is increasingly growing as a customer, societal and market need (Garvare and Johansson, 2010; Lin, 2013; Siva et al., 2016). Through retaining focus on customer and stakeholder requirements on social, environmental and economic issues, the motivation and capability of organizations to identify, integrate and improve sustainability is highly increased (Aquilani

et al., 2016; Garvare and Isaksson, 2001). Regulatory compliance and sustainability parameters including environmental KPIs such as waste and emissions are managed through various performance measures on customer and community satisfaction (Lin, 2013). Customers impose normative pressures on firms, supporting organizational compliance with sets of environmental, social and economic norms, legitimacy and standards widely accepted in the industry (Somsuk and Laosirihongthong, 2016). For improved customer acceptance, firms are driven to develop product, process and supply chain designs to accommodate and optimize triple bottom line (Seuring and Müller, 2008).

Based on these arguments, a positive relationship between the customer focus principle and the integration of triple bottom line sustainability into organizations and supply chains is proposed through identification, embedding, measurement and improvement of customer sustainability requirements and market demands on sustainability.

3.2. Leadership

Leadership is at the core of ISO9001 framework as well as the SSCM philosophy that requires the organizational leaders at all levels to create conditions where all team members are engaged to deliver quality and sustainability performance objectives (Agi and Nishant, 2016; Ansari and Qureshi, 2015; ISO, 2015b; Luthra et al., 2015; Reefke and Sundaram, 2016; Somsuk and Laosirihongthong, 2016). The leaders through establishing the vision, the unity of purpose and managing the organizational resources for sustainability improvements across the supply chain, ensuring high performing teams are engaged to deliver economic, environmental and social objectives will highly influence sustainability performance of firms and the overall supply chain (Bastas and Liyanage, 2018). The positive impact of quality management's leadership principle on triple bottom line sustainability is highlighted by several authors in the literature (Aquilani et al., 2016; Nguyen et al., 2018; Zink, 2007). Furthermore, top management support and commitment is emphasized as a critical success factor for economic, ecologic and social sustainable development (Ansari and Qureshi, 2015; Reefke and Sundaram, 2016). A similar view point is put forward on the key role of leadership principle for integration and improvement of environmental sustainability in organizations and supply chains (Agi and Nishant, 2016; Luthra et al., 2015; Somsuk and Laosirihongthong, 2016).

The commitment, vision and willingness of senior leadership reinforces the organizational transformation towards the new sustainability management approach, fostering the new sustainability culture and mind-set (Aquilani et al., 2016). The leadership principle enables implementation of sustainability goals and associated strategies, “promoting behaviors and performance throughout the firm towards sustainability objectives”, the effect of which has been validated by Nguyen et al. (2018) in their recent empirical study. In organizations seeking sustainable operations, leaders embed environmental and social considerations into the set of business objectives that typically include financial aspects, establishing a long-term business orientation towards sustainable development and satisfaction of current and future stakeholder needs (Zink, 2007). For sustainable supply chains, a clear vision is required from the senior leaders, promoting intra and interorganizational initiatives for implementation of sustainability improvement activities (Ansari and Qureshi, 2015). Leadership principle allows establishment of “a long-term strategic focus on sustainability, relevant sustainability goals to work towards and support for sustainability improvement of the supply chain on transitional and final levels on a continuous basis, alleviating resistance to change” (Reefke and Sundaram, 2016).

Table 2

The sustainable supply chain quality management theory and its ingredients (Whetten, 1989).

Sustainable Supply Chain Quality Management Theory		
Ingredient	Element	
Description	What?	ISO9001 quality and supply chain integration management principles for organizational triple bottom line (economic, environmental and social) sustainability integration and improvement
	How?	<ul style="list-style-type: none"> • 3.1 Customer Focus • 3.2 Leadership • 3.3 Engagement of people • 3.4 Process approach • 3.5 Improvement • 3.6 Evidence based decision making • 3.7 Relationship management • 3.8 Supply chain integration Positive relationship proposed for integration of triple bottom line sustainability into organizational management mechanisms and improvement.
Explanation	<i>Research problem:</i>	
	The multi-dimensional nature of sustainability brings together inherent complexity for integration, performance measurement and improvement in organizations and supply chains (Bastas and Liyanage, 2018; De Brito and Van der Laan, 2010; Seuring and Müller, 2008).	
	New management approaches and concepts are highly required to facilitate integration of triple bottom sustainability into organizations and supply chains for sustainable development (Bastas and Liyanage, 2018; Beske and Seuring, 2014; De Brito and Van der Laan, 2010; Rajeev et al., 2017; Reefke and Sundaram, 2016; Winter and Klemeyer, 2013).	
	<i>Research motivation:</i>	
Context	Development of a theory and concept for integration of triple bottom line sustainability into organizational and supply chain management mechanisms to facilitate performance measurement and improvement by industrial practitioners.	
	<i>Justification of factors selection:</i>	
	The ISO9001 framework due to its wide implementation level in organizations globally, its applicability to most business sectors, high availability of support for its implementation compared to other QM methods, familiarity of managers with its principles and its well-recognized role in structuring and catalyzing organizational performance measurement and improvement. The supply chain integration principle included as the eighth principle to both increase the effects of ISO9001 principles and embedding the triple bottom line into the supply chain practices, as an imperative principle of SSCM.	
	Who?	Organizational managers and leaders in strategic, tactical and operational levels.
Context	Where?	Organizations and supply chains operating in manufacturing and other business sectors.
	When?	No time dependence identified (Considering current growing societal, industrial and research trends on sustainability).
		Empirical studies are suggested for investigation of the generalizability, reliability and validity of the propositions in applications under different conditions (regions, cultures, sectors, market conditions).

Stemming from this rationale, a positive relationship between the leadership principle and the integration of triple bottom line sustainability into organizations and supply chains is put forward.

3.3. Engagement of people

Engagement of people principle includes involvement, recognition and empowerment of team members in achieving organizational goals (ISO, 2015b). The sustainability management literature strategically positions engagement of people principle as a fundamental parameter for economic, ecologic and social sustainability performance of organizations and supply chains (Aquilani et al., 2016; Luburić, 2015; Rusinko, 2005; Zink, 2007). This argument is established on the basis that the people are at the heart of every

organization and only through their support, commitment, empowerment and involvement, TBL parameters can be integrated, performance at all levels established and improvement objectives achieved (Aquilani et al., 2016; Garvare and Isaksson, 2001; Luburić, 2015; Rusinko, 2005; Zink, 2007).

Aquilani et al. (2016) identified employee training, involvement and collaboration as a critical success factor for implementation and improvement of sustainability in firms and value chains. Zink (2007) adopted a stakeholder-oriented perspective for integration of sustainability, defining employees as key stakeholders of an organization and their involvement as an “important precondition” of adopting the sustainable development culture. Rusinko (2005) highlighted that engagement and empowerment of employees results in organization-wide deployment of sustainability

considerations along the whole value chain. [Nguyen et al. \(2018\)](#) positively linked training of employees and recognition of individual contributions with triple bottom line performance of organizations, that fosters competence, empowerment and ownership of firm members towards sustainable development. [Garvare and Isaksson \(2001\)](#) put forward that it is the “human” that drives every change and articulated implementation of sustainable values on personal level as key to sustainable development. [Luburić \(2015\)](#) supported a similar view, placing engagement of people at the core of embracing and achieving sustainability objectives in firms.

In summary, a positive relationship between the engagement of people principle and the integration of triple bottom line sustainability into organizations and supply chains is proposed.

3.4. Process approach

Sustainability and triple bottom line performance requires a holistic view and integrated approaches not only through organizational focus on end results (products and services) but also through managing the value stream of activities that deliver these results (processes) ([Bastas and Liyanage, 2018](#)). Implementation of process approach principle contributes to achievement of consistent results through management of key activities and their interrelations as a process through defined responsibilities, objectives, resources and interfaces ([ISO, 2015b](#)). The positive contribution of process approach principle for integration, measurement and improvement of triple bottom line sustainability of organizations and supply chains is proposed by a number of authors in the literature ([Aquilani et al., 2016](#); [Garvare and Isaksson, 2001](#); [Isaksson, 2006](#); [Nguyen et al., 2018](#)). This is achieved through incorporation of economic, ecologic and social indicators into organizational mechanisms and facilitation of sustainability performance measurement, monitoring, reporting and improvement ([Aquilani et al., 2016](#); [Garvare and Isaksson, 2001](#); [Isaksson, 2006](#); [Nguyen et al., 2018](#)).

[Aquilani et al. \(2016\)](#) defined process management as one of the most important critical success factors for sustainability, process approach facilitating intra and interorganizational communication, measurement and improvement activities for sustainable development. [Isaksson \(2006\)](#) put forward that the process approach principle “creates the basis for a set of TBL indicators for different types of indicators such as, input, enablers, drivers, output and outcome”, enhancing the understanding, communication and reporting of a high number of indicators from multiple agendas of TBL. On this basis, process management was articulated as a management principle for describing and improving organizational sustainability ([Isaksson, 2006](#)). [Nguyen et al. \(2018\)](#) established a positive relationship between triple bottom line sustainability and “how the organization manages process related issues such as process objectives, authority and responsibility for process management, process risks, and process standardization to achieve the overall outcome of the management system”, concluding that process management practices can support the integration and improvement of sustainability in firms. [Garvare and Isaksson \(2001\)](#) defined “process performance excellence” as a core value of sustainable development, arguing that process approach results in coordinated learning and improvement in different parts of the system for sustainability. The process that manages and optimizes triple bottom line expectations of interested parties for stakeholder satisfaction is defined as the “mother of all processes” that enables collective adoption of economic, ecologic and social issues along with sustainable development ([Garvare and Isaksson, 2001](#)).

In short, a positive relationship between the process approach principle and the integration of triple bottom line sustainability into organizations and supply chains is proposed.

3.5. Improvement

Stemming from the dynamic nature of the business climate, improvement principle is essential for organizational reflex to changes through an ongoing focus on innovation and capability development ([ISO, 2015b](#)). The improvement principle facilitates the organizational capability of anticipating and reacting to changes, risks, opportunities and threats internal and external to firms ([ISO, 2015b](#)). Improvement as a quality management principle is argued to positively contribute towards integration of triple bottom line sustainability and sustainable development of organizations and supply chains ([Aquilani et al., 2016](#); [Nguyen et al., 2018](#); [Rusinko, 2005](#); [Zink, 2007](#)).

Improvement principle is defined among the most important critical success factors for adoption of sustainability in organizations, identified at the interface between sustainability and QM ([Aquilani et al., 2016](#)). Through the improvement principle, firms deploy continuous efforts, activities and projects with a view to improve products, services and processes, contributing to economic, ecologic and social sustainability performance enhancements ([Nguyen et al., 2018](#)). This stance has also been empirically validated, concluding the overall contribution of the improvement principle on TBL sustainability performance along with the implication that this QM principle does not sacrifice on any TBL aspect, if deployed without favoring of a particular dimension ([Nguyen et al., 2018](#)). The continual improvement philosophy increases the capability of organizations to adapt to changing stakeholder needs, catalyzing the organizational change towards sustainability ([Zink, 2007](#)). [Rusinko \(2005\)](#) further identified a positive relationship between continuous improvement driven by Deming’s PDSA cycle and sustainable development of organizations, improvement principle and PDSA methodologies structuring and facilitating setting and achievement of sustainability goals. The continuous improvement principle is also known to have a positive effect on operational and financial performance of firms [Kaynak \(2003\)](#).

Based on these arguments, a positive relationship between the improvement principle and the integration of triple bottom line sustainability into organizations and supply chains is proposed.

3.6. Evidence based decision making

Evidence based decision making stems from the principle that more effective decisions with higher objectivity and confidence levels are made as a result of analysis of facts, evidence, information and data ([ISO, 2015b](#)). Management culture and decision making based on relevant data, information, facts, evidences is established as a fundamental element of an integrated quality principles-based sustainability management system ([Kuei and Lu, 2012](#)). The adoption of evidence based decision making principle fosters analytical thinking in the organization, facilitating sustainability performance assessment through review and actioning of operational metrics, measures and scorecards ([Kuei and Lu, 2012](#)). Through the implementation of evidence based measurement, reporting and decision making, the firm’s capability in engaging and communicating with their key stakeholders for collaboration, communication and improvement of sustainability is increased ([Garvare and Isaksson, 2001](#); [Kuei and Lu, 2012](#); [Zink, 2007](#)). Decision making based on analysis, information and data is identified as a critical success factor at the interface of QM and SM, as the capability of the organization of achieving its sustainability improvement objectives is enhanced through measuring, monitoring and control of sustainability parameters and associated development activities ([Aquilani et al., 2016](#)).

Stemming from these justifications established in the literature, a positive relationship between the evidence based decision

making and the integration of triple bottom line sustainability into organizations and supply chains is proposed.

3.7. Relationship management

Relationship management principle of quality management drives firms to identify and manage relationships with their key stakeholders including suppliers and local community that are fundamental for success and sustainability (ISO, 2015b). This principle leads to increased ability of value generation for organizations and their interested parties, reinforcing business flexibility and increased capability in responding to dynamic business and stakeholder conditions (Bastas and Liyanage, 2018). Management of relationships with key stakeholders and the quality of relationships between supply chain members are identified as critical enablers of sustainable development of organizations and supply chains (Ansari and Qureshi, 2015; Aquilani et al., 2016; Reefke and Sundaram, 2016; Xia and Li-Ping Tang, 2011).

Through engaging, collaborating and managing relationships with key stakeholders such as customers, suppliers and public the capability of organizations to identify, integrate and improve TBL sustainability is highly increased (Aquilani et al., 2016; Garvare and Isaksson, 2001). On-going identification and management of stakeholder sustainability requirements is imperative for sustainable development, which is facilitated by the relationship management principle (Zink, 2007). Triple bottom line performance of supply chains are highly influenced by the supply chain collaboration and partnerships, management of relationships with suppliers driving firms closer towards working on common sustainability goals and improvement (Ansari and Qureshi, 2015; Gimenez et al., 2012). Management of external (e.g. measuring service levels, sustainability performance for external stakeholders) and internal (e.g. measuring strategic alignment within the firm and supply chain) relationships is ranked as an important enabler for integration of sustainability into organizational and supply chain processes (Reefke and Sundaram, 2016). Environmental sustainability literature further resonate with regards to the positive influence of relationship management on the implementation and integration of sustainability, defining establishment of effective relationships between supply chain members as a highly influential factor for green performance of supply chains (Agi and Nishant, 2016; Tseng and Chiu, 2013).

Based on the arguments established in the literature, a positive relationship between the relationship management principle and the integration of triple bottom line sustainability into organizations and supply chains is proposed.

3.8. Supply chain integration

Sustainable supply chain management (SSCM) literature resonate that information flow, coordination, collaboration and connection between the supply chain partners is key for achievement of higher levels of organizational and overall supply chain sustainability performance (Ashby et al., 2012; Beske and Seuring, 2014; Liebetrueth, 2017; Rajeev et al., 2017; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013; Xia and Li-Ping Tang, 2011). Supply chain integration principle stems from the close alignment, open communication, coordination and cooperation based on continuous information flow internally and externally among the supply chain network members, which is defined as central to coherent execution of SCM activities, maximized value generation and support of integration and improvement of sustainability parameters (Bastas and Liyanage, 2018; Chang et al., 2016; Quang et al., 2016; Soares et al., 2017).

Chang et al. (2016) empirically supported the positive contribution of supply chain integration to financial performance and economic sustainability of firms. Environmentally, Sueyoshi and Wang (2014) evidenced that supply chain integration and associated cooperation between the trade partners significantly contributes to the environmental sustainability performance. Robinson and Malhotra (2005) and Flynn et al. (2010) suggested that through supply chain integration, organizational effectiveness and internal process efficiency improvements are realized. Cross-enterprise collaboration (e.g. information sharing, joint ventures) and integration of processes across the supply chain (e.g. full visibility from cradle-to-grave) are categorized as critical enablers of sustainable supply chain management (Reefke and Sundaram, 2016). Supply chain integration principle facilitates implementation of sustainability concepts through not only supporting incorporation “into diverse business processes and activities across functional silos within a single company, but also through cooperation between parties across the network of relationships that form a supply chain” (Winter and Knemeyer, 2013). Supply chain integration fosters interorganizational cooperation and synergy, catalyzing innovation towards sustainable development (Xia and Li-Ping Tang, 2011).

Based on these arguments, a positive relationship between the supply chain integration principle and the integration of triple bottom line sustainability into organizations and supply chains is proposed.

3.9. The integrated theoretical framework of SSCQM

The review of the seven quality management principles as per ISO (2015b) and the supply chain management principle of supply chain integration i.e. critical success factor for sustainable supply chain management; from the lens of sustainable development resulted in identification of synergies and positive relationships (Bastas and Liyanage, 2018). On the basis of the knowledge base established and theoretical considerations derived from the QM, SCM and sustainability integration research domain, the theoretical framework of sustainable supply chain quality management (SSCQM) was constructed as demonstrated in Fig. 4. The integrated construct of SSCQM, stems from the latest indications in the QM, SCM and sustainability integration literature and builds upon the prospective synergies offered by QM and SCM for deployment at organizations to drive sustainable development internally and across their supply chain network.

4. An integrated business diagnostic and sustainability improvement model

The framework introduced in Fig. 4 offers several practical implications for industrial practitioners, senior managers and decision makers that can be used as a platform to drive sustainable development in organizations. With a view to facilitate industrial implementation, a road map for operationalization was presented in Fig. 5, that is constructed on the basis of Deming's Plan-Do-Check-Act (PDCA) structure due to its established reputation in the management literature for facilitation of organizational improvement and sustainable development (Kuei and Lu, 2012; Rusinko, 2005). Initially, the economic, ecologic and social parameters important (priorities) for the organization are derived through adoption of “leadership, customer focus and relationship management” principles, formulating sustainability factors key to the organization's context and its stakeholders (denoted as Step 0 in Fig. 5) (Garvare and Isaksson, 2001; Zink, 2007). Current state analysis is then undertaken that entails business diagnostics to identify organizational maturity and assessment of current organizational performance levels against the high-risk triple bottom line parameters identified (Step 1). Organizational maturity revolves around

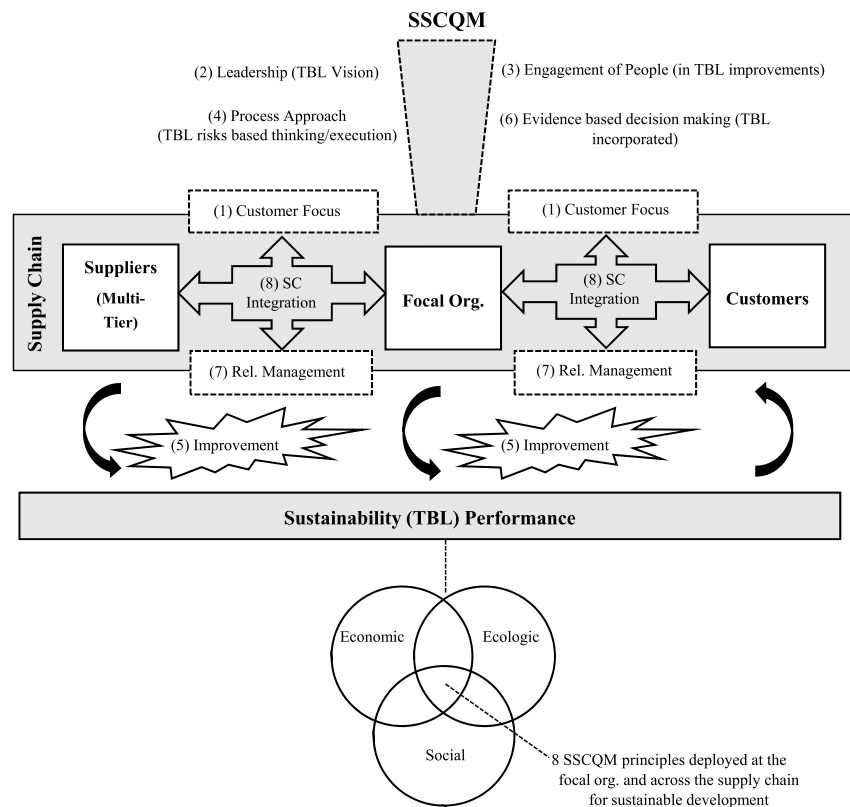


Fig. 4. The framework of SSCQM, integrating QM and SCM principles for sustainable development (Reprinted from: Sustainable supply chain quality management: A systematic review, 181, Bastas A. and Liyanage K., Journal of Cleaner Production, 726–744, Copyright 2018, with permission from Elsevier).

the support structure, procedures, processes, resource commitments and degree of knowledge in the business along with deployment effectiveness of the principles under evaluation (Garza-Reyes et al., 2015). Sustainability performance measurement models in the literature e.g. Chardine-Baumann and Botta-Genoulaz (2014) and/or organizational sustainability reporting standards e.g. GRI (2017) can be utilized to establish current organizational sustainability performance levels, in particular for the TBL priorities of the organization (Vigneau et al., 2015). A business diagnostic tool is presented in Fig. 6 to facilitate establishment of organizational maturity levels of the eight SSCQM principles, providing the decision makers with a holistic map of where their organizations are in relation to the SSCQM principle deployment levels with a view to drive sustainable development.

Following on from the establishment of current state, risks and opportunities for sustainable development are identified along with gaps and areas requiring improvement in the organizational mechanisms (Step 2). This will enable implementation of counter-measures and risk mitigating actions, facilitating deployment of policies and strategies in the organization aligned towards sustainability improvement. Consequently, projects are implemented internally in the organization and across its supply chain network to address the risks and opportunities established (Step 3). The effects of the principles deployed on the sustainability measures targeted are required to be monitored periodically to confirm effectiveness and embedded into the organizational culture through leadership commitment and standard work practices, driving continual organizational sustainable development (Step 4).

To facilitate the key step in this systematic cycle of continual sustainable development, the SSCQM business diagnostic concept is demonstrated in Fig. 6. This organizational diagnostic tool was constructed through extraction of organizational indicators of the

eight SSCQM principles from the literature (Chang et al., 2016; ISO, 2015b). The concept presented in Fig. 6 is structured in a checklist (Y/N) format, where the organization is assessed against the indicators of each principle versus each dimension of triple bottom line (economic, ecologic and social). In the case of the indicating organizational practice/process being fully implemented to incorporate social sustainability, “Y” is awarded against the indicator. As a result, implementation and maturity scores against each principle, alignment score against each triple bottom line parameter and an overall SSCQM organizational score is established, that acts as a measurement and improvement platform. The indicators denoted in amber in Fig. 6 against “customer focus, leadership and relationship management” principles can be utilized to facilitate determination of “the voice of the stakeholders” of the organization in the TBL sustainability priority assessment stage of the road map introduced (Fig. 5 – Step 0).

Through benchmarking against the SSCQM diagnostic tool, the industrial practitioners can:

- Determine the maturity level of each SSCQM principle in their organizations
- Holistically evaluate alignment of existing organizational culture, mechanisms, practices and processes against triple bottom line (economic, ecologic and social) parameters
- Establish organizational strengths, weaknesses, opportunities and threats (SWOT) with reference to sustainability synergistic SSCQM principles
- Integrate triple bottom line (economic, ecologic and social) considerations into organizational quality and supply chain management systems and processes
- Undertake organizational current state (current SSCQM score) and future state analyses (desired SSCQM score) towards sustainable development

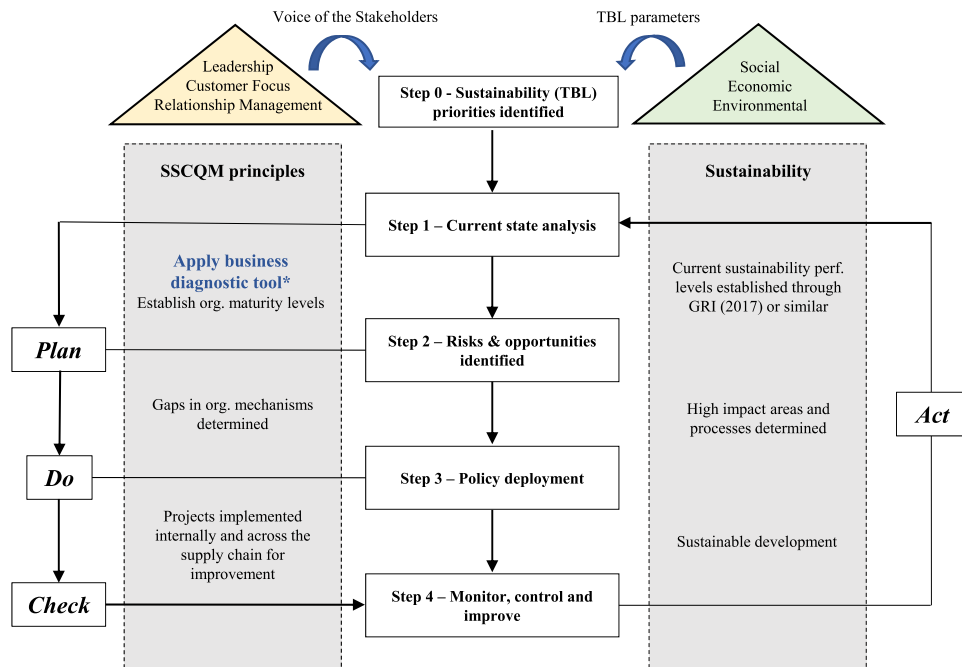


Fig. 5. Road map for implementation of SSCQM and sustainable development. *Please refer to Fig. 6 for business SSCQM diagnostic tool.





SSCQM	Principle	Organizational Indicators					
	1. Customer Focus	Are the current and future sustainability needs and requirements of current and potential customers identified ?	3	2	0	32%	
		Are the sustainability needs and requirements of customers aligned with the objectives of the organization ?	3	1	0		
		Are the organizational members at all levels aware of customer sustainability needs and requirements ?	3	1	1		
		Are the products, services and processes of the organization aligned with the sustainability needs/requirements of the customers and market ?	3	1	1		
	2. Leadership	Are the leaders of the organization committed to sustainable development through clear mission, vision, policies and objectives ?	4	4	2	58%	
		Are the sustainable development mission, vision, policies and objectives articulated throughout the organization ?	4	3	1		
		Is the organization-wide commitment to sustainable development encouraged, recognizing contribution both at individual and team levels ?	4	3	2		
		Is the workforce provided with the necessary resources, training and authority to drive sustainability improvement activities ?	4	3	1		
	3. Engagement of people	Is collaboration promoted for sustainable development throughout the organization ?	5	2	1	49%	
Is sharing of knowledge / experience facilitated among employees for sustainable development ?		3	3	1			
Is the workforce empowered to determine constraints, take initiatives and contributing to sustainable development as required ?		4	2	1			
Is the authority, responsibility and accountability established for managing processes in line with sustainability objectives ?		3	3	0			
4. Process Approach	Are the high risk activities and processes determined for organizational sustainability performance (sustainability risk-based thinking) ?	4	3	0	42%		
	Are the high risk processes and their interrelations managed effectively and efficiently as a coherent system in line with sustainability objectives ?	3	3	0			
	Are the sustainability improvement objectives implemented at all levels of the organization ?	3	3	0			
	Is the workforce trained and competent in promoting, tracking and completing sustainability improvement projects in line with the objectives ?	4	2	0			
5. Improvement	Are the sustainability improvement considerations incorporated into the new product, process and service introduction processes ?	3	2	0	38%		
	Are the key indicators for organizational sustainability improvement objectives identified, monitored and controlled ?	3	1	0			
	Is the workforce trained and competent in sustainability performance data capturing, evaluation and analysis methods ?	2	2	0			
	Is accurate, reliable and secure data evaluated for organizational decision making and sustainability improvement action deployment ?	2	1	1			
6. Evidence based decision making	Are the current and future sustainability needs and requirements of interested parties (e.g. Public, Regulatory etc.) identified and prioritised ?	2	1	0	20%		
	Is the information, feedback, expertise and resources being exchanged with key interested parties for sustainable development ?	2	1	0			
	Are collaborative sustainability improvement activities being established with suppliers, partners and other interested parties ?	2	1	0			
	Is information being shared between supply chain members (including IT support) with ref. to sustainable development ?	2	1	1			
7. Relationship management	Are joint cooperation activities being held across the supply chain including cross-enterprise participation for sustainable development ?	1	1	1	22%		
	Is there an association among supply chain members based on commitment, long term orientation and trust with ref. to sustainable development ?	1	1	1			
	Unidimensional TBL score			59%		39%	12%
	Organizational SSCQM TBL Sustainability Score			36%			
Not Implemented		Fully Implemented					
0		5					

Fig. 6. SSCQM business diagnostic tool.

- Assign sustainability improvement objectives aligned with organizational mechanisms, monitoring and controlling effect of improvement projects implemented
- Deploy sustainability synergistic intra and interorganizational policies, strategies and processes for continual sustainable development

Considering the case in Fig. 6, it would be observed by the managers of the organization that more focus is required in the implementation and embedding of “social – 12%” and “ecologic – 39%” sustainability parameters. The SSCQM principles can be utilized in the facilitation of integrating these parameters into the organizational mechanisms. Furthermore, it would also be noted

that actions are required to be taken to improve organizational maturity in the “relationship management – 20%” and “supply chain integration – 22%” principles, driving the organization towards sustainable development through implementation of triple bottom line into its culture, systems and processes. The business diagnostic tool introduced is a guideline concept for practitioners that adopts key indicators of the QM and supply chain integration principles for sustainable development. The checklist questions can be simplified or expanded to accommodate industry and organizational specific parameters.

For organizational sustainability measurement, reporting indicators set out by GRI (2017) can be reflected upon as extensive for all three dimensions of sustainability, taking into consideration various organizational sustainability factors internal to firms and external across their supply chains, that can be followed in operationalization of the framework, road map and diagnostic tool presented (Vigneau et al., 2015).

On the other hand, the SSCQM framework and the business diagnostic tool, although adopting the supply chain management view through incorporation of supply chain integration principle, only provides sustainability assessment of the focal organization but not its entire supply chain. To overcome this limitation, it is recommended to the prospective implementers of this model to consider promotion of a similar SSCQM view at the upstream and downstream of their supply chain networks in their journey towards sustainable supply chains. As conceptualized in Fig. 7, the adoption of SSCQM philosophy across the supply chain of the organization will allow assessment and improvement of the true sustainability performance of the organizations and their supply chains. The SSCQM principles of “relationship management, customer focus and supply chain integration” can provide a bridge towards achieving cross-enterprise engagement and deployment, supporting sustainable development of supply chains.

4.1. Implications for theory and practice

Causal relationships between the core management and performance improvement approach ISO9001, supply chain integration principle of SCM and triple bottom line sustainability were structured and reorganized under a novel integration and improvement framework of SSCQM for sustainable development of organizations and supply chains. The SSCQM theory and propositions formulated introduce a revised thinking to sustainability, quality and supply chain management research and practice, demonstrating further the high potential and catalyzing role of the existing, deeply rooted management principles in the integration and improvement of multi-dimensional sustainability agendas (Isaksson, 2006; Kuei and Lu, 2012; Zink, 2007). The synergistic lens of SSCQM theory introduced influences the academic and industrial understanding on ISO9001 and supply chain integration principles, which offers a development platform for subsequent research, investigating applications of the fruitful propositions in this study under different qualitative scenarios of who, where and when (Whetten, 1989). This implies new research directions through empirical studies in different contextual factors, results of which will provide evidence, rationalization and fortification for relationships between ISO9001, SCM and triple bottom line sustainability. The theoretical construct of SSCQM develops further on the existing relationships proposed between QM, SCM and organizational performance, contributing to our societal, industrial and research journey towards sustainable production and consumption. The theoretical and conceptual contribution of SSCQM is linked to the core organizational management concepts of ISO9001 and supply chain management, addressing a contemporary sustainability research problem that new management approaches are required to facilitate the complex organizational challenge of integrating triple bottom line into

organizational management practices and supply chains (Bastas and Liyanage, 2018; Beske and Seuring, 2014; De Brito and Van der Laan, 2010; Rajeev et al., 2017; Reefke and Sundaram, 2016; Whetten, 1989; Winter and Knemeyer, 2013).

Furthermore, the SSCQM theory and conceptual framework developed brings together significant implications for the practice of organizational and supply chain science. The SSCQM theory and concept established a new approach on the contemporary issue of integrating sustainability into organizational systems and processes which can be utilized by organizational leaders and decision makers, supporting our transition towards sustainable management and operations (Rajeev et al., 2017; Whetten, 1989). The concept and diagnostic tool proposed outlines a road map for practitioners, facilitating identification, integration, performance measurement and improvement of triple bottom line sustainability parameters. As part of the concept, the maturity of the management principles established as “synergistic” for integration and improvement of sustainability can be determined, risks and opportunities identified, and improvement actions deployed. Through this approach, the capability of an organization to integrate sustainability parameters into its core strategic, tactical and operational management processes is increased, serving towards our journey for sustainable operations, products, services and consumption.

5. Conclusions and future research directions

This paper critically investigated the emerging research avenue of integrating quality management (QM), supply chain management (SCM) and sustainability to contribute in the journey towards gaining further insights for higher levels of sustainability performance. An in-depth literature review was undertaken, evidencing the needs and examining the shortcomings of the current models in the literature. The findings from our structured literature review highlighted significant limitations in the management integration research streams. In particular, the holistic perspective of triple integration of QM, SCM and sustainability was seen to be highly limited in the literature although a significant emphasis on organizational performance improvement benefits, which was taken forward for exploration under a collective framework of SSCQM (sustainable supply chain quality management), where novel synergies were derived and systemized to drive sustainable development in organizations (Bastas and Liyanage, 2018).

The fruitful potential of the globally implemented ISO9001:2015 quality management principles harmonized and deployed across the supply chain with the core sustainable SCM principle of supply chain integration, was revealed and converted into a road map for industrial practitioners that can be followed to not only realize sustainability improvements in their organizations but also across their supply chain network. Finally, a business diagnostic tool was introduced, incorporating the sustainability synergistic SSCQM principles for holistic gauging of maturity levels against triple bottom line, facilitating SWOT analysis and policy deployment for continual organizational sustainable development.

Our research findings are in line with several authors in the literature that emphasized the supporting role of quality management practices in the integration of sustainability considerations (Aquilani et al., 2016; Bastas and Liyanage, 2018; Isaksson, 2006; Kuei and Lu, 2012; Nguyen et al., 2018; Siva et al., 2016; Zink, 2007). Systematic integration with supply chain members and other stakeholders is also concluded as a strategic parameter for the integration of sustainability into intra and interorganizational processes, resonating with a range of recent theoretical and conceptual contributions (Beske and Seuring, 2014; Chitaka et al., 2018; Qorri et al., 2018; Reefke and Sundaram, 2016). Voice of the stakeholders approach has been deployed in our concept to

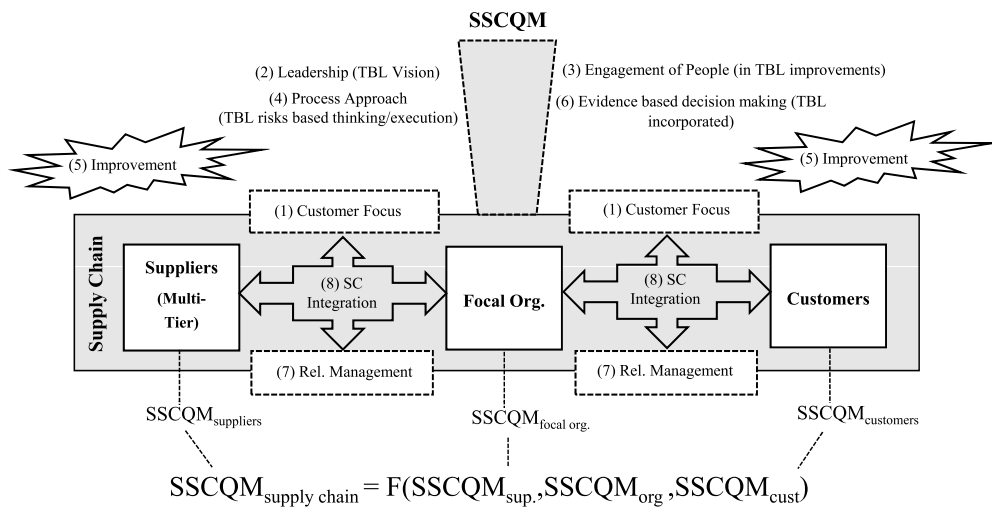


Fig. 7. SSCQM for sustainable development of supply chains.

facilitate determination of sustainability priorities for performance measurement and action deployment however, utilization of dynamic priority setting models as proposed by Ahi et al. (2017) offers further opportunities and more dynamic representations for practitioners. Our findings also echo with the view point of Chitaka et al. (2018) that evidence based decision support models will facilitate sustainability performance measurement and stakeholder risk based policy deployment. Similar to Peace et al. (2018)'s approach, our proposed diagnostic tool utilized a quantitative self-assessment method for the integration of sustainability into decision making and processes.

Peer reviewed articles from main databases identified as central to QM, SCM and sustainability literature were included (Scopus, WOS, Emerald, Elsevier, IEEE and EBSCO) which may have limited the scope to a certain extent. However, this action was taken for rigor purposes and the high sample size (50 integrated models) considered not only brought together a collective view during the critical evaluation phase of the extant models, but also offered significant reliability level to the literature review undertaken and deductions provided in the paper.

The theoretical and conceptual framework contributions in this paper also entail certain research limitations. Every theoretical development introduces "a statement of relations between concepts within a set of boundary assumptions and constraints" (Suddaby, 2014). The contextual conditions of "who, where and when" draw the boundaries, the extent of generalizability and range of the propositions formulated (Whetten, 1989). Although the theoretical and conceptual frameworks established in this paper incorporate propositions and concepts adopted from quantitative and qualitative evidence in the literature supported by a range of scholars, they were inevitably designed with the authors' "familiar surroundings" in mind (manufacturing organizations operating under ISO9001 quality management system framework) in this current climate of sustainability integration challenge that the organizations are facing (Whetten, 1989). This can be reflected upon as a contextual limitation for the theory and conceptual phenomenon of SSCQM along with a key future research direction on verification, testing, validation and further development studies investigating the propositions in applications under qualitatively different conditions of who (different business cultures, management styles and leadership levels), where (different geographical regions and business sectors) and when (different time periods, business climates and market conditions) (Whetten, 1989). Delphi studies are particularly encouraged for future empirical research,

which is an appropriate method for verification and improvement of novel theory and concepts (Fernández-Llamazares et al., 2013; McMillan et al., 2016), that has been successfully adopted to date in various disciplines such as systems management (Brancheau et al., 1996), international business (Griffith et al., 2008) and innovation management (Munier and Rondé, 2001), in particular where there are no other comparable sources in the area of novel development (Linstone and Turoff, 1975).

References

- Agi, M.A.N., Nishant, R., 2016. Understanding influential factors on implementing green supply chain management practices: An interpretive structural modelling analysis. *J. Environ. Manage.* 188, 351–363. <http://dx.doi.org/10.1016/j.jenvman.2016.11.081>.
- Agrawal, R., Sharma, V., 2015. Supply chain social sustainability: A comparative case analysis in Indian manufacturing industries. *Procedia - Soc. Behav. Sci.* 189, 234–251. <http://dx.doi.org/10.1016/j.sbspro.2015.03.219>.
- Ahi, P., Searcy, C., Jaber, M.Y., 2017. A probabilistic weighting model for setting priorities in assessing sustainability performance. *Sustain. Prod. Consum.* 13, 80–92. <http://dx.doi.org/10.1016/j.spc.2017.07.007>.
- Ansari, Z.N., Qureshi, M.N., 2015. Sustainability in supply chain management: An overview. *IUP J. Supply Chain Manag.* 12, 24–46.
- Anttila, J., Jussila, K., 2017. ISO 9001:2015—a questionable reform. What should the implementing organisations understand and do? *Total Qual. Manag. Bus. Excell.* 28, 1090–1105. <http://dx.doi.org/10.1080/14783363.2017.1309119>.
- Aquilani, B., Silvestri, C., Ruggieri, A., 2016. Sustainability, TQM and value co-creation processes: The role of critical success factors. *Sustainability* 8, 995. <http://dx.doi.org/10.3390/su8100995>.
- Ashby, A., Leat, M., Hudson-Smith, M., 2012. Making connections: a review of supply chain management and sustainability literature. *Supply Chain Manag. Int. J.* 17, 497–516. <http://dx.doi.org/10.1108/13598541211258573>.
- Asif, M., Searcy, C., Garvare, R., Ahmad, N., 2011. Including sustainability in business excellence models. *Total Qual. Manag. Bus. Excell.* 22, 773–786. <http://dx.doi.org/10.1080/14783363.2011.585784>.
- Awudu, I., Zhang, J., 2012. Uncertainties and sustainability concepts in biofuel supply chain management: A review. *Renew. Sustain. Energy Rev.* 16, 1359–1368. <http://dx.doi.org/10.1016/j.rser.2011.10.016>.
- Azar, A., Kahnali, R.A., Taghavi, A., 2010. Relationship between supply chain quality management practices and their effects on organisational performance. *Singapore Manag. Rev.* 32, 45–68.
- Azizi, R., Maleki, M., Moradi-Moghadam, M., Cruz-Machado, V., 2016. The impact of knowledge management practices on supply chain quality management and competitive advantages. *Manag. Prod. Eng. Rev.* 7. <http://dx.doi.org/10.1515/mper-2016-0001>.
- Banawi, A., Bilec, M.M., 2014. A framework to improve construction processes: Integrating lean, green and six sigma. *Int. J. Constr. Manag.* 14, 45–55. <http://dx.doi.org/10.1080/15623599.2013.875266>.
- Bastas, A., Liyanage, K., 2018. Sustainable supply chain quality management: A systematic review. *J. Clean. Prod.* 181, 726–744. <http://dx.doi.org/10.1016/j.jclepro.2018.01.110>.

- Beske, P., Seuring, S., 2014. Putting sustainability into supply chain management. *Supply Chain Manag. Int. J.* 19, 322–331. <http://dx.doi.org/10.1108/SCM-12-2013-0432>.
- Brancheau, J.C., Janz, B.D., Wetherbe, J.C., 1996. Key issues in information systems management: 1994–95 SIM delphi results. *MIS Q.* 20, 225. <http://dx.doi.org/10.2307/249479>.
- Briner, R.B., Denyer, D., 2012. Systematic review and evidence synthesis as a practice and scholarship tool. *Oxford Handb. Evidence-Based Manag.* <http://dx.doi.org/10.1093/oxfordhdb/9780199763986.013.0007>.
- Carmignani, G., 2009. Supply chain and quality management: The definition of a standard to implement a process management system in a supply chain. *Bus. Process. Manag. J.* 15, 395–407. <http://dx.doi.org/10.1108/14637150910960639>.
- Chang, W., Ellinger, A.E., Kim, K.K., Franke, G.R., 2016. Supply chain integration and firm financial performance: A meta-analysis of positional advantage mediation and moderating factors. *Eur. Manag. J.* 34, 282–295. <http://dx.doi.org/10.1016/j.emj.2015.11.008>.
- Chardine-Baumann, E., Botta-Genoulaz, V., 2014. A framework for sustainable performance assessment of supply chain management practices. *Comput. Ind. Eng.* 76, 138–147. <http://dx.doi.org/10.1016/j.cie.2014.07.029>.
- Chen, I.J., Paulraj, A., 2004. Towards a theory of supply chain management: The constructs and measurements. *J. Oper. Manag.* 22, 119–150. <http://dx.doi.org/10.1016/j.jom.2003.12.007>.
- Cherrafi, A., Elfezazi, S., Govindan, K., Garza-Reyes, J.A., Benhida, K., Mokhlis, A., 2017. A framework for the integration of green and lean six sigma for superior sustainability performance. *Int. J. Prod. Res.* 55, 4481–4515. <http://dx.doi.org/10.1080/00207543.2016.1266406>.
- Chitaka, T.Y., von Blottnitz, H., Cohen, B., 2018. The role of decision support frameworks in industrial policy development: A South African iron and steel scrap case study. *Sustain. Prod. Consum.* 13, 113–125. <http://dx.doi.org/10.1016/j.spc.2017.11.004>.
- Chuang, S.P., 2014. Assessing and improving the green performance using a compound approach. *Flex. Serv. Manuf. J.* 26, 69–91. <http://dx.doi.org/10.1007/s10696-012-9156-1>.
- Cluzel, F., Yannou, B., Afonso, D., Leroy, Y., Millet, D., Pareau, D., 2010. Managing the complexity of environmental assessments of complex industrial systems with a lean 6 Sigma approach. In: *Proc. 1st Int. Conf. Complex Syst. Des. Manag. CSDM*, 2010, pp. 279–294. http://dx.doi.org/10.1007/978-3-642-15654-0_20.
- De Brito, M.P., Van der Laan, E.A., 2010. Supply chain management and sustainability: Procrastinating integration in mainstream research. *Sustainability* 2, 859–870. <http://dx.doi.org/10.3390/su2040859>.
- De Freitas, J.G., Costa, H.G., Ferraz, F.T., 2017. Impacts of lean six sigma over organizational sustainability: A survey study. *J. Clean. Prod.* 156, 262–275. <http://dx.doi.org/10.1016/j.jclepro.2017.04.054>.
- Dubey, R., Gunasekaran, A., Samar Ali, S., 2015. Exploring the relationship between leadership, operational practices, institutional pressures and environmental performance: A framework for green supply chain. *Int. J. Prod. Econ.* 160, 120–132. <http://dx.doi.org/10.1016/j.ijpe.2014.10.001>.
- Dubin, R., 1978. *Theory Development*. Free Press, New York.
- Evans, J.R., Lindsay, W.M., 2010. *The Management and Control of Quality*. South-Western Cengage Learning.
- Fernandes, A.C., Sampaio, P., Sameiro, M., Truong, H.Q., 2017. Supply chain management and quality management integration. *Int. J. Qual. Reliab. Manag.* 34, 53–67. <http://dx.doi.org/10.1108/IJQRM-03-2015-0041>.
- Fernández-Llamazares, C.M., Hernández-Gago, Y., Pozas, M., Cabañas, M.J., Feal, B., Villaronga, M., Álvarez Del-Vayo, C., Valverde, E., 2013. Two-round delphi technique for the consensual design of a paediatric pharmaceutical care model. *Pharmacol. Res.* 68, 31–37. <http://dx.doi.org/10.1016/j.phrs.2012.11.001>.
- Flynn, B.B., Flynn, E.J., 2005. Synergies between supply chain management and quality management: emerging implications. *Int. J. Prod. Res.* 43, 3421–3436. <http://dx.doi.org/10.1080/00207540500118076>.
- Flynn, B.B., Huo, B., Zhao, X., 2010. The impact of supply chain integration on performance: A contingency and configuration approach. *J. Oper. Manag.* 28, 58–71. <http://dx.doi.org/10.1016/j.jom.2009.06.001>.
- Fonseca, L.M., 2015. From quality gurus and TQM to ISO 9001:2015: A review of several quality paths. *Int. J. Qual. Res.* 9, 167–180.
- Francis, F., 2009. Total quality management – A tool for design for environment. *Adv. Comput. Tools Eng. Appl.* 351–354. <http://dx.doi.org/10.1109/ACTEA.2009.5227948>.
- Fynes, B., Voss, C., De Búrca, S., 2005. The impact of supply chain relationship quality on quality performance. *Int. J. Prod. Econ.* 96, 339–354. <http://dx.doi.org/10.1016/j.ijpe.2004.05.008>.
- Garvare, R., Isaksson, R., 2001. Sustainable development: extending the scope of business excellence models. *Meas. Bus. Excell.* 5, 11–15. <http://dx.doi.org/10.1108/13683040110403899>.
- Garvare, R., Johansson, P., 2010. Management for sustainability – A stakeholder theory. *Total Qual. Manag. Bus. Excell.* 21, 737–744. <http://dx.doi.org/10.1080/14783363.2010.483095>.
- Garza-Reyes, J.A., Rocha-Lona, L., Kumar, V., 2015. A conceptual framework for the implementation of quality management systems. *Total Qual. Manag. Bus. Excell.* 26, 1298–1310. <http://dx.doi.org/10.1080/14783363.2014.929254>.
- Gimenez, C., Sierra, V., Rodon, J., 2012. Sustainable operations: Their impact on the triple bottom line. *Int. J. Prod. Econ.* 140, 149–159.
- Gold, S., Schleper, M.C., 2017. A pathway towards true sustainability: A recognition foundation of sustainable supply chain management. *Eur. Manag. J.* 6–10. <http://dx.doi.org/10.1016/j.emj.2017.06.008>.
- Govindan, K., Azevedo, S.G., Carvalho, H., Cruz-Machado, V., 2014. Impact of supply chain management practices on sustainability. *J. Clean. Prod.* 85, 212–225. <http://dx.doi.org/10.1016/j.jclepro.2014.05.068>.
- GRI, 2017. Sustainability Reporting [WWW Document]. GRI Report. Stand. URL <https://www.globalreporting.org/information/sustainability-reporting/>. (Accessed 10 October 2017).
- Griffith, D.A., Cavusgil, S.T., Xu, S., 2008. Emerging themes in international business research. *J. Int. Bus. Stud.* 39, 1220–1235. <http://dx.doi.org/10.1057/palgrave.jibs.8400412>.
- Groszold, J., Hoejmoose, S.U., Roehrich, J.K., 2014. Squaring the circle: Management, measurement and performance of sustainability in supply chains. *Supply Chain Manag. Int. J.* 19, 292–305. <http://dx.doi.org/10.1108/SCM-12-2013-0440>.
- Gu, P., Song, R., Chen, X., 2017. Management practice of supply chain quality management in service-oriented manufacturing industry. *MATEC Web Conf.* 100, 05035. <http://dx.doi.org/10.1051/mateconf/201710005035>.
- Heras-Saizarbitoria, I., Boiral, O., 2013. ISO 9001 and ISO 14001: Towards a research agenda on management system standards. *Int. J. Manag. Rev.* 15, 47–65. <http://dx.doi.org/10.1111/j.1468-2370.2012.00334.x>.
- Isaksson, R., 2006. Total quality management for sustainable development. *Bus. Process Manag. J.* 12, 632–645. <http://dx.doi.org/10.1108/14637150610691046>.
- ISO, 2015a. ISO9001:2015 Quality Management System [WWW Document]. Int. Organ. Stand. URL <https://www.iso.org/iso-9001-quality-management.html>. (Accessed 17 August 2017).
- ISO, 2015b. Quality management principles [WWW Document]. URL <http://www.iso.org/iso/pub100080.pdf>. (Accessed 30 January 2018).
- ISO, 2017. ISO Survey [WWW Document]. URL <https://www.iso.org/the-iso-survey.html>. (Accessed 20 August 2018).
- Jabbour, A.B.L.D.S., Frascareli, F.C.D.O., Jabbour, C.J.C., 2015. Green supply chain management and firms' performance: Understanding potential relationships and the role of green sourcing and some other green practices. *Resour. Conserv. Recycl.* 104, 366–374. <http://dx.doi.org/10.1016/j.resconrec.2015.07.017>.
- Jabbour, A.B.L.D.S., Jabbour, C.J.C., Latan, H., Teixeira, A.A., Oliveira, J.D.H.C., 2014. Quality management, environmental management maturity, green supply chain practices and green performance of Brazilian companies with ISO 14001 certification: Direct and indirect effects. *Transp. Res. E* 67, 39–51. <http://dx.doi.org/10.1016/j.tre.2014.03.005>.
- Jraisat, L.E., Sawalha, I.H., 2013. Quality control and supply chain management: a contextual perspective and a case study. *Supply Chain Manag. Int. J.* 18, 194–207. <http://dx.doi.org/10.1108/13598541311318827>.
- Kaynak, H., 2003. The relationship between total quality management practices and their effects on firm performance. *J. Oper. Manag.* 21, 405–435. [http://dx.doi.org/10.1016/S0272-6963\(03\)00004-4](http://dx.doi.org/10.1016/S0272-6963(03)00004-4).
- Kaynak, H., Hartley, J.L., 2008. A replication and extension of quality management into the supply chain. *J. Oper. Manag.* 26, 468–489. <http://dx.doi.org/10.1016/j.jom.2007.06.002>.
- Kuei, C., Lu, M.H., 2012. Integrating quality management principles into sustainability management. *Total Qual. Manag. Bus. Excell.* 3363, 1–17. <http://dx.doi.org/10.1080/14783363.2012.669536>.
- Kuei, C., Madu, C.N., Lin, C., 2011. Developing global supply chain quality management systems. *Int. J. Prod. Res.* 49, 4457–4481. <http://dx.doi.org/10.1080/00207543.2010.501038>.
- Lambert, D.M., Enz, M.G., 2017. Issues in supply chain management: Progress and potential. *Ind. Mark. Manag.* 62, 1–16. <http://dx.doi.org/10.1016/j.indmarman.2016.12.002>.
- Liebetruht, T., 2017. Sustainability in performance measurement and management systems for supply chains. *Procedia Eng.* 192, 539–544. <http://dx.doi.org/10.1016/j.proeng.2017.06.093>.
- Lin, R.-J., 2013. Using fuzzy DEMATEL to evaluate the green supply chain management practices. *J. Clean. Prod.* 40, 32–39. <http://dx.doi.org/10.1016/j.jclepro.2011.06.010>.
- Lin, C., Chow, W.S., Madu, C.N., Kuei, C.-H., Pei Yu, P., 2005. A structural equation model of supply chain quality management and organizational performance. *Int. J. Prod. Econ.* 96, 355–365. <http://dx.doi.org/10.1016/j.ijpe.2004.05.009>.
- Lin, C., Kuei, C., Chai, K., 2013. Identifying critical enablers and pathways to high performance supply chain quality management. *Int. J. Oper. Prod. Manag.* 33, 347–370. <http://dx.doi.org/10.1108/01443571311300818>.
- Linstone, H.A., Turoff, M. (Eds.), 1975. *The Delphi Method: Techniques and Applications*. Addison-Wesley Educational Publishers Inc, MA.
- Luburić, R., 2015. Quality management principles and benefits of their implementation in central banks. *J. Cent. Bank. Theory Pract.* 4, 91–121. <http://dx.doi.org/10.1515/jcbtp-2015-0013>.
- Luthra, S., Garg, D., Haleem, A., 2015. Critical success factors of green supply chain management for achieving sustainability in Indian automobile industry. *Prod. Plan. Control* 26, 339–362. <http://dx.doi.org/10.1080/09537287.2014.904532>.

- Mahdiraji, H.A., Arabzadeh, M., Ghaffari, R., 2012. Supply chain quality management. *Manag. Sci. Lett.* 2, 2463–2472. <http://dx.doi.org/10.5267/j.msl.2012.07.020>.
- Maletić, M., Maletić, D., Gomišček, B., 2011. Can sustainable quality management contribute to the organizational performance? *African J. Bus. Manag.* 5, 3297–3301. <http://dx.doi.org/10.5897/AJBM10.1575>.
- Marshall, D., McCarthy, L., Heavey, C., McGrath, P., 2015. Environmental and social supply chain management sustainability practices: construct development and measurement. *Prod. Plan. Control* 26, 673–690. <http://dx.doi.org/10.1080/09537287.2014.963726>.
- McMillan, S.S., King, M., Tully, M.P., 2016. How to use the nominal group and delphi techniques. *Int. J. Clin. Pharm.* <http://dx.doi.org/10.1007/s11096-016-0257-x>.
- Mehra, S., Huffman, J.M., Austin, S.F., Sirias, D., 2001. TQM as a management strategy for the next millennia. *Int. J. Oper. Prod. Manag.* 21, 855–876. <http://dx.doi.org/10.1108/01443570110390534>.
- Mellat-Parast, M., 2013. Supply chain quality management. *Int. J. Qual. Reliab. Manag.* 30, 511–529. <http://dx.doi.org/10.1108/02656711311315495>.
- Munier, F., Rondé, P., 2001. The role of knowledge codification in the emergence of consensus under uncertainty: Empirical analysis and policy implications. *Res. Policy* 30, 1537–1551. [http://dx.doi.org/10.1016/S0048-7333\(01\)00166-4](http://dx.doi.org/10.1016/S0048-7333(01)00166-4).
- Nguyen, M.H., Phan, A.C., Matsui, Y., 2018. Contribution of quality management practices to sustainability performance of Vietnamese firms. *Sustain* 10, 1–31. <http://dx.doi.org/10.3390/su10020375>.
- Peace, A., Ramirez, A., Broeren, M.L.M., Coleman, N., Chaput, I., Rydberg, T., Sauvion, G.-N., 2018. Everyday Industry—Pragmatic approaches for integrating sustainability into industry decision making. *Sustain. Prod. Consum.* 13, 93–101. <http://dx.doi.org/10.1016/j.spc.2017.08.003>.
- Powell, D., Lundebj, S., Chabada, L., Dreyer, H., 2017. Lean six sigma and environmental sustainability: the case of a Norwegian dairy producer. *Int. J. Lean Six Sigma* 8, 53–64. <http://dx.doi.org/10.1108/IJLSS-06-2015-0024>.
- Qorri, A., Mujkić, Z., Kraslawski, A., 2018. A conceptual framework for measuring sustainability performance of supply chains. *J. Clean. Prod.* 189, 570–584. <http://dx.doi.org/10.1016/j.jclepro.2018.04.073>.
- Quang, H.T., Sampaio, P., Carvalho, M.S., Fernandes, A.C., Binh An, D.T., Vilhenac, E., 2016. An extensive structural model of supply chain quality management and firm performance. *Int. J. Qual. Reliab. Manag.* 33, 444–464. <http://dx.doi.org/10.1108/IJQRM-11-2014-0188>.
- Rajeev, A., Pati, R.K., Padhi, S.S., Govindan, K., 2017. Evolution of sustainability in supply chain management: A literature review. *J. Clean. Prod.* 162, 299–314. <http://dx.doi.org/10.1016/j.jclepro.2017.05.026>.
- Reefke, H., Sundaram, D., 2016. Key themes and research opportunities in sustainable supply chain management—identification and evaluation. *Omega* 66, 1–17. <http://dx.doi.org/10.1016/j.omega.2016.02.003>.
- Robinson, C.J., Malhotra, M.K., 2005. Defining the concept of supply chain quality management and its relevance to academic and industrial practice. *Int. J. Prod. Econ.* 96, 315–337. <http://dx.doi.org/10.1016/j.jipe.2004.06.055>.
- Rusinko, C.A., 2005. Using quality management as a bridge to environmental sustainability in organizations. *SAM Adv. Manag. J.* 70, 54–60.
- Saunders, M.N.K., Lewis, P., Thornhill, A., 2015. *Research Methods for Business Students*, seventh ed. Pearson.
- Schmidt, M., Schwegler, R., 2008. A recursive ecological indicator system for the supply chain of a company. *J. Clean. Prod.* 16, 1658–1664. <http://dx.doi.org/10.1016/j.jclepro.2008.04.006>.
- Seuring, S., Müller, M., 2008. From a literature review to a conceptual framework for sustainable supply chain management. *J. Clean. Prod.* 16, 1699–1710. <http://dx.doi.org/10.1016/j.jclepro.2008.04.020>.
- Seuring, S., Sarkis, J., Müller, M., Rao, P., 2008. Sustainability and supply chain management - An introduction to the special issue. *J. Clean. Prod.* 16, 1545–1551. <http://dx.doi.org/10.1016/j.jclepro.2008.02.002>.
- Shalij, P.R., Devadasan, S.R., Prabhushankar, G.V., 2009. Design of ISO 9001:2000 based supply chain quality management systems. *Int. J. Process Manag. Benchmarking* 3, 1. <http://dx.doi.org/10.1504/IJPM.2009.026406>.
- Silvestre, B.S., 2015. Sustainable supply chain management in emerging economies: Environmental turbulence, institutional voids and sustainability trajectories. *Int. J. Prod. Econ.* 167, 156–169. <http://dx.doi.org/10.1016/j.jipe.2015.05.025>.
- Siva, V., Gremyr, I., Bergquist, B., Garvare, R., Zobel, T., Isaksson, R., 2016. The support of quality management to sustainable development: a literature review. *J. Clean. Prod.* 138, 148–157. <http://dx.doi.org/10.1016/j.jclepro.2016.01.020>.
- Soares, A., Soltani, E., Liao, Y.-Y., 2017. The influence of supply chain quality management practices on quality performance: an empirical investigation. *Supply Chain Manag. Int. J.* 22, 122–144. <http://dx.doi.org/10.1108/SCM-08-2016-0286>.
- Somsuk, N., Laosirihongthong, T., 2016. Prioritization of applicable drivers for green supply chain management implementation toward sustainability in Thailand. *Int. J. Sustain. Dev. World Ecol.* 4509, 1–17. <http://dx.doi.org/10.1080/13504509.2016.1187210>.
- Srdić, A., Šelih, J., 2011. Integrated quality and sustainability assessment in construction: a conceptual model. *Technol. Econ. Dev. Econ.* 17, 611–626. <http://dx.doi.org/10.3846/20294913.2011.603177>.
- Stindt, D., 2017. A generic planning approach for sustainable supply chain management - How to integrate concepts and methods to address the issues of sustainability? *J. Clean. Prod.* 153, 146–163. <http://dx.doi.org/10.1016/j.jclepro.2017.03.126>.
- Suddaby, R., 2014. Editor's comments: Why theory? *Acad. Manag. Rev.* 39, 407–411. <http://dx.doi.org/10.5465/amr.2014.0252>.
- Sueyoshi, T., Wang, D., 2014. Sustainability development for supply chain management in U.S. petroleum industry by DEA environmental assessment. *Energy Econ.* 46, 360–374. <http://dx.doi.org/doi:10.1016/j.eneco.2014.09.022>.
- Talib, F., Rahman, Z., Qureshi, M.N., 2011. A study of total quality management and supply chain management practices. *Int. J. Product. Perform. Manag.* 60, 268–288. <http://dx.doi.org/10.1108/17410401111111998>.
- Tari, J.J., Molina-azorín, J.F., Heras, I., 2013. Benefits of the ISO 9001 and ISO 14001 standards: A literature review. *J. Ind. Eng. Manag.* 5, 297–322. <http://dx.doi.org/10.3926/jiem.488>.
- Terzioviski, M., Hermel, P., 2011. The role of quality management practice in the performance of integrated supply chains: A multiple cross-case analysis. *Qual. Manag. J.* 18, 10–25.
- Tseng, M.L., Chiu, A.S.F., 2013. Evaluating firm's green supply chain management in linguistic preferences. *J. Clean. Prod.* 40, 22–31. <http://dx.doi.org/10.1016/j.jclepro.2010.08.007>.
- Tsouflias, G.T., Pappis, C.P., 2008. A model for supply chains environmental performance analysis and decision making. *J. Clean. Prod.* 16, 1647–1657. <http://dx.doi.org/10.1016/j.jclepro.2008.04.018>.
- Türkay, M., Saraçoğlu, Ö., Arslan, M.C., 2016. Sustainability in supply chain management: Aggregate planning from sustainability perspective. *PLoS One* 11, e014750. <http://dx.doi.org/10.1371/journal.pone.0147502>.
- Utne, I.B., 2009. Improving the environmental performance of the fishing fleet by use of Quality Function Deployment (QFD). *J. Clean. Prod.* 17, 724–731. <http://dx.doi.org/10.1016/j.jclepro.2008.11.005>.
- Vanichchinchai, A., Igel, B., 2009. Total quality management and supply chain management: similarities and differences. *TQM J.* 21, 249–260. <http://dx.doi.org/10.1108/17542730910953022>.
- Vanichchinchai, A., Igel, B., 2010. The impact of total quality management on supply chain management and firm's supply performance. *Int. J. Prod. Res.* 49, 3405–3424. <http://dx.doi.org/10.1080/00207543.2010.492805>.
- Vigneau, L., Humphreys, M., Moon, J., 2015. How do firms comply with international sustainability standards? Processes and consequences of adopting the global reporting initiative. *J. Bus. Ethics* 131, 469–486. <http://dx.doi.org/10.1007/s10551-014-2278-5>.
- Webster, J., Watson, R.T., 2002. Analyzing the past to prepare for the future: Writing a literature review. *MIS Q.* 26, xiii–xxiii. <http://dx.doi.org/10.1.1.104.6570>.
- Whetten, D.A., 1989. What constitutes a theoretical contribution? *Acad. Manag. Rev.* 14, 490–495. <http://dx.doi.org/10.5465/AMR.1989.4308371>.
- Winter, M., Knemeyer, M., 2013. Exploring the integration of sustainability and supply chain management: Current state and opportunities for future inquiry. *Int. J. Phys. Distrib. Logist. Manag.* 43, 18–38.
- Xia, Y., Li-Ping Tang, T., 2011. Sustainability in supply chain management: suggestions for the auto industry. *Manag. Decis.* 49, 495–512. <http://dx.doi.org/10.1108/00251741111126459>.
- Zeng, J., Phan, C.A., Matsui, Y., 2013. Supply chain quality management practices and performance: An empirical study. *Oper. Manag. Res.* 6, 19–31. <http://dx.doi.org/10.1007/s12063-012-0074-x>.
- Zhang, M., Awasthi, A., 2014. Using six sigma to achieve sustainable manufacturing. In: *Proceedings of the 2014 International Conference on Innovative Design and Manufacturing, ICIDM 2014*, pp. 311–317. <http://dx.doi.org/10.1109/IDAM.2014.6912713>.
- Zhong, J., Ma, Y., Tu, Y., Li, X., 2016. Supply chain quality management: an empirical study. *Int. J. Contemp. Hosp. Manag.* 28, 2446–2472. <http://dx.doi.org/10.1108/IJCHM-03-2015-0110>.
- Zink, K.J., 2007. From total quality management to corporate sustainability based on a stakeholder management. *Manag. Hist.* 13, 394–401. <http://dx.doi.org/10.1108/09574090910954864>.